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Shedding Light on Sustainable Shipping

Examining Content and Motivations for Sustainability Reporting along the Shipping Value Chain

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Abstract

Sustainability reporting is the primary way corporate sustainability data is disseminated to stakeholders and the wider public. While sustainability reporting is growing, certain industries still lag, such as shipping. Given the crucial role sustainability reporting can play in driving sustainable business practices, promoting improved reporting in the shipping industry is a valuable goal.

This thesis examines the main factors characterizing and motivating sustainability reporting within shipping in order to identify focal areas for strengthened sustainability reporting. The thesis looks not only at shipping lines but other industry actors to analyze the interactions between different players in the shipping value chain.

This study consists of two analyses. The first reviews the published sustainability material of companies involved in the shipping industry to explore the prevalence of key sustainability themes and frameworks. The second consists of interviews with sustainability leadership at firms within the shipping value chain to discover deeper insights on the motivations and barriers influencing a company's sustainability disclosure process.

The sustainability reporting analysis revealed a wide range of frameworks used and themes reported on. The most prominent frameworks were the GRI and SDGs. Most reports covered many sustainability themes, but safety and climate-related issues were most prevalent, with less coverage of emerging fields such as natural capital valuation.

Interviews pointed to the key role cargo owners play in driving sustainable practices and data collection in shipping lines as well as the value of regulatory action and growing interest from diverse stakeholder groups in sustainability reporting, but that greater standardization in reporting demands would ease their burden and improve consistency.

Overall, this thesis shows that the current status of shipping sustainability reporting is very diverse and industry-wide coordination could fill current gaps and allow for diffusion of existing best practices.

Keywords: Sustainability Reporting, Shipping, Value Chain Analysis, Stakeholders

Executive Summary

Shipping is a critical part of the global economy – and also a critical driver of many global sustainability challenges. Yet it has been overlooked in existing research and policies focused on promoting sustainability, with interventions undermined by the international scope of the industry and the variety of industry-specific challenges and impacts that fit poorly in other governance frameworks.

In the current day, shipping sustainability is governed through a wide range of company and industry-wide initiatives, prodded forward by port state governments and emerging interest from stakeholders throughout the shipping value chain. Many shipping companies do take action on sustainability and report on these actions, but progress still lags other sectors. A solution to this disparity could be targeted industry reporting guidelines and sustainability goals, such as the Roadmap to Sustainable Shipping (Roadmap) produced by the Sustainable Shipping Initiative, a partner in this work.

Thus, this thesis looks at both the content and motivation for sustainability reporting within shipping, the "what" and "why" that are useful for policymakers, industry coalitions, or stakeholders looking to improve sustainability in a company or industry-wide, addressing the following research questions:

1. What CSR themes are currently reported on by major companies in the shipping value chain?

    a. *Sub-Question 1.1:* Which frameworks are used in shipping CSR reporting?

    b. *Sub-Question 1.2:* How do these themes align with the Sustainable Shipping Initiative's Roadmap to Sustainable Shipping?

2. What are the main motivations for CSR reporting in the shipping value chain?

    a. *Sub-Question 2.1:* How do power dynamics within the shipping value chain play a role in these motivating factors?

The shipping value chain for this paper includes cargo owners, shipping lines, ports, shipyards, and shipping service providers, which are hypothesized to mutually influence each other's sustainability and disclosure practices.

After a literature review introducing the shipping value chain, the sustainability impacts of shipping, and existing research on sustainability reporting and shipping, this research is conducted using two methods:

1. Qualitative and quantitative analysis of published sustainability reports at 60 major companies in five shipping industry subsectors – shipping lines, ports, shipyards, cargo owners, and service providers. Reports or other public sustainability material are coded to a list of themes developed from the Roadmap. This analysis addresses research question 1.

2. Qualitative analysis of interviews with sustainability leadership at seven major actors within the shipping value chain, comprising shipping lines, ports, and cargo owners. Semi-structured interviews with a convenience sample of relevant actors were coded based on motivations for sustainability reporting identified across industries in literature. This analysis addresses research question 2.

Method 1 identified the main frameworks used and issues reported on by the industry as a whole and by subsector and regional subgroups. All of the major frameworks identified were used by at least 15% of the companies analyzed with many overlapping, but the Global Reporting Initiative and Sustainable Development Goals were clearly the most commonly used, especially among operators and cargo owners. Reports discussed a wide variety of themes, with at least one report touching on each, though in many cases initiatives and metrics addressing each theme varied. The most common themes reported on are safety, diversity & inclusion, and climate change (especially in the context of efficiency improvements and emissions reduction). Other themes such as circular economy, shipping careers, and labor and human rights were common but especially prevalent among certain subsectors of the value chain, while emerging or technical issues such as natural capital valuation or marine spatial planning received less coverage.

Operators and cargo owners were more likely to produce sustainability reports and had wider ranging reports than ports, shipyards, and service providers but less variation was found on a geographic level, though European firms had the highest level of reporting overall.

Method 2 reinforced a number of motivations first identified in literature, including the importance of stakeholders and regulations, the strategic value of sustainability reporting, and the potential for financial or brand benefits from disclosing sustainability successes. They reinforced a value chain model of industry power structures by showing the way cargo owners can have sustainability requirements from shipping lines (and downstream retailers can pressure cargo owners in a similar fashion). Interviews did not necessarily show as clear a link between ports or shipyards and other parts of the value chain, where sustainability impacts are less clear and financial and logistical challenges can occur by switching suppliers.

Interviewees often mentioned the challenges in fitting their existing sustainability activity into a global sustainability reporting framework or meeting the different formats of data requests from governments, clients, and other stakeholders and pushed for more concerted action led by the IMO or national governments to standardize and incentivize reporting and sustainability requirements.

The findings of this thesis show that despite the reputation of the shipping industry, large shipping companies do disclose sustainability practices and results and are active in a number of sustainability areas. But the diversity of motivations and reporting requirements complicate any industry-wide comparison and reinforce the importance of action by the IMO or through comprehensive industry initiatives to mandate reporting and develop tailored and relevant reporting frameworks that can meet the demands of corporate leaders, external stakeholders, and governments alike.

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Abbreviations

Abbreviation	**Term**
CSR	Corporate Social Responsibility
ESG	Environmental, Social, Governance
ESI	Environmental Ship Index
EU	European Union
GHG	Greenhouse gas
GRI	Global Reporting Initiative
IMO	International Maritime Organization
KPI	Key Performance Indicator
MARPOL	International Convention for the Prevention of Pollution from Ships
MSI	Multi-Stakeholder Initiative
NGO	Non-Governmental Organization
SASB	Sustainability Accounting Standards Board
SDG	Sustainable Development Goals
SME	Small or Medium Enterprise
SOLAS	International Convention for the Safety of Life at Sea
SSI	Sustainable Shipping Initiative
TCFD	Taskforce on Climate Related Financial Disclosures
UN	United Nations
UNGC	United Nations Global Compact

1 Introduction

1.1 Problem Definition

The shipping industry is a critical component of almost all economic activity and in every part of the world (Poulsen et al., 2016). Despite unprecedented shocks to global trade due to the COVID-19 pandemic and growing calls to retreat from globalization across the political spectrum, shipping is likely to remain a major aspect of the global economy for many years to come (GlobeNewswire 2020).

However, like almost all industries, the shipping industry has recently come under heightened scrutiny over its sustainability record. Shipping runs on fossil fuels, especially particularly dirty ones such as heavy fuel oil, and thus contributes to 3% of total global carbon dioxide (CO_2) emissions, a proportion that could rise significantly without further action (Berg 2016; Coady et al., 2013). Beyond emissions, shipping is also connected to numerous other sustainability challenges including air pollution, water and coastal pollution, invasive species, waste, worker health & safety, labor rights and fair pay, diversity, discrimination & harassment, poverty reduction and economic opportunity, transparency, tax evasion, piracy, and maritime governance (Parviainen et al., 2018, Andersson et al., 2016).

The globally fragmented nature of the shipping industry and industry-specific loopholes (e.g., flags of convenience) have allowed shipping to avoid regulatory pressures that have driven sustainability in other sectors (Sofev, 2018). The UN's International Maritime Organization (IMO) has proposed various sustainability initiatives within shipping but is limited in its enforcement ability and cooperation with national governments (Wu et al., 2020; Parviainen et al., 2018). Combined with the lack of pressure from consumers or governments (Lund-Thomsen et al., 2016) the shipping industry traditionally has had a lower commitment to sustainability and poor transparency (KPMG, 2017).

Nonetheless, many shipping companies do publish materials detailing their sustainability activities, and this number has increased in recent years (KPMG, 2017). With sustainability reporting having the potential to fill existing governance gaps within the industry to some extent (Yliskylä-Peuralahti and Gritsenko, 2014), it is valuable for shipping industry stakeholders, policymakers, and researchers to understand how and why shipping companies report on sustainability.

Sustainability (or Corporate Social Responsibility [CSR]) provides multiple benefits to companies connected to the shipping sector. Developing a sustainable reputation can be a competitive advantage for winning clients and stakeholders, ease port state interventions and permitting, and avoid reputational risks (Stein & Acciaro, 2020; Mahoney et al., 2013). Through these benefits or others shipping companies with better sustainability practices can experience greater financial success (Drobetz et al., 2014). Increasing concerns about Scope 3 emissions and supply chain issues in cargo owners, retailers, and other industry sectors reliant on shipping forces shipping companies to produce data to meet client CSR demands (Parviainen et al., 2018; Lister, 2015; Coady et al., 2013; Yuen et al., 2017). With annual CSR reporting providing the primary and most systematic way companies portray their sustainability activities for external stakeholders (Mahoney et al., 2013), this reporting must be well-developed to meet the requirements of these stakeholders.

CSR reporting can also be a strong motivation for improving activities around sustainability by influencing companies to improve internal sustainability management to increase data collection, set improvement targets, and expand their focus to meet a larger set of CSR issues (Pérez-López et al., 2013). Presence of CSR reporting can be thus linked to stronger CSR performance (Mahoney et al., 2013), and improving reporting quality can therefore improve not just transparency but also the actual underlying sustainability metrics.

Research has looked at motivations for sustainability in the shipping industry, but studies specifically on shipping industry CSR reporting are lacking. Given findings of regional differences in shipping sustainability approaches (Drobetz et al., 2014), landscape analysis of reporting that goes beyond national boundaries could prove especially insightful for crafting global policies or identifying regions of consistently weak disclosure. Research is also needed to develop reporting frameworks tailored to the shipping industry, as this is currently led by non-academic actors and may be disconnected from relevant literature. Given the significant room for improvement in shipping sustainability, research on the existing status of reporting can be a useful resource for market actors looking to find methods to standardize and enhance reporting practices or draw attention to underreported issues. This improvement in reporting may then incentivize improvements in corporate sustainability practices.

1.2 Aim and Research Questions

The goal of this paper is to provide a comprehensive overview of shipping CSR reporting practices following a framework specific to shipping to identify alignment and mismatches between different segments of the shipping value chain. The secondary goal is to identify common motivating factors for reporting as a means to target future interventions in the sector, such as cargo owner initiatives to push greater CSR reporting in their supply chains.

Given these goals, the value of sustainability reporting discussed above, and the dearth of existing research in the shipping industry this paper thus has the aim to answer the following research questions:

1. What CSR themes are currently reported on by major companies in the shipping value chain?

    a. *Sub-Question 1.1:* Which frameworks are used in shipping CSR reporting?

    b. *Sub-Question 1.2:* How do these themes align with the Sustainable Shipping Initiative's Roadmap to Sustainable Shipping?

2. What are the main motivations for CSR reporting in the shipping value chain?

    a. *Sub-Question 2.1:* How do power dynamics within the shipping value chain play a role in these motivating factors?

The Sustainable Shipping Initiative's Roadmap to Sustainable Shipping, as discussed in Section 1.3, is used as an analytical framework for Research Question 1.

Answering these questions will present the information necessary to develop a comprehensive and holistic approach to integrating sustainability reporting within shipping.

1.3 Background on the Partner Organization

The Sustainable Shipping Initiative (SSI) is a London-based coalition of shipping industry leaders from 15 companies and NGOs collaborating to lead the industry to adopt best practices in sustainability. SSI is globally and cross-sector focused and considers sustainability in all dimensions, in contrast to other shipping industry organizations focused on climate reporting (e.g., Green Ship, Clean Cargo Working Group). This paper is written in partnership with SSI.

SSI believes this research will lay the groundwork for design or adaptation of resources that can be targeted to specific areas for improvement in shipping sustainability, specifically its *Roadmap to a sustainable shipping industry* (referred hereafter as the Roadmap). The Roadmap is a set of benchmarks to help shipping companies gradually progress in their sustainability by 2040, organized in six Vision Areas: Oceans, Communities, People, Transparency, Finance, and Energy (see Figure 1-1). Within each Vision Area are Objectives and Themes, each with corresponding Milestones (see Figure 1-2). The Roadmap is used as a framework for the sustainability reporting analysis in this thesis as discussed in Section 2.2.1.

Figure 1-1. Roadmap Vision Areas (SSI, 2020)

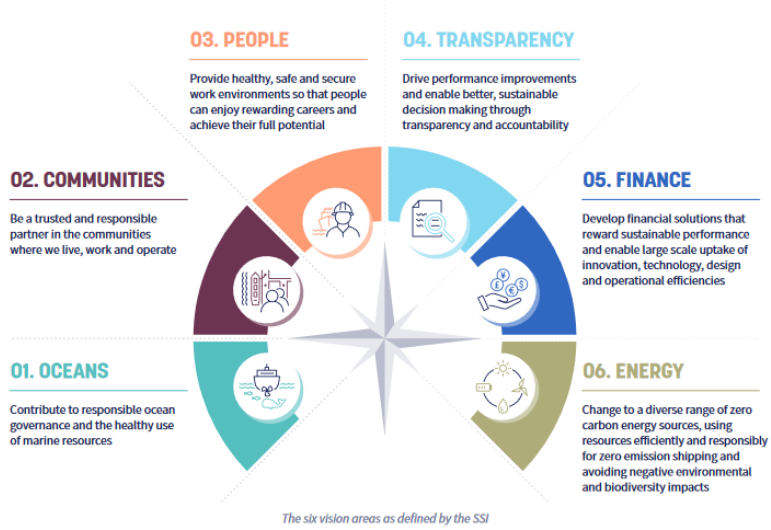

Figure 1-2. Roadmap Sample Objectives, Themes, and Milestones (SSI, 2020)

1.4 Scope

This study focuses on actors in the global cargo shipping industry. Due to myriad different actors within shipping, the geographic distribution of the industry, and the interplay between different forms of transportation, the "shipping industry" is highly complex and challenging to define (ICS, 2020). For the purposes of this research, the shipping industry is viewed as actors involved in marine freight transportation. This generally excludes companies who operate land- or air-based freight transportation, as well as marine personal transport (e.g., cruise lines and ferries). Many of those industries face related sustainability concerns as the freight shipping industry, but also have noticeable differences that would excessively broaden this study.[1]

When considering the shipping value chain, it is valuable to divide into two separate lifecycles that partially overlap:

1. The lifecycle of a ship

2. The lifecycle of a product transported aboard a ship

During the period from port-to-port the product value chain aligns with that of the ship. Otherwise, a largely separate set of factors are involved which are generally not considered within the shipping industry, though the act of shipping is clearly a portion of most products' value chain. Thus, this study will focus on the value chain of a ship specifically, and as such incorporate actors like shipyards and classification societies that do not become involved with routine cargo shipping activity once a ship is operational.

This study has a wide scope compared to previous work on sustainability reporting in the shipping industry. It is not focused on a specific geography and examines companies from a variety of parts of the shipping value chain. Conclusions here aim to compare across jurisdictions and subsectors instead of addressing questions related to policies in one specific country. The goal for this approach is for these findings to be applicable to the entire shipping industry on a broad scale and develop linkages between value chain components, as past work in the field has largely been narrow despite the international scope of the industry.

Hundreds of thousands of companies can be considered directly involved in shipping (Bureau van Dijk, 2021). Millions of others rely on shipping in their supply chain or client bases. However, in order to enable depth of research and target issues relevant for shipping, this study is focused on a selection of 60 large companies within five prominent subsectors in the shipping value chain, as explained in Section 3.2.1, and a narrower selection of interview subjects from the different subsectors as explained in Section 3.2.2. The sample used is large enough to provide valuable conclusions in a qualitative analysis but should not be taken as a statistically representative picture of the industry, as it is a primarily convenience sample (though based on sectoral quotas). Findings herein are not necessarily generalizable to every shipping industry actor, especially for SMEs and in regions of the world that are poorly represented here, as discussed in Section 5.2. Only the most recent sustainability reporting data is used, this study does not attempt to explain changes over time or predict future developments in the field.

[1] Note that the cargo owners reviewed do use non-marine transportation in their business and different forms of transport are often linked in their reporting. Some companies included also operate in sectors beyond maritime freight transportation.

The author accepts that public CSR reports do not necessarily represent a complete picture of a company's sustainability activity. For example, a company may not credit an action to pressure from financiers when they can claim it is due to corporate values, which is better for brand image. Unsuccessful initiatives may be excluded from the reporting or greenwashed so as not to reflect poorly on the company's actions (Mahoney et al., 2013). However, sustainability reporting is the only systematized source of information on a company's sustainability practices for stakeholders without access to proprietary data. It is also a picture of how the company wants itself to be perceived in a sustainability standpoint (Mahoney et al., 2013). Thus, this form of research can find the gaps in reporting as a self-governance or promotional tool, even if surveys or interviews may be required for a complete understanding of motivations and attitudes towards sustainability.

Interview data is limited to companies that agreed to interviews, which is an even narrower subset that is primarily Northern European, many of which are SSI members. This data is thus even less representative than the sustainability reporting review.

1.5 Ethical Considerations

1.5.1 Researcher honesty and personal integrity

This thesis is done in collaboration with SSI. SSI has provided no funding for this research and the non-public resources leveraged from SSI are limited to member contacts. SSI has assisted in developing the research questions outlined above but has not made requests for specific findings or research methods that would compromise the integrity of the research or the quality of the findings. This involvement does however affect my choice of methods and companies analyzed in order to provide materials that meet SSI's needs as described in Section 1.3, with some SSI members included even when they would not meet the other search criteria. The Roadmap has been critically examined in Section 5 and additional information has been included where necessary in order to provide a full picture where the Roadmap may be lacking. All materials here are accurate to the source data and all writing has been confirmed as free from plagiarism by anti-plagiarism software.

1.5.2 Ethical responsibilities to the subjects of research

This thesis incorporates interviews. Written consent was provided by all interview participants confirming their willingness to participate in this study and have their responses recorded and publicized (including direct quotes, if used). All interview respondents are anonymized and all material used authentically represents the collected responses and is appropriately cited. Any other empirical material used comes only from public information or provided directly by partners and no ethical issues are anticipated. Findings portrayed here are not linked to specific companies and the author makes no value judgments on a company's sustainability activity.

1.5.3 Use of findings

This research is conducted primarily to meet the academic requirements of the Master of Science in Environmental Management and Policy at Lund University and is not used by the author for individual purposes. These findings are shared with SSI in a modified format. SSI has the right to use this research for their activities independently without the author's direct consent and to share it with their members or other partners as desired. The complete thesis is publicly available through Lund University and findings may be used freely for other academic purposes, but not for commercial use.

1.5.4 Use of data records

Empirical public data (e.g., from sustainability reports and literature reviews) is provided herein and will be available to SSI upon request. Analysis on this data and responses from interviews or any other non-public sources are maintained in a folder within the author's uGoogle Drive, which is secure from third-party access, and will be archived after the conclusion of this project. No personal data is publicized in this thesis or other deliverables provided to SSI except where there is written consent and a clear rationale for doing so.

1.6 Audience

This work is intended for particular use by SSI and for colleagues and professors at the IIIEE. Findings herein are valuable for other researchers interested in corporate sustainability reporting or sustainability in the shipping industry, whether from an academic, political, or corporate context. This work provides background details on shipping in Section 2.2 that should make it accessible for readers with no subject area or industry expertise.

1.7 Outline

- Section 2 provides the literature review supporting this research, including the shipping industry value chain analysis.

- Section 3 describes the research design and methodology.

- Section 4 presents the primary findings from the two empirical analyses.

- Section 5 presents discussion of the connections between the findings, literature, and other relevant topics, as well as limitations of the research.

- Section 6 is the conclusion, including recommendations and avenues for future research.

2 Literature Review

2.1 Literature Review Methodology

Existing literature on sustainability reporting and the shipping industry was identified and examined to develop the background for the research. Academic literature was found using Google Scholar or Lund University's LUBSearch literature databases. Other non-academic sources were found through Google searches (e.g., for industry reports or news articles), as was especially the case for the value chain analysis. Search strings used for the literature review included the following:

- shipping industry sustainability report*
- stakeholder pressure on shipping (+ sustainability)
- sustainability reporting motivations (barriers, impacts)

Literature is judged relevant if it was written in English and after 2010, as given the rapid transformation of sustainability in business practices and public discourse literature more than ten years old may no longer be accurate and up to date.[2] With about 16,000 results for a Google Scholar search with the first search term above with this time specification, this was not judged to be overly limiting and the research confirmed that most relevant findings from earlier dates were replicated in recent work. Literature was preferred which addresses the topics globally or theoretically, localized or case studies were considered where relevant but were less likely to provide the industry-wide picture that is the focus of this study. Potentially relevant literature was identified by title and abstract or reference in other literature and confirmed upon further reading.

2.2 Background: Shipping Industry Value Chain Analysis

Understanding the shipping value chain is core to understanding the way CSR is approached in different parts of the industry. A value chain is the range of activities which are required to bring a product or service from conception to the end-of-life (Morris, 2001). Shipping is a prominent example of a 'global value chain', where value chain activities are geographically fragmented and all activities are exposed to global economic trends, competition, and innovation (Ponte & Sturgeon, 2014).

A simplified diagram of the shipping industry value chain can be shown below in Figure 2-1. A narrative of the lifecycle of a ship pinpointing relevant actors follows (Notteboom, 2021; Poulsen et al., 2016).[3] As value chains are defined by their network of power dynamics and actor interactions (Ponte & Sturgeon, 2014), understanding the shipping value chain allows one to pinpoint key actors in the industry and thus scope an industry-wide analysis.

[2] There are certain exceptions here for particularly relevant work, especially major theories which were developed before 2010.

[3] This description is high-level as this paper does not seek to focus on the intricacies of shipping business practices.

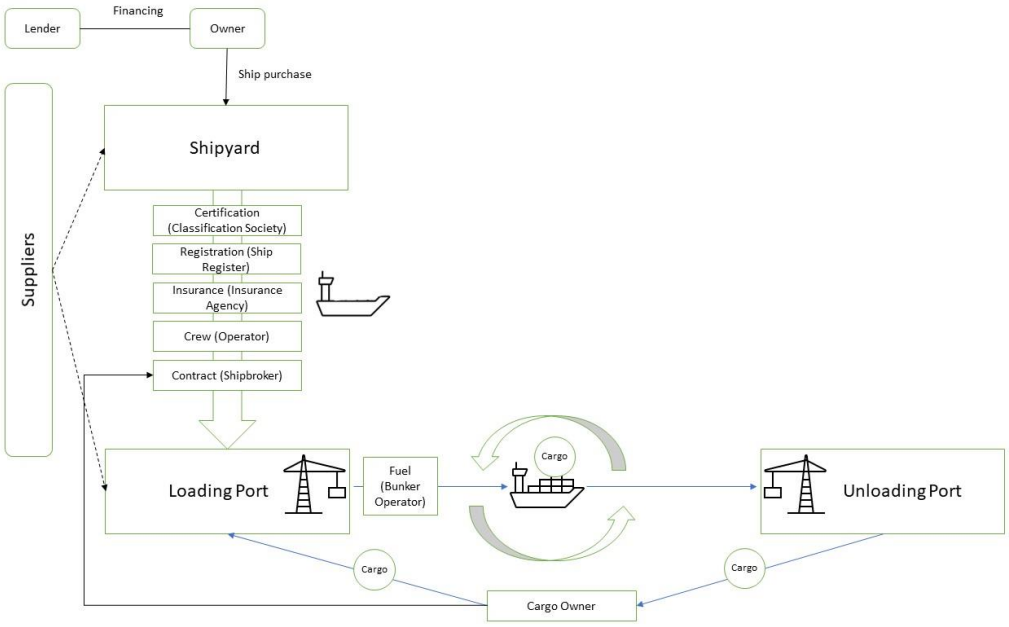

Figure 2-1. Shipping Value Chain – Key actors and process flows

If a new ship is to be constructed, the **shipowner** will pay a **shipyard** for its construction. Given that new cargo ships can cost from USD 100-150 million (Notteboom, 2021) the shipowner may require financing. Financing primary comes through debt from **banks** with specialized ship lending operations, though with trends away from maritime lending in large commercial banks this may also be obtained through private equity, bond issuances, export finance, or other financing methods (Miliotis, n.d.). Ships typically have a 25-year lifespan (Lister et al., 2015), so long-term factors must be taken into account in any new ship purchase. The shipyard will purchase and assemble the necessary raw materials using its own labor. During or after construction, the ship will be examined by a **classification society** and provided a certificate to confirm it is built according to the classification society's standards.

Once complete, the ship is transferred into the hands of its owner. In order to confirm title of the ship and receive permission to operate internationally, a ship is registered with a national **ship register**. This can be done in the state where the owner resides, which is necessary for closed registers. More frequently, however, it is done based on tax and regulatory requirements in a country without ownership requirements for registration, known as an open register or flag-of-convenience. After registration the ship will bear the flag of the country in which it is registered and must operate following that country's laws. Once certified by a classification society and registered the owner will purchase maritime insurance on the ship from an **insurance agency**. In order to be operational, the ship must have a crew. Crews can be hired and managed directly by the owner (as an **owner-operator/shipping line**) or by a contracted third party (a **ship operator**).

Once fully operational, the ship will begin transporting cargo. To do this, the ship will generally travel to a **port**. At a port, goods will be transferred from land-based transport methods to the ship. This can happen through multiple different business structures.

1. A **cargo owner** rents space on a ship plying a set route to transport products from Port A to Port B. The ship operator maintains full control of the vessel during the transit.

2. A **charterer**[4] rents a ship to transport solely its own products. Charterers may also be parties without cargo who use the ship to supplement their own fleets or re-lease at higher rates. Chartering takes different forms but allows the charterer to adopt a specific route and arrange logistics at both ends of the voyage. Charterers may bring in their own crew but more often will let the ship be crewed by its original operator (Manaadiar, 2019).

In both cases a **shipbroker** will connect the cargo owner with a shipowner in order to find available cargo space at a target price. Ports are subdivided into terminals, which can be operated by the port authority or a **port terminal operator**.[5] While in port, ships will be fueled up by a **bunker operator.** After loading, the ship will travel its route and unload at the destination port, where goods will be transferred to land transportation for transport to their final destination. Coordination of different logistics options and route management may be done by the cargo owner, shipping line, or a **logistics service provider**.

A ship will continue this practice for its life, returning occasionally to a shipyard for maintenance. Upon the conclusion of its period of operation, ships will travel to **shipbreaking yards** to be disassembled for raw materials, usually in the developing world.

Companies involved in each stage can vary – many shipowners have diversified into ownership of ports, shipyards, or logistics services; while in other cases ships may be owned by investment entities and all services are outsourced to different parties (Notteboom, 2021). With the rise of shipping alliances, partnerships between different independent shipping lines to expand their route network, lines of ownership and operation are even more blurred (Notteboom, 2021).

With 11.08 billion tons shipped in 2020, shipping is an enormous market (UNCTAD, 2020). However, the core shipping activity of transporting a product between ports has relatively low margins, based on freight rates with additional surcharges. These low margins have fueled vertical integration of major shipping companies with higher value-added activities such as port operation or logistics consulting along the value chain, or horizontal integration of shipping firms through acquisition or alliance (Notteboom, 2021). Today, the top 10 shipping lines comprise 84% of the market (AlphaLiner, 2020). Shipyards show less concentration among companies (OECD, 2017), while ports are broadly dispersed. Shipping is globally competitive and no individual country dominates the sector, though shipbuilding has become concentrated in East Asia (OECD, 2017). Regardless of the primary operating sector of a company, shipping businesses also rely on a wide network of suppliers to procure technology, equipment, or business services.

All the actors mentioned above are important to the industry, but certain actors are more prominent due to their scale, visibility, or critical role in defining a ship's lifecycle and usage. Thus, narrowing this study down to these main actors provides both a more reasonable scope and a clearer view of value chain interactions. The figure below shows a simplified network of

[4] A charterer is still a cargo owner but a cargo owner is not necessarily a charterer, the difference is primarily in the form of contract and scale of the operations.

[5] This can be coterminous with the port authority, a corporation based in a different port, a third-party corporation, or other structures.

power dynamics between the selected main actors in the shipping value chain. Cargo owners (at least large ones) can pressure owners of ships they use in their supply chain to meet certain standards (Poulsen et al., 2016), while the shipowners can then require changes in the shipyards and ports to meet these standards in new vessels (e.g., alternative fuel technologies). External and internal stakeholders outside of the industry will also influence each individual actor in certain ways. Service providers (e.g., classification societies) can increase the power of downstream actors by simplifying contractual relationships and data asymmetries (Poulsen et al., 2016), though their role and influences differ between contexts.

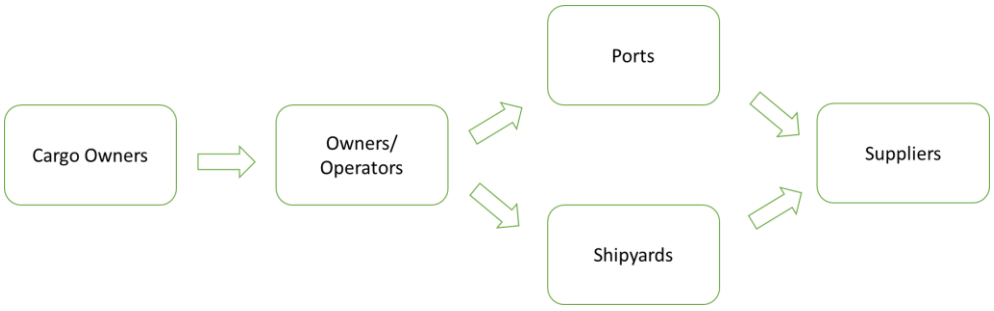

Figure 2-2. Shipping Value Chain – Power relationships

The four actors on the left of this diagram represent the primary scope of this report – suppliers (such as manufacturers of engines) are excluded as being too widely spread to systematically identify and not necessarily focused on shipping industry issues, though service providers (especially classification societies) are added to provide a sample of sustainability reporting practices in smaller specialized actors in the industry.

2.3 Sustainability and Shipping

2.3.1 Sustainability and CSR

Sustainability is a complex term, but one that is most often viewed within the context of the Brundtland Report (1987), which coined the idea of sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987). Within businesses, sustainability is often referred to as Corporate Social Responsibility (CSR), the "responsibility of an organization for the impacts of its decisions and activities on society and the environment, through transparent and ethical behaviour" (ISO, 2010:3), representing a shift from a profit-focused business model to one that incorporates a greater range of stakeholders (Strand, 2015). CSR is often separated into interconnected spheres for Environmental, Social, and Governance (ESG)-related issues, especially within a financial context (van Duuren et al., 2015). These definitions and classifications are applied within this paper. The terms sustainability, CSR, and ESG can be viewed largely interchangeably (Strand, 2015) but this paper uses CSR to refer to business practices around social and environmental issues, sustainability for the broader issues targeted by CSR, and ESG for CSR considerations within the financial sector.

2.3.2 Sustainability issues in the shipping industry

As discussed above, the shipping industry faces a number of sustainability challenges. Environmental issues include emissions of greenhouse gases such as CO_2, NOx, and SOx and other air pollutants from ships, shipyards, and ports, contributing to global climate change and detrimental human and environmental health impacts. Water pollution through dumping, sewage, and cargo spills is also a major concern. Other environmental

concerns during the shipping process include invasive species in bilge water, damage to coastal environments, and noise pollution (Parviainen et al., 2018). The process of shipping construction and fueling also requires large amounts of raw material extraction and end-of-life disposal which causes its own environmental challenges (Andersson et al., 2016). While rarely an industry that directly receives public scrutiny, shipping faces the risk of highly visible disasters, such as the Exxon Valdez oil spill (Lister, 2015) as shown very recently by an oil spill from a grounded tanker protected area in Mauritius (Mungur et al., 2021) or the Ever Given grounding in the Suez Canal. Many of these issues can be addressed with existing technologies, though in many cases these are cost-prohibitive or challenging to implement for shipping businesses (Lai et al., 2011).

From a social perspective, shipping traditionally has had problems with poor working conditions, given the low wages for sailors and the safety issues in a ship environment and in ship recycling. Governance issues such as poor transparency and abuse of flags of convenience to avoid taxes and other regulatory requirements are also widespread (Deengar, 2007; Parviainen et al., 2018). Corruption is also more common in shipping than other industries, as ships often stop at smaller ports with unscrupulous local officials and various port fees and other regulations are prone to bribe-seeking (Lee, 2019). Shipping is also a main component of prominent geopolitical issues such as piracy, illegal trafficking, or ocean governance (Andersson et al., 2016).

At an industry level, the IMO is the main organization promoting sustainability standards and upholding international treaties, such as the International Convention for the Safety of Life at Sea (SOLAS) and the International Convention for the Prevention of Pollution from Ships (MARPOL). The IMO developed regulations on fuel sulfur content which entered into force on January 1, 2020 which represent a significant step forward in environmental protection by forcing a large-scale shift from heavy fuel oil to low-sulfur oils or alternative fuels (IMO 2020). Its current action regulating shipping GHG emissions would continue this shift but has been widely criticized for the level of industry influence delaying and weakening these targets (Sofev, 2018) and on a broader scale for regulations that lack details and practical guidance (Coady et al., 2013).

The IMO is also constrained by the need to meet demands of low-income countries with fewer desires to limit their own economic growth through regulation (Wu et al., 2020). Overall, the IMO has been slow to act on certain shipping-related sustainability issues and has been hampered by lack of ratification or enforcement mechanisms for other existing treaties (Parviainen et al., 2018; Lister, 2015). Under the UN Convention on the Law of the Sea port states have authority to regulate their own waters, and public shipping companies are bound by laws of their headquarters country, which can fill some of the gaps in the maritime regulatory environment. But given the challenge adapting to a patchwork of local regulations, international regulation is preferred by the industry over variations between port states (Lister, 2015).

Despite these challenges, shipping is still the most carbon efficient method of transport (WSC, 2021). As a result, shifting from truck or air transport to water-based transportation is a growing interest of policymakers and sustainable-minded businesses alike (CTCN, n.d.).

2.3.3 CSR activity in the shipping industry

CSR has grown within the shipping industry despite the challenges it faces. These challenges include the short-term and highly competitive nature of the industry, which limits incentives for long-term CSR planning; the business-to-business nature of the industry, which avoids

direct consumer pressure; and the jurisdictional governance issues outlined above (Parviainen et al., 2018).

Motivations for CSR are disparate, however, driven by a mixture of company or region-specific factors rather than sector-wide collaboration or regulatory pressures. In some cases, regulations or expectations of future regulations do play a key role, especially for companies based in countries with high standards around environmental and social impact (Yliskylä-Peuralahti and Gritsenko, 2014; Acciaro, 2012). In other cases, CSR is driven more by efficiency-related cost savings that have secondary environmental benefits (Acciaro, 2012). Lastly, some firms treat CSR as a competitive advantage through green branding (Acciaro, 2012).

Emerging research has looked at the influence of stakeholders on shipping companies. Stakeholder theory, generally attributed to Freeman (1983) though expanded since views how importance of different stakeholders (e.g., customers, management) can impact a company's reaction to their pressure (Mitchell et al., 1997). Primary stakeholders (investors, management) are traditionally considered to have greater salience than secondary stakeholders (NGOs, the general public), especially in the shipping industry (Mitchell et al., 1997; Parviainen et al., 2018). Thus, direct pressures from corporate cargo owners (which are more likely to be public-facing), financiers, or internal management have all been identified at driving shipping industry CSR practices (Parviainen et al., 2018; Lister, 2015; Coady et al., 2013; Yuen et al., 2017).

2.3.4 Multi-Stakeholder Initiatives and Shipping

Multiple voluntary multi-stakeholder initiatives (MSIs) have developed as a form of self-governance around sustainability within the shipping industry, given the weakness of the sector's institutional governance (Coady et al., 2013). These organizations bring together shipping companies, NGOs, and other industry stakeholders to provide resources and shared commitments to promote the transition to sustainable practices. Multi-stakeholder initiatives are viewed as another tool to improve the salience of secondary stakeholders and implement private governance mechanisms, which is one function of organizations such as SSI (Parviainen et al., 2018; Yliskylä-Peuralahti and Gritsenko, 2014; Wuisan et al., 2012). MSIs are a forum in which NGOs and corporate actors collaborate to encourage dialogue and action on specific CSR issues and develop standards in the absence of clear national or international regulatory guidance (Utting, 2001). MSIs function to both alleviate concerns over greenwashing in internal corporate actions and to ease the costs of independent action (Utting, 2001). MSIs exist in numerous sectors, prominently in others with transnational impacts and weak state regulation such as forestry (Utting, 2001).

The delays and dissension within the IMO regulation process discussed in Section 2.3.2 have opened up the field for a thriving MSI environment within shipping (Lister, 2015). In shipping, these groups may be led by cargo owners, shipping sustainability leaders, and/or NGOs and have grown in prominence since the early 2000s. In some cases, cargo owners will pressure shipping lines into joining MSIs (Lister, 2015). Besides SSI, prominent shipping MSIs include the Clean Cargo Working Group, the World Ports Climate Initiative, Green Marine, and Green Ship of the Future (Coady et al., 2013).

MSIs are responsible for the development of multiple rating and measurement schemes and industry guidelines. However, MSIs have also been criticized for being poorly integrated into the IMO, contributing to regulatory fragmentation, and offering confusing and non-complementary rating options (Lister, 2015). As a voluntary initiative, MSIs may also not draw in shipping companies without prior interests in sustainability. Nevertheless, this is an active field with clear successes in promoting concerted voluntary sustainability action (Lister, 2015).

2.4 Sustainability Reporting

2.4.1 Background – Sustainability Reporting

Sustainability reporting encompasses the public disclosure of information related to a company's CSR activities and impacts.[6] Public corporate reporting on sustainability has existed since the 1970s but has become increasingly sophisticated and widespread especially since the 1990s (Hahn and Kuhnen, 2013). As of 2020, 80% of the 5,200 major firms analyzed in KPMG's annual sustainability reporting study reported on CSR, with numbers exceeding 90% in most high-income nations (KPMG, 2020). While originally voluntary, at least 64 countries have mandatory reporting requirements at some level, including most major economies (Havrysh, 2020) and even many countries without mandatory reporting requirements (e.g., the USA) show high reporting rates (KPMG, 2020). Nonetheless, existing requirements apply primarily to large businesses and the "comply or explain"[7] principle incorporated in many regulations allows significant flexibility that can provide openings for low-quality reporting (Havrysh, 2020).

With the development of the Global Reporting Initiative (GRI), Sustainability Accounting Standards Board (SASB), and ISO 26000 standards plus the expansion of third-party ESG data providers there has been some movement toward sustainability reporting standardization. Today, GRI is the most common reporting standard, used by 67% of companies in the KPMG survey (KPMG, 2020). Less strict reporting guidelines such as the UN's Sustainable Development Goals (SDGs), UN Global Compact (UNGC) and the Task Force on Climate-Related Financial Disclosures (TCFD) have also spurred greater focus on certain sustainability areas. On the other hand, country-specific movement towards integrated reporting and increasing standards in countries or regions such as the EU have also led to reporting divergence (KPMG, 2020) and notable differences across companies, regions, and industries remain (Hahn and Kuhnen, 2013; Dienes et al., 2016; KPMG, 2020). The field remains dynamic, with ongoing proposals by the International Financial Reporting Standards Foundation to develop another standardized sustainability reporting framework in line with their global framework for financial reporting (IFRS, 2021).

2.4.2 Motivations for Sustainability Reporting

The presence and quality of sustainability reporting is linked to a number of factors, many of which overlap with the drivers of CSR overall. These factors have been heavily studied, though results are still not always conclusive. Broadly, motivations for sustainability reporting can fall into the following categories, alone or more likely in combination (Buhr, 2007):[8]

1. **Moral or ethical duty:** The firm (or its top management) believes even in the absence of business or legal reasons it should make this data available for the betterment of society.

[6] The term "sustainability reporting" is used instead of "CSR reporting" or other terms as it was more commonly used in the reports analyzed, but these terms are synonymous.

[7] A hybrid between voluntary and mandatory reporting which allows companies to provide alternative explanations instead of strict compliance.

[8] Some similar themes from Buhr's work are consolidated.

2. **Competitive advantage:** The firm believes its progress on sustainability is strong compared to competitors and promoting this progress will attract customers, employees, or other sustainability-conscious stakeholders.

3. **Standard setting:** The firm believes if it leads in meeting voluntary reporting standards or collaborating in developing standards it can minimize later costs of compliance or force competitors to increase their costs to meet the same standard.

4. **Peer pressure:** The firm believes failure to report will reflect poorly upon it if competitors have higher standards of reporting.

5. **Image management:** The firm believes publicizing its CSR activity can be used as a way to improve brand image by showing progressive values or covering up negative behaviors.

6. **Social license to operate:** The firm believes reporting will improve its relationship with NGOs and the local community and avoid stakeholder conflicts.

7. **Financial benefits:** The firm believes showing interest and/or progress in CSR topics will attract investor interest, resulting in lower cost of capital.

8. **Compliance:** The firm must report to meet legal requirements.

Pérez-López et al. (2015) identified multiple additional internal motivations in addition to the above.[9]

9. **Operational strategy:** Reporting is used to improve resource and risk management and identify strategic opportunities.

10. **Diffusion:** Reporting increases sustainability knowledge, collaboration, and innovation across corporate functions.

11. **Data collection:** Reporting allows better tracking of target metrics.

These motivating factors are backed up by multiple other pieces of research. CSR reporting is generally more active where there are judged to be financial benefits from greater disclosure, such as cheaper access to capital or risk avoidance (Dienes et al., 2016; Hahn and Kuhnen, 2013). Corporate branding is a major consideration for if and how CSR reports are presented (Morris, 2013). Companies increasingly report on CSR due to pressure from stakeholders or to match competitors (Hahn and Kuhnen, 2013). Lastly, presence of regulatory requirements from governments or stock exchanges (such as the EU's non-financial reporting directive) is another key driver of CSR reporting (Hahn and Kuhnen, 2013; KPMG, 2020) and regulatory requirements can lead to not only new disclosure, but greater assurance and stricter standards for companies previously reporting voluntarily (Ioannou & Serafeim, 2011). In a detailed review of literature on correlating factors (which can proxy for motivations but are not necessarily identical), Dienes et al. identified that factors such as firm size, media visibility, presence of audit committees, and less concentrated ownership structure all had positive

[9] Also consolidated to key themes and excluded those overlapping with Buhr's list.

effects on CSR reporting, while firm age, capital structure, profitability, and board composition all had mixed results (Dienes et al., 2016).

Lozano et al. (2016) differentiated between a number of these factors, identifying internal motivations (e.g., branding and transparency) as the strongest influences on a company's decision to begin CSR reporting, though external pressures have a greater impact on subsequent reporting. This study elucidated the importance of different stakeholders, showing that the majority of CSR reporting involved not only corporate employees and management but also customers, shareholders, suppliers, industry organizations, and NGOs.

2.4.3 Drivers of Issues Reported On

The specific issues included in CSR reporting are defined largely by the reporting frameworks used, as each framework structures data in specific ways, while issues of interest to the company are often defined by a materiality analysis conducted by the company to find stakeholder perspectives on different sustainability issues (GRI, 2021). Beyond this, issues reported are driven largely by the same motivations driving reporting overall – stakeholder pressure, regulatory requirements, or promotion of areas where the company has been active. Industry or geography specific factors also play a role, as a company's industry and location will define in many ways the sustainability issues it faces in its business activities.

2.4.4 Barriers for Sustainability Reporting

Multiple barriers hinder the greater adoption of sustainability reporting. The high cost of reporting compared to its benefits for certain companies; concerns about revealing sensitive, damaging, or inaccurate information; confusing or incomplete regulations; and lack of knowledge or data on sustainability issues are all identified across geographies, though are especially prominent in areas without a strong institutional framework for CSR (Dissanayake et al., 2020; Olsen, 2015; Lozano et al., 2016). Many companies do not see a business case, sufficient pressure, or moral duty for reporting (Stubbs et al., 2012). SMEs (which have fewer resources and stakeholder interest for reporting) are especially wary of reporting compared to larger companies even in the same industry (Dissanayake et al., 2020, Dienes et al., 2016). Arguments for voluntary reporting point out the challenge of adopting a one-size-fits-all framework for disparate industry sectors dealing with distinct sustainability issues, as well as the ability of the market to reward high performers in CSR without further mandates (Havrysh, 2020). Sustainability reporting can also be avoided by companies as part of a "buffering" strategy, i.e. increasing the costs for stakeholders to examine sustainability performance (Vejvar et al., 2018).

2.4.5 Impacts of Sustainability Reporting

Implementing sustainability reporting has been shown to have a number of business and CSR impacts. Sustainability reporting contributes to organizational change in a reciprocal cycle, with 94% of companies in one study reporting sustainability reporting has changed their business in at least minor ways (Lozano et al., 2016). This organizational change manifests in areas such as greater data collection, a more strategic view of sustainability, and greater stakeholder communication (Lozano et al., 2016). Reporting can drive improvement in sustainability practices in order to meet reporting guidelines or show continuous progress in a virtuous cycle (Pérez-López et al., 2015). Within the business sector overall, decisions by leading firms to adopt sustainability reporting pushes competitors to report themselves (Ioannou & Serafeim, 2011).

From a financial perspective, Dhaliwal et al. (2011) confirmed companies achieve lower costs of equity capital after beginning CSR disclosure, supported by Plumlee et al. (2015), who also found evidence for positive cash flow impacts from environmental disclosure. On the other hand, Guidry & Patten (2011) found minimal connection between environmental disclosure and investor demands and while Clarkson et al. (2013) found positive financial benefits in cost of assets they could not replicate the reduction in costs of equity capital. The financial impact is not always positive however, as sustainability reporting requirements have also pushed some players out of fields where compliance costs are too high (Vejvar et al., 2018).

2.4.6 Sustainability Reporting in the Shipping Value Chain

Existing research on sustainability reporting in the shipping industry is limited, even with the breadth of literature on shipping sustainability challenges sampled in Sections 2.3.2 and 2.3.3. This may be due to the challenges of finding consistent sustainability reporting to analyze, as reporting within the transportation industry (including shipping) has traditionally lagged other sectors (KPMG, 2020).[10][11] However, there has been significant improvement in the quantity of sustainability reporting from companies within the shipping industry in the last few decades (Morris, 2013; KPMG 2017). If properly implemented, sustainability reporting could be particularly valuable for shipping as a method of self-regulation that fills in the existing governance gaps within the industry (Yliskylä-Peuralahti and Gritsenko, 2014).

Studies have been conducted at the master's thesis level, such as Morris (2013) and Olsen (2015), which analyzed sustainability reporting trends, drivers, and barriers for major container shipping lines, as peer-reviewed studies do not cover the industry from a global perspective. Many of the approaches in these studies influence this report, though here the scope is expanded to look at the broader shipping value chain. Vejvar et al. (2016) looked also at major container shipping lines to analyze CSR discourse in these companies' sustainability reports but was even narrower in examining solely social sustainability.

Drobetz et al. (2014) conducted the most comprehensive industry analysis, a quantitative examination of the drivers and effects of sustainability reporting for major shipping companies. Their research found firms operating in Anglo-American markets and under flags of convenience had much less CSR disclosure on their websites, while Euro-Asian shipping firms performed better. Better sustainability reporting did tie to improved financial performance, though this effect was not universal (Drobetz et al., 2014). Similar studies were done within the cruise industry (de Grosbois, 2015; Hall et al., 2017). As discussed above the cruise industry is outside the scope of this report, but these studies add to the broader discourse of sustainability within marine industries. Among other value chain actors, Stein & Acciaro (2020) developed a reporting framework for ports but did not examine the existing port reporting landscape. Vejvar et al. (2018) found that none of a sample of inland ports produced sustainability reports. None of these studies, however, expanded their focus to include value chain actors outside of the specific sector of interest.

[10] At 71%, this was the second lowest of all analyzed sectors in 2020, with minimal change from 2017. The global average is 77%.

[11] It may also relate to the high concentration of shipping lines and shipbuilders in East Asian countries, where more research may be available in local languages that was not accessible for this study.

3 Research Design and Methodology

3.1 Research Design

3.1.1 Empirical Study Methodology – Sustainability Reporting

This is a primarily qualitative analysis, as sustainability reporting at the level studied is by nature qualitative data and given the scale of the industry a valid quantitative analysis would be extremely data intensive. Qualitative data also provides a) more detailed insights that can be applied by practitioners in the field and b) flexibility to explore the reasons behind the connections identified (Blaikie & Priest, 2019). However, some quantitative components are included in order to provide an illustration of broader scale industry practices.

The bulk of this thesis consists of reviewing public sustainability reporting within the shipping value chain, trying to identify a) key sustainability reporting practices and b) if and how the reporting company explains the motivations for the sustainability reporting. This review draws upon the literature review in Section 2. Sustainability reporting review is an established and growing practice in academic sustainability studies, though with significant variations depending on the research target (Dienes et al., 2016). This method of review will be the most effective approach to address Research Question 1, as it examines sustainability reporting directly and at a broad enough scale to draw meaningful conclusions. It will however be supplemented with additional analysis as described in Section 3.1.2.

Sustainability reporting has been analyzed in a number of contexts as both independent and dependent variable, examining individual motivations for reporting, region or industry specific practices, business impacts of reporting, or other considerations (Mion, 2019). However, analyzing sustainability reporting is challenging due to the variations in reporting quality, the differences in frameworks used, and the ability for sustainability reporting to serve as greenwashing and misrepresent a company's true commitment to sustainability (Mion, 2019; Mahoney et al., 2013). The idea of a sustainability reporting quality metric has been researched, representing the clarity, balance, trustworthiness, and/or scale of disclosure. While many studies use various indicators to represent sustainability reporting quality as a variable no universal metric exists in either the academic or corporate environment and many studies look purely at quantity (e.g., word count) or presence of reporting instead of going more in depth (Mion, 2019). Thus, this study does not attempt to "rate" the quality of sustainability reporting, but to identify key themes and motivations.

Scoping the sustainability reporting review is based on the shipping value chain analysis in Section 2.2. The shipping industry is complex and as discussed in Section 1.3 the system boundaries for this analysis could grow to include nearly every company operating in the global economy. However, reviewing reporting in the primary segments of the shipping value chain is judged to be sufficient for high-level analysis given research constraints.

The value chain research supports selection of the following subsectors for analysis:

Subsector
Shipping lines
Shipyards
Ports
Cargo Owners/Charterers
Classification Societies

These subsectors are judged to a) comprise the core shipping business areas, b) have sustainability concerns directly connected to shipping, and c) include large and globally distributed companies that are more likely to produce public sustainability documentation and d) extend across the length of the shipping value chain. The one exception is classification societies, which are of interest as an example of a service provider to the shipping industry and as a standard-setting organization they are highly connected to emerging demands for sustainability. Excluded business subsectors are comparatively small, reliant on small firms, have limited public data to determine the largest players, or are primarily active outside of shipping specifically. Nonetheless, there is potential for future research to extend this analysis to additional actors.

This thesis analyzed reports from the ten largest global companies in each of the five subsectors as available, supplemented with SSI members' reports. 50+ reports are a large enough sample to form meaningful conclusions but reasonable to complete using the available time and resources. Certain of these categories exhibit a high level of concentration, thus this review can be reasonably claimed to represent usual industry practices in those subsectors, though this is not necessarily the case for ports or cargo owners. Some companies were active in multiple subsectors, if so they were assigned to their primary business area and the next largest company in their secondary business areas was used in its place.

3.1.2 Empirical Study Methodology – Interviews

For Research Question 2, review of public sustainability reporting may be insufficient or limiting due to the issues discussed in Section 1.4. Thus, more in-depth data could be collected through direct communication with individuals in the industry involved in sustainability planning.

Interviews were arranged with representatives with seven companies in different subsectors of the shipping industry in order to add additional insight to the conclusions of the sustainability reporting review. These interviews discussed corporate motivations for CSR reporting, the role for reporting in corporate sustainability strategy, selection of issues to report on, and progress made towards sustainability or greater transparency. Interviews were conducted virtually using Zoom or similar videoconferencing software due to the COVID-19 pandemic and the geographic dispersal of the interview subjects.

3.2 Data Collection

3.2.1 Data Collection – Sustainability Reporting

The largest companies in each subsector were identified using Bureau van Dijk (BvD)'s Orbis database, a global repository of corporate data.

Orbis offers certain screening criteria to narrow down a search to a more targeted set of companies. The search strategy for Orbis included the following criteria:

Table 3-1. Orbis Search Strategy

Number	Search criteria	Rationale
1	**Status:** Active Companies	This study looks at recent sustainability reporting, inactive companies would not

Number	Search criteria	Rationale
		provide timely data even if archived reporting is available
2	**Years with available accounts:** 2017, 2018, 2019	The study selected the five largest companies by revenue in the target industry subsectors. Financial data is necessary to perform this revenue comparison. Companies lacking public financial data are also likely to lack public sustainability reporting.
3	**BvD Independence indicator**: A+, A, A-, B+, B, B-, C+, C	The independence indicator screens out companies that are subsidiaries of other companies or state-owned. Including subsidiary companies could result in multiple results from the same corporate group, which likely do not have separate sustainability policies.
4	**NACE Code:** Variable	Narrowed in on companies in a specific subsector. This category varied depending on the industry subsector examined.

Search strategies for each subsector with specific NACE codes are shown in Table 2-2. For classification societies, an external source provided a more reliable list of companies operating in the subsector than the Orbis search as the subsector is too narrow for any existing NACE codes, though Orbis was still used for quantitative data on these companies to ensure consistency.

Table 3-2. Subsector Screening Criteria

Subsector	NACE code(s)	External source
Shipowners/operators	502: Sea and coastal freight water transport	N/A
Shipyards	3011: Building of ships and floating structures; 3315: Repair and maintenance of ships and boats; 3831: Dismantling of wrecks	N/A
Ports[12]	5222: Service activities incidental to water transportation; 5224: Cargo handling	N/A
Cargo Owners/Charterers	46: Wholesale trade, except of motor vehicles and motorcycles; 47: Retail trade, except of	N/A

[12] This keyword included both companies involved in port or terminal operation (majority of analyzed firms) and companies involved in producing port equipment (one company, Cargotec).

Subsector	NACE code(s)	External source
	motor vehicles and motorcycles	
Classification Societies	N/A	Lloyd's List, 2019

The search was Boolean with the format 1 AND 2 AND 3 AND 4. Results were sorted by revenue in 2019.[13] The top companies were qualitatively reviewed via the Orbis business description and corporate websites to confirm their business aligned with the shipping industry subsector as defined above. Three companies that clearly did not engage in activities relevant to the cargo shipping industry or were subsidiaries of companies previously analyzed were excluded.[14]

Additionally, SSI's 12 corporate members are also included in the analysis, per SSI's request. Two of these members (Maersk and Lloyd's Register) overlapped with the 50 largest companies found through the Orbis search, so the number of reports reviewed for this study is thus 60.[15] Overview data for these companies is taken from Orbis as well. The list of companies with sustainability reporting reviewed is included as Appendix A.

After selecting the list of companies, sustainability reports were found through company websites, using the most recent year available (generally 2019). Sustainability reports in this study comprise standalone CSR/sustainability/ESG reports,[16] integrated reporting, or sustainability data included in an annual financial report. Due to lack of translation resources this study excluded documents only available in non-English languages. If sustainability information was only found outside of a regular sustainability report format (e.g., directly on the corporate website) this was coded in a separate category but still analyzed to the extent possible, however sustainability material published in addition to reporting was not analyzed to avoid subjectivity in material selection, as this study focuses on reporting and not total sustainability activity. All reports analyzed are cited in the bibliography.

3.2.2 Data Collection – Interviews

Seven representative companies in the shipping industry were identified through connections of the author or by SSI. The goal of interviews was to cover each of the five value chain sectors in the sustainability reporting analysis, though the final list of interviewees included three shipping lines,[17] two ports, and two cargo owners due to a lack of responses from other sectors. Some companies interviewed were included in the sustainability reporting review, others are present in this study only as interview partners. Interview selection was based to some extent on contact availability. Some of these companies did not produce sustainability reports but

[13] The most recent available financial data, as this research was conducted in early 2021.

[14] Hyundai Mipo Dockyard Co., Ltd. (Shipyard), a subsidiary of Korea Shipbuilding & Offshore Engineering Co., Ltd; Cosco Shipping Development Company Limited (Port), a subsidiary of Cosco Shipping Holdings Company Limited; and Austal Ltd. (Shipyard), which manufactures only ferries and military vessels, not cargo ships.

[15] Several SSI members did not fall into any of the subsectors listed above. Additional categories from SSI members include charterers, banks, and shipping technology providers. This inclusion strengthens the study by allowing examination of these smaller subsectors as well.

[16] This merely a distinction in title, not in content.

[17] One of which also was active in port management.

were still interviewed to find motivations behind not creating a public report. The list of interviewees is included as Appendix B, with interviewee names and companies anonymized to protect privacy.

Senior employees in the sustainability (or equivalent) department of these companies, once they agreed to participate in this study, were briefly interviewed to get a more complete understanding of their sustainability reporting practices. The interviews were semi-structured, with prepared interview questions based on literature and findings in the sustainability reporting analysis included as Appendix C, which generally represents the questions used in each interview. Specific interview questions were tailored to each business subsector (and in some cases individual company activities) in order to get directly relevant responses. Follow-up questions were asked depending on interviewee responses and due to limitations with timing or the interviewee's business knowledge not all questions were necessarily answered in each interview. Interviews were recorded to simplify transcription.

3.3 Data Analysis

3.3.1 Data Analysis – Sustainability Reporting

A content analysis on findings from the sustainability reporting review was conducted using NVivo software to deductively code reports based on the Roadmap themes, as shown in Table 2-3. Coding results were pulled into a Microsoft Excel synthesis matrix, a tool used to track different themes within a set of documents, for quantitative calculations. Records of the review process were maintained in NVivo. This thesis does not look to rate companies based on the quality of their sustainability reporting, ambition, or success at reaching their sustainability targets; a company is marked as reporting on an issue whether it has 10 pages on it or one paragraph. This alternative more critical view is a potential avenue for future research.

Sustainability issues searched for in the reports are based on the Roadmap themes to connect the findings of Research Question 1 (on the themes included in reporting) to Research Question 2.1 (on the connection between reporting and the Roadmap). Note that a roadmap is "a strategic plan that defines a goal or desired outcome and includes the major steps or milestones needed to reach it" (ProductPlan, 2021) not a reporting framework per se, but in general, these themes align with the industry sustainability issues identified in Section 2.3.2.

SSI's Roadmap is used for theme mapping for multiple reasons:

1. Existing sustainability reporting frameworks cover a broad range of industries and thus lack granularity in issues that are unique to shipping. Shipping specific frameworks (e.g., the Poseidon Principles, Sea Cargo Charter) are limited to climate issues.
2. The Roadmap is not used as a basis for reporting by any company, including SSI members. Thus, there will be no bias towards companies that report using an existing framework and thus touch on more issues within that framework, such as if issues were mapped against GRI or the SDGs.
3. SSI intends the Roadmap to be a valuable tool to the industry to improve its sustainability reporting. Connecting it to existing reporting identifies areas where either the Roadmap or existing reporting is lacking, allowing the Roadmap to be developed in a way that best supports its goal.

In some cases, companies reported on themes that were not included in the Roadmap (e.g., charitable contributions or firm governance). These themes are not reviewed in further depth

to maintain a consistent analytical framework across this analysis, but this list of themes is not exhaustive of those included in sustainability reporting.

Potential avenues for improvement in the Roadmap based on its alignment with this analysis are discussed in Section 5. For companies with primary business outside of the "shipping industry" (e.g., cargo owners or companies with large non-shipping business segments), themes are excluded if they applied only for business operations unconnected to shipping or coded separately for cargo owners whose action on a theme did not clearly apply within the company's value chain. It was assumed supply chain policies apply equally to shipping companies if relevant, even if shipping was not specifically discussed. Themes discussed only in the context of a materiality analysis or as part of a reporting framework and had no further detail in the report were not coded as reported on. For details on the specific keywords included under each theme, please reference the Roadmap as provided in the References.

The sustainability reporting review also looked for motivations based on those listed in the literature review, though exclude some that were never explicitly stated in sustainability reporting. Discussion on findings on these motivations in the sustainability reports is included in Section 4.2.1 but motivations are discussed to a greater extent in the interview findings in Section 4.2.2.

Table 3-3. Content Analysis Framework: Sustainability Reporting

Company Descriptive Factors	
Name	
Country/Region of Incorporation	
Public/Private Status	
Revenue	
Industry subsector	
Reporting Framework	
Format (standalone report, part of financial report, website data, etc.)	
Reporting framework(s) used (GRI, SASB, etc.)	
Reporting on Roadmap Themes	
Oceans	Ocean policy and governance
	Marine spatial planning
Communities	Port governance and standards
	Port disclosure
	Port, coastal, and indigenous communities
	Air and water quality
	Circular economy
People	Labor and human rights regulation
	Labor and human rights disclosure
	Safety standards
	Shipping careers
	Diversity & inclusion
Transparency	Sustainability performance reporting
	Rating schemes
	Supply chain accountability
	Sustainability data
Finance	Financial rewards for high performance
	Natural capital accounting and ecosystem valuation

Energy	Decarbonisation
	Emissions regulation
	Efficiency improvements
	Sustainable fuels
Reporting Motivations from Buhr (2007) and Pérez-López et al. (2015)	
Moral or ethical duty	
Competitive advantage	
Standard setting	
Peer pressure	
Image management	
Social license to operate	
Financial benefits	
Compliance	
Operational strategy	
Diffusion	
Data collection	
Stakeholder pressure, general[18]	
Other	

Following the coding, the results were subjected to a basic statistical analysis (e.g., percent of reports addressing an issue) in order to find the following results:

1. Prevalence for each framework, theme, and motivation
2. Issue/motivation differences by subsector and geography

Key connections were identified through that analysis, such as higher focus on certain themes in certain parts of the value chain, and gaps in reporting on certain themes were reviewed. Findings here informed the interview subjects and questions that followed. Findings are presented in Section 4.1 in textual and graphic format.

3.3.2 Data Analysis – Interviews

Interview recordings were transcribed using various free online transcription services.[19] Content analysis was conducted on the transcriptions using NVivo to identify themes and trends from the interviews as connected to literature, the sustainability reporting analysis, or novel findings. Interview responses were used primarily to address Research Question 2 on the motivations for reporting based off the motivations identified in literature and a coding list of motivations was prepared on the motivations listed in Section 2.4.2.[20]

Table 3-4. Content Analysis Framework: Interviews

Identified Motivations
Moral or ethical duty
Competitive advantage
Standard setting
Peer pressure

[18] Not a separate category in either Buhr (2007) and Pérez-López et al. (2015) but covered by many other pieces of literature.

[19] Otter.ai, Temi, and Sonix.

[20] This coding list is identical to that used for the motivations section of the sustainability reporting analysis.

Image management
Social license to operate
Financial benefits
Compliance
Operational strategy
Diffusion
Data collection
Stakeholder pressure, general
Other

However, interviews also supplemented and expanded the descriptive data analysis where applicable. Interview findings are presented in Section 4.2.

4 Findings

Section 4.1 presents the findings from the sustainability reporting analysis: summary metrics on sample characteristics and the frameworks used and Roadmap themes reported on by companies analyzed in the five value chain sectors.

Section 4.2 provides findings related to motivations for sustainability reporting, especially from the seven interviews with CSR leaders at shipping companies.

4.1 Themes and Frameworks in Shipping Sustainability Reporting (Research Question 1)

4.1.1 Summary Data

This study reviewed sustainability reports from 60 companies, selected as described in Section 3. 44 of those companies produced annual sustainability reports or included sustainability data in other annual filings, while 9 had no report but discussed their sustainability activity through website materials. Seven of these companies did not produce public, English language sustainability materials and as such have no content to analyze. Private or state-owned companies are overrepresented in companies with no reporting or only website materials.

Table 4-1. Reporting Analysis by Subsector

Primary Subsector	**Companies Analyzed**	**Companies Missing Data**
Shipping lines	12	1
Ports and port equipment suppliers	8	2
Shipyards	8	3
Cargo owners/charterers	13	0
Classification societies	9	1
Banks	2	0
Other[21]	1	0
Total	**53**	**7**

Companies with headquarters in nineteen countries were included in this analysis, with the heaviest concentrations in China/Hong Kong, Japan, South Korea, and the USA.[22] This is in line with the current distribution of companies in the target subsectors but does mean that companies headquartered in Latin America and Africa are excluded from this report (among other smaller regions). Geographic distribution is not necessarily consistent across subsectors – all except one shipyard is in East Asia, while every cargo owner except one is headquartered in the USA or EU.

[21] Rightship Pty Ltd., a provider of shipping environmental and safety management software.

[22] Companies with legal headquarters in offshore tax haven jurisdictions (Bermuda, Cayman Islands) were assigned to the location of their operational headquarters.

Table 4-2. Reporting Analysis by Geography

Region	Companies Analyzed	Companies Missing Data
Europe[23]	14	1
East Asia[24]	25	6
Middle East and South Asia[25]	4	0
North America and Australia[26]	10	0

The following findings exclude any companies that had no reporting in order to give a more accurate picture of the main reporting frameworks, themes, and motivations.

4.1.2 Frameworks

Reports were analyzed for adherence to any of the six major global approaches to reporting identified.[27] There was noticeable variance in reporting frameworks, with approximately one-quarter producing no sustainability report that followed an established framework. However, each framework was used by at least 15% of reports, with 86% of reports incorporating multiple frameworks. The GRI standards represented the most popular strict reporting framework, used by over half of all reports, while the SDGs were clearly the most popular report framing mechanism, though use of the SDGs ranged from brief mentions on a single page to an overarching report framework (those percentages rise to 61% and 82% respectively if looking only at specific sustainability reports and not website material).

Table 4-3. Reporting Frameworks

Reporting frameworks	Percentage
SDGs	68%
GRI	51%
UNGC	38%
TCFD	30%
SASB	15%
ISO 26000	15%
Other[28]	21%
No/company-specific framework	6%

[23] Denmark, Norway, Germany, UK, France, Italy, Netherlands, Russia. Given the interlinkages and similar economic structures of Norway and the UK to the European Union, it was not deemed necessary to separate out EU from non-EU countries. The one Russian classification society was missing data so an Eastern Europe division was unnecessary.

[24] China, Taiwan, Hong Kong, Japan, South Korea, Singapore, the Philippines.

[25] India and Saudi Arabia

[26] Australia is combined with the USA as both have similar economic and political structures despite the geographic difference. Australia had only two companies which is insufficient for a separate analysis.

[27] The level of detail in each framework differs, GRI and SASB are frameworks with a more structured approach across sustainability issues while TCFD and the UNGC represent a level of commitment to sustainability action that is not necessarily represented in a consistent reporting format; SDGs are often used to frame the report but were generally an add-on to existing reporting structures.

[28] National or industry-specific reporting standards or the International Integrated Reporting Council (IIRC) guidelines. This variable is probably undercounted as many reports likely conform with national guidance without declaring it.

Reporting frameworks	Percentage
No report[29]	17%

The following table shows the distribution of frameworks used by subsector. For this and subsequent tables all "service provider" categories (classification societies, banks, and other) are combined as the latter categories have insufficient data points for independent analysis. High scores are highlighted.

Table 4-4. Frameworks used by Subsector

Framework	Operators	Ports	Shipyards	Cargo Owners	Service Providers
GRI	67%	38%	63%	69%	17%
UNGC	25%	25%	13%	62%	50%
SDGs	83%	38%	25%	100%	67%
TCFD	33%	0%	13%	62%	25%
SASB	17%	25%	0%	31%	0%
Other	33%	38%	25%	15%	0%
ISO 26000	25%	0%	25%	23%	0%

Almost all standards were most commonly used by cargo owners. This may be due to the larger scale of cargo owners, their greater exposure to public pressure, or their concentration in the US, EU, and Japan where reporting expectations are higher. Ports and shipyards tended to lag on the number of standards used.

4.1.3 Themes

There was noticeable variation in the different themes reported on when examining through the structure of the Roadmap. Foremost among the themes included were **safety** and **climate issues**.

Safety standards was included in nearly 90% of reports. Companies went into great detail on their safety training and risk management policies.

Climate themes (encompassing **Decarbonisation**, **Emissions Regulation**, and **Efficiency**) all scored over 80%, overlapping in most reports. It was a consistent feature at every part of the value chain and most reports included a dedicated climate section. But the last part of the Energy vision area of the Roadmap, **Sustainable Fuels**, featured in only half of reports. However, a number of cargo owners reported on climate only regarding their own operations, not regarding their supply chain.

On the other end of the spectrum, a number of highly industry-specific or more novel sustainability areas were very infrequently identified. Neither **Port governance and standards** nor **Port disclosure** featured prominently, even among port companies.[30] Two other shipping considerations that are not part of any existing sustainability standard were rare, **Ocean policy**

[29] Companies that published sustainability data on their website or in company informational material but did not have an annual report.

[30] However, the last "port" topic (**Port, coastal, and indigenous communities**) was more common, as it incorporates issues such as corruption and water pollution that are more often reported on.

and governance and **Rating schemes**.[31] **Natural capital accounting and ecosystem valuation** and **Marine spatial planning** were reported on by only two and one companies, respectively. Details on particular activities included under each theme are provided in Section 4.1.4.

Table 4-5. Themes Reported On (Color-coded by Roadmap Vision Area)

Vision Area	Themes	Percentage
Oceans	Ocean policy and governance	11%
	Marine spatial planning	2%
Communities	Port governance and standards	9%
	Port disclosure	9%
	Port, coastal, and indigenous communities	42%
	Air and water quality	68%
	Circular economy	72%
People	Labor and human rights regulation	68%
	Labor and human rights disclosure	60%
	Safety standards	89%
	Shipping careers	60%
	Diversity & inclusion	75%
Transparency	Sustainability performance reporting	79%
	Rating schemes	17%
	Supply chain accountability	62%
	Sustainability data	79%
Finance	Financial rewards for high performance	25%
	Natural capital accounting and ecosystem valuation	4%
Energy	Decarbonisation	89%

[31] And the bulk of the latter were for sustainability rankings such as MSCI and the Dow Jones Sustainability Index, not shipping-specific ratings (e.g., Environmental Ship Index).

Vision Area	Themes	Percentage
	Emissions regulation	91%
	Efficiency improvements	83%
	Sustainable fuels	53%

Each company was given a theme score that summed the number of themes they discussed. The median score was 13 and mean was 11.5 (out of a maximum of 22), showing a clear incorporation of these themes into reporting but also that reporting that all reports do not address the entirety of the Roadmap themes. The theme scores ranged from 1 to 20.[32]

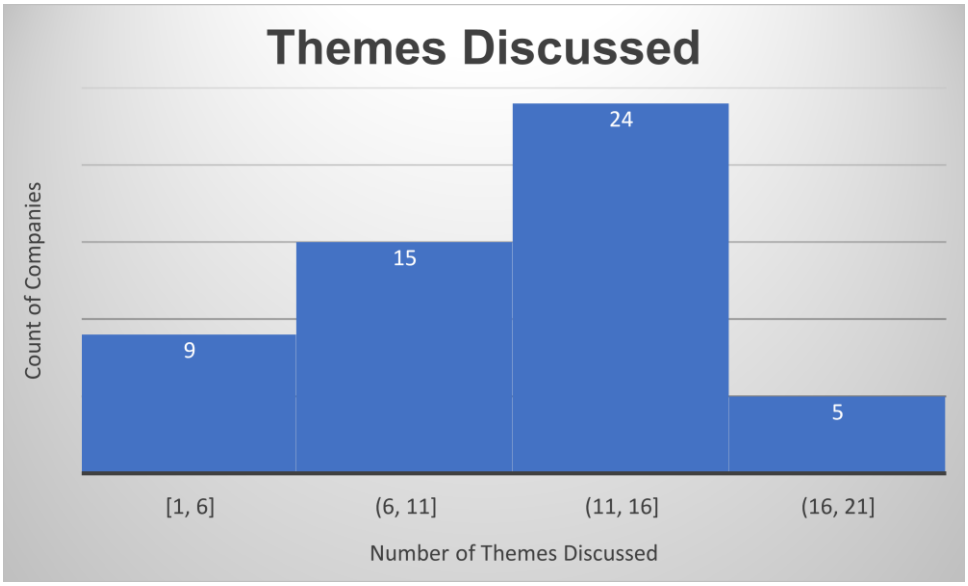

Figure 4-1. Distribution of Theme Scores

Median and mean theme scores for each value chain segment are shown in Table 4-6. High and low scores are highlighted.

Table 4-6. Themes Reported on by Subsector

Subsector	Median theme score (Mean)
Operators	**14.5 (14.6)**
Cargo Owners *In supply chain/shipping*	13.0 (13.2) *9.0 (9.5)*
Ports	13.0 (10.6)
Service Providers	8.5 (**10.2**)
Shipyards	**7.5** (10.7)
Total	**13.0 (11.5)**

[32] The theme score is a metric only of quantity/breadth of the report, it is not intended to signify reporting quality.

Shipping lines, which are active in all themes, have the highest mean and median score, and the only median score which is greater than the overall average. Service providers and shipyards have the lowest scores, in part due to having the highest prevalence of data drawn only from websites (33.3% and 37.5%, respectively). Despite their distance from shipping activity, cargo owners scored comparatively high, perhaps due to the stronger adherence to reporting frameworks discussed above. However, when removing themes that were discussed for internal operations but not applied in the value chain, the score is noticeably lower.

Table 4-7. Themes Reported on by Geography

Subsector	**Median theme score (Mean)**
Europe	**14.5 (13.1)**
North America/Australia	11.0 (10.6)
Asia	14.0 (11.4)
Middle East/South Asia	**6.0 (8.3)**
Total	**13.0 (11.5)**

European companies reported on the highest number of themes, though Asian firms were not far behind. The low score for the Middle East/South Asia category is due primarily to lack of data – only one of the four firms here published a traditional sustainability report. Given the globalized nature of the industry and the disproportionate division of subsectors by geography it is more reasonable to examine differences at the subsector level.

As the theme scores variations show, there were differences in the preponderance of themes reported on by subsector. Multiple themes (e.g., safety, diversity, air and water quality) received 100% coverage in a subsector, even though none received 100 percent coverage across all reports. Table 4-8 shows reporting prevalence by subsector, with leaders on each theme highlighted in green.[33]

Table 4-8. Themes Reported on by Subsector

Themes	**Operators**	**Ports**	**Shipyards**	**Cargo Owners**	***Cargo Owners (for supply chain)***	**Service Providers**
Ocean policy and governance	25%	0%	0%	15%	*15%*	8%
Marine spatial planning	8%	0%	0%	0%	*0%*	0%
Port governance and standards	17%	38%	0%	0%	*0%*	0%
Port disclosure	17%	13%	0%	8%	*8%*	8%

[33] Low performers were not highlighted due to the preponderance of 0% for less common issues.

Themes	Operators	Ports	Shipyards	Cargo Owners	*Cargo Owners (for supply chain)*	Service Providers
Port, coastal, and indigenous communities	58%	50%	38%	38%	*23%*	25%
Air and water quality	100%	38%	88%	69%	*31%*	42%
Circular economy	67%	75%	50%	92%	*46%*	67%
Labor and human rights regulation	83%	50%	50%	100%	*85%*	42%
Labor and human rights disclosure	75%	63%	50%	77%	*77%*	33%
Safety standards	100%	75%	88%	85%	*62%*	92%
Shipping careers	92%	88%	63%	23%	*23%*	50%
Diversity & inclusion	92%	75%	50%	100%	*77%*	50%
Sustainability performance reporting	92%	75%	63%	100%	*100%*	58%
Rating schemes	33%	0%	13%	15%	*15%*	17%
Supply chain accountability	83%	63%	38%	92%	*92%*	25%
Sustainability data	92%	63%	63%	100%	*92%*	67%
Financial rewards for high performance	42%	0%	13%	31%	*15%*	25%
Natural capital accounting and ecosystem valuation	0%	0%	0%	8%	*0%*	8%
Decarbonisation	100%	75%	63%	100%	*69%*	92%
Emissions regulation	100%	88%	63%	100%	*62%*	92%
Efficiency improvements	100%	100%	88%	77%	*38%*	58%
Sustainable fuels	83%	38%	50%	23%	*15%*	67%

4.1.4 Sustainability Reporting Details

This section provides a brief discussion what specific initiatives and activities were coded to each of the Roadmap themes, highlighting similarities and differences in action between and within the different value chain actors.

Ocean policy and governance

Two shipping lines and one cargo owner discussed their engagement with the IMO either in requests for action or technical guidance. Two shipping lines and one classification society discussed their efforts leading the Trident Alliance and the UN Global Compact's sustainable ocean efforts. This topic was not discussed by any ports or shipyards.

Marine spatial planning

One shipping line conducted ocean monitoring on one of its ships in partnership with a research institution. However, this initiative was cancelled and will not be continued in future years.

Port governance and standards and **Port disclosure**

Two ports and two shipping lines with stakes in port infrastructure engaged in discussion with local communities around port projects on a regular or institutionalized basis. These organizations and one additional cargo owner disclosed certain information on their ports, belonged to MSIs working on port-related issues, or received external certification for port facilities.

Port, coastal, and indigenous communities

This was one of the most diverse themes, as it covers a number of entities taking action to combat corruption, impact assessments of port construction, measures to reduce pollution and environmental impacts in coastal waters, community consultations, and more general statements of supports for rights of indigenous peoples.

Air and water quality

This was a very common topic, especially in the context of the MARPOL and the Ballast Water Management Convention. Other maritime approaches to improve air and water quality include using water-based paints, selective catalytic reduction, scrubbers, and other emission control mechanisms for NOx, PM, and other air pollutants. Land-based companies also took a number of actions to reduce pollution to meet local regulations and protect employee and health and wellbeing depending on business activities (e.g., reducing dust at an open shipyard).

Circular economy

This theme was approached from many angles. Actions taken by companies that align with circular economy include office or onboard waste reduction, elimination of single-use plastics/packaging, waste-to-energy (including fuel) programs, manufacturing ships or other equipment with recycled or waste materials, ship recycling standards, repurposing containers, ocean plastic cleanup, or non-specific commitments to circular economy. Quantitative indicators were less common here, though some companies reported on waste production and water use.

Labor and human rights regulation and **Labor and human rights disclosure**

These themes covered similar areas, though **Labor and human rights disclosure** was only coded if a company provided clear data related to labor and human rights, and as such is less common than **Labor and human rights regulation**, which was included if the company had signed onto international human rights standards or applied a code of conduct for labor and/or human rights. Companies regularly blended labor, human rights, safety, and diversity issues in reporting.

Safety standards

Safety was a very commonly discussed topic across industry sectors. Most companies reviewed have a safety code of conduct internally and/or for suppliers, frequently based on ISO standards and reviewed by classification societies and with a zero-harm goal. Quantitative safety data is usually provided, such as fatalities, Lost Time Incident Rate, and similar metrics.

Shipping careers

Almost all companies discussed their employee training and/or mentoring programs and various opportunities for employee advancement and continuing education in at least a qualitative sense, some provided data on total training hours, new hires, or other career-related metrics. Some also discussed their relationships with labor unions. However, non-shipping companies rarely made any specific reference to careers within shipping supply chains and as such are not coded here.

Diversity & inclusion

Diversity was commonly discussed, though usually in a general sense (i.e., the firm stating it values diversity). Racial or ethnic diversity had different focuses depending on the location of the company, but almost all reported on gender diversity in management and total employment, with some adding age or disability metrics. American companies made commitments to diversity in the supply chain, though this was not common elsewhere.

Sustainability performance reporting and **Sustainability data**

Companies that produced a sustainability report were coded to **Sustainability performance reporting**, while **Sustainability data** was coded if companies provided clear data on their selected sustainability metrics (even if outside a sustainability report). Results for these are largely similar, as almost all sustainability reports had some data component.

Rating schemes

One shipping line and one cargo owner/charterer received third-party ratings on their ships, one from the Environmental Ship Index (ESI) and one from RightShip. Several others discussed general sustainability ratings from industry-wide rating services (EcoVadis, Sustainalytics, etc.).

Supply chain accountability

Supply chain accountability takes the form primarily of supplier codes of conduct or sustainability-based supplier screening. While the basic approach to this theme is supplier audits or ratings, some companies are active in collaborating with the supply chain on sustainability issues or even providing additional funding for supplier sustainability improvements. This theme was most prominent in large companies with a correspondingly large supplier network.

Financial rewards for high performance

This was discussed by both banks, which offer sustainability-linked financial products. Several other companies had issued green bonds or received green loans tied to certain sustainability improvements. One shipping line discussed lower port fees attained through high scores on the ESI.

Natural capital accounting and ecosystem valuation

One cargo owner discussed their work with the Ecosystem Services Market Consortium, an organization working on market-based conservation. One bank calculated its portfolio's negative impact on natural capital.

Decarbonisation and **Emissions regulation**

These themes largely overlapped, though some companies discussed decarbonisation from a lifecycle perspective (regarding ship design/construction) instead of or in addition to an emissions perspective. As discussed above, this was one of the primary themes discussed and most companies with a sustainability report had an emissions reduction target and provided at least Scope 1 GHG emission data (Scope 3 was noticeably less frequently calculated). Sulfur emissions in the context of IMO 2020 regulations were a frequent topic, though upcoming GHG regulation was less commonly discussed even if a company took action on CO_2 and other non-sulfur GHGs.

Efficiency improvements

Efficiency was the primary way of reducing emissions, both on ships and in shore-based facilities. Efficiency was improved through technology-based route optimization and digitalization, upgraded equipment (e.g., lighting), and better ship design.

Sustainable fuels

Sustainable fuels discussed by shipping lines and shipbuilders included Liquefied Natural Gas (LNG), ammonia, land-based electricity, wind and solar power, biofuels, and hydrogen. These fuels are primarily in the testing stage and do not comprise a significant proportion of ships at any shipping line. Ports and shipyards also discussed electrification of equipment and vehicles. Some cargo owners discussed use of electric vehicles or biofuels for land transport, though these were not coded as outside the marine shipping industry. Classification societies were active in research around sustainable fuels.

4.2 Motivations for Sustainability Reporting (Research Question 2)

4.2.1 Sustainability Reporting Analysis

Motivations for sustainability reporting were largely absent in the reports. Motivations for CSR action were provided occasionally, with regular reference to the major IMO conventions, especially the IMO 2020 Sulfur Regulation, which was both material and timely to any industry actor. Certain entities mentioned access to sustainability-linked/ESG finance and many viewed climate change and other sustainability issues as risk areas. Sustainability was also regularly described as a key aspect of business strategy. None of these however directly differentiate reporting from sustainable activity in general.

Regulatory requirements were a clear driver of the reporting format (evident both through statements in the report and similarities within reports from the same country), especially in countries where CSR is a mandatory segment of annual financial reporting (e.g., Japan and France), but it undoubtedly plays a role in others. Considerations such as branding/image management and competitive advantage are undoubtedly present given the well-developed narratives and graphics within the reports but cannot be identified in a standardized manner.

Motivations are therefore focused on in the interviews and are not discussed further in this section.

4.2.1 Interviews

Seven individuals were interviewed for this study, each from a different company. Interviews were aimed to gain insights at each stage of the value chain, though the final set of interviewees fell within the subsectors of shipping lines, ports, and cargo owners. Interviews targeted the motivations behind sustainability reporting and the connections between different value chain actors in the sustainability reports, as descriptive data could be gleaned from reviewing published reporting as demonstrated in Section 4.1.

Interview 1 – Head of CSR, European Port

Interview 1 was with a large publicly owned port in Northern Europe. The port produces a sustainability report in the local language and provides various sustainability data in its annual report and website with a focus on climate, safety, and employment. The interviewee discussed the growing materiality of diversity, inequality, and air pollution. The company's sustainability report is externally audited, which the interviewee claimed was an important motivating factor behind the inclusion of certain issues.

This port had an expansive view of the relevant stakeholders regarding sustainability issues, discussing clear government mandates, pressure from local communities and financial stakeholders to provide sustainability disclosure, and a growing support of disclosure on the board over the past 10-20 years. However, the port itself was largely insulated from sustainability pressures from shipping lines or cargo owners – indeed, the interviewee stated information flow generally goes from shipping lines to the port, as the port offers a discount to ships that meet the Environmental Ship Index.[34] But this oversight from customers increasing, as the interviewee said "I think that shipping companies feel that pressure to operate more sustainably before for their environment, and we are one small part of their environment but I think that paying customers are wanting I think more and more." The port's sustainable activities are often viewed as a long-term investment, such as in developing LNG infrastructure.

The interviewee provided some insights on sustainability pressures on shipping lines, discussing the growing demand from cargo owners for greater sustainability, stating "that's the most important pressure for shipping companies to be more sustainable and to be transparent". The financial benefits of efficiency are also a key driving factor.

Interview 2 – Director of Operations, American Port

Interview 2 was with a small publicly owned but privately managed port in the Northeast United States. This port does not produce any sustainability report. The interviewee stated this is due to the high cost and time requirements for a report and the lack of reporting mandates from relevant government authorities. However, many of the metrics that would be included in a traditional sustainability report are included in applications for federal grants, which are publicly accessible.

Nonetheless, the port has made a number of environmental improvements in recent years for greater efficiency/energy-savings and believes it will continue to do so when business reasons emerge, and it is compliant with all local regulations. Current environmental or social impacts

[34] A designation that a ship performs better than IMO air emission standards.

are minor, especially as the electrical grid shifts towards renewable power and the interviewee believes the port is largely in-line or better than similar American ports.

The interviewee recommends a stronger federal government role in driving sustainability reporting in ports, providing funds and ensuring all ports must meet the same standards, using the increased port security requirements in the wake of the September 11, 2001 terrorist attacks as an example. The role of public funding in driving sustainability practices was a key theme of the interview.

The interviewee has not noticed meaningful interest from cargo owners or shipping lines in receiving sustainability data from the port, stating "they haven't come to us or I don't see them coming to the port saying we must have you do this, … shippers can't go to certain ports if they have not shown themselves to be… complying with security regulations. So I've seen that there but not on the emission side. They do want the ports to share with them anything green we are doing, but our emissions regulations come from the government not the carriers or shippers." This is due largely to the minimal scale of port-related sustainability impacts compared by those of shipping lines, the interviewee noted that "When it comes to the port emissions they're fractional they're…[an] order of magnitude smaller, because your emissions are coming from a lighting bill to light the yard, or they're coming from plugging in refrigerated containers. They are also coming from yard equipment, trucks and cranes but these items are all further along in the technology available for reducing emissions."

Interview 3 – Global Sustainability Developer for Supply Chain Operations, Retailer

Interview 3 was with a major privately-owned consumer products retailer based in Northern Europe but with global operations. This company prioritizes sustainability in its branding. It uses shipping as a cargo owner but discussed shipping directly only very briefly in the company's sustainability report. Product transport (including both land and ocean transport) comprised only 5% of the company's climate footprint, likely influencing the greater focus on manufacturing and retail operations. The company also discusses labor and human rights issues in its value chain in its report, but not with specific reference to shipping.

However, the interview showed the company is much more active around sustainability in shipping than shown in its report. The company has annual audits and a specific code of conduct for shipping suppliers, with a particular focus on climate, labor, and safety issues. Representing the challenges inherent in a large company, the interviewee spoke of the "battle for prioritization" between different sustainability issues and means of disclosure. Shipping is also not nearly as visible to the company's customers compared to other aspects of the firm's operations.

But in some areas sustainability monitoring work is outsourced to other parties. The interviewee stated "So that if a port is auditing or countries are getting a ship visiting a port, then of course we rely on that we don't need to go further. So we know that there are some information available … when that is not worth it for us to go too much in detail on those ones because it's well covered by the regulations." The interviewee also spoke of relying on a shipping MSI for emissions data and room for improvement in the data received there.

Sustainability factors are an important consideration for the company when selecting shipping suppliers, and it has an internal sustainability rating process. But shipping poses certain challenges given the lack of alternatives on certain routes and distinctions at the ship or route level even within the same shipping line that could impact emissions. The interviewee stated

given these limitations "At the same time… we can't be very strict saying, especially on greenhouse gas emission is not the red on green… it's really kind of benchmark…So what is the best practice and it's very much about discussion which initiative, we could have together what we could do together, and if possible, focusing on big movement." Nonetheless, major sustainability failures would be a breach in contract with significant financial repercussions to the shipping line.

The interviewee reinforced the minor impacts ports have within the supply chain in comparison to shipping lines and land-based transport, but also that benchmark data for ports is very difficult to obtain.

Interview 4 – Sustainability Manager, Bulk and Ferry Shipping Line

Interview 4 was with a privately-owned shipping conglomerate based in Northern Europe. The company operates both a bulk shipping line and a ferry service, as well as real estate and retail investments. Each business area of the company functions largely independently but the company prepares a sustainability report integrated into its annual financial review covering all of these business areas and has overarching sustainability pillars and KPIs applied in all business areas.

This interviewee also pointed towards the importance of stakeholders in driving the process of sustainability data collection and reporting. Customers played a large role in requesting sustainability, but much more prominently in the ferry sector[35] than for the bulk shipping lines, which primarily served the fossil fuel industry, where competition was higher and sustainability ethics were less prominent. The marketing value of the company's sustainability activity was also much stronger in the consumer-facing ferry and property ownership business areas than in bulk shipping.

This interviewee mentioned the importance of the sustainability report for employees, stating they saw high demand for sustainability in younger employees and the sustainability report was used for new and prospective employee presentations: "And without the sustainability report, and the work behind that…we would have had to sort of invent the wheel and do the presentation. And over and over again, a new time, every time. But having this sustainability report, it's an easy tool for them to have that conversation and have this dialogue with them." The sustainability report "also sort of puts pressure internally on the management to actually keep on working with the youth and not lose speed, so to say, and it's sort of keeping the spotlight on these questions more than it would have been otherwise."

The interviewee viewed conflicting regulatory standards and data reporting requirements as a challenge for sustainability reporting, given the various shipping mandates within the EU are distinct from those of the IMO. Requests from a bank or client may require a very different format. The result is excessive time spent transforming data to meet various needs instead of having one streamlined approach.

Interview 5 – Director of Communications, Bulk Shipping Line

Interview 5 was with a privately-owned Northern European bulk shipping line and member of the SSI. This company had not produced a sustainability report to date but is in the process of creating its first and does promote its sustainability initiatives in its website and other

[35] The ferry sector is involved in cargo shipping as a Roll-On Roll-Off transport service that carries freight trucks between ports.

materials. This company is not mandated to produce a report due to its private status but has received increasing pressure from banks and clients to provide sustainability data, plus growing interest among employees. However, low-profile ownership, concerns about unreliable data, identifying meaningful issues and ways to present them, a small team, and desire to learn how competitors approach reporting have delayed reporting until this point despite the company's environmental values.

The interview discussed how shipowners apply sustainability when purchasing from shipyards. Sustainability considerations can be incorporated in these negotiations but there are certain limitations due to existing supplier relationships and technical capacities, it is rare to choose a shipyard solely or primarily because of its sustainability record. Shipping lines do not seem to have strong influence over sustainability within shipyards unless they are willing to bear the extra transaction costs of sourcing new more sustainable supplies.

Interview 6 – Global Head of Sustainability, Commodity Trader/Charterer

Interview 6 was with a major commodity trader, which operates as a shipowner and charterer for internal transport and as a service to third parties. The company has a significant section of their sustainability report dedicated to shipping issues and is an active member of the SSI, though the report still primarily focused on commodity-related sustainability issues.

This interview reiterated the role of clients (in this case food and consumer products companies especially) and employees in driving sustainability progress and reporting, with a particular acknowledgement of the increasing sustainability requirements of lenders, as the company has a large credit line for business operations. Over the past ten years, sustainability has become much more of a focal point for corporate management and strategy. For this company, regulatory disclosure requirements were minimal; the sustainability report satisfied regulatory requirements in the Netherlands, where the company is headquartered.

The interviewee acknowledged that stakeholder interest was stronger for product-related sustainability issues (e.g., palm oil) than freight, but as a core business area it was also essential to incorporate freight in the company's sustainability reporting strategy. The interviewee also stated shipping sustainability would grow in importance in the future from both a customer and regulatory standpoint and that only five years ago it was not something even considered.

Though the company took some action reviewing for human rights violations in ports used, he also admitted that port selection was based on customer/product location or price and it was difficult to shift between ports based on sustainability considerations. However, the company was involved in discussions with shipowners and buildings to focus their chartering on newer and more efficient ships, demonstrating the downward pressure outlined in other interviews and literature.

Interview 7 – Integrated Shipping and Logistics Company

Interview 7 was with a large Northern European shipping line which also has operations managing port terminals and engaging on land-side logistics. The company is a member of the SSI. The interviewee has produced a sustainability report covering a broad array of themes for many years and is an active member of multiple shipping sustainability organizations. The historic progression of the sustainability report has been unique, as the interviewee stated they have streamlined their reporting from an original report which aligned directly to the GRI guidelines for each business unit to one that uses GRI as guidelines but focuses on material issues at a corporate level. But recently, given increasing data demands the company is discussing ways to expand or segment reporting again, and/or provide more supplementary

material, such as the recent decision to publish an ESG data table separately from the written report.

The interviewee reiterated the importance of sustainability disclosure regulations and growing interest of investors, customers, and employees in sustainability data, though this is still not universal. This was one of few interviews to speak to interest from NGOs in sustainability reporting. However, the interviewee echoed the sentiment that different stakeholders each have different data requirements which can add extra complexity beyond an annual sustainability report. The report itself is used for internal or external communication on key stories and metrics and response to questionnaires. Instead of a traditional stakeholder-based materiality matrix for determining issue relevance for reporting, the company has a much more nuanced approach for narrowing down the broad range of sustainability issues relevant to the company. The company focuses on issues where the company could have a large negative impact, where there are potential business risks, or where there is a strategic value for the business to be active on an issue.

The interviewee discussed more of the strategic goals of reporting, stating "we actually put a lot of effort into our sustainability report because we see that it's an important tool to build trust with our stakeholders, to communicate our strategy on sustainability, our performance [and] to share also dilemmas and challenges where it's difficult." The interviewee also stated "sustainability is becoming more of an actual commercial offering for us... And then the sustainability report is kind of… the foundation that we can use to show to customers also that we have a strong comprehensive approach and strategy on across all sustainability issues across responsible business practices."

As the company is active in port management, the interviewee could provide a consolidated perspective of differences between those two parts of the value chain. The interviewee noted that sustainability-related stakeholder pressure was higher on the ship operation side of the business than on the ports and land-based logistics, though these segments are a much smaller part of the business.

4.2.3 Motivations – Summary

As discussed above, motivations were not clearly presented in public sustainability reporting, beyond those linked to compliance or reporting framework requirements. However, many of the motivations identified in Section 2.4.2 were discussed during the interviews and despite their narrow scope interview findings are largely in line with findings from the broader analysis and literature:

Table 4-9. Prevalence of Different Motivations in Interviews (n=7)

Motivations identified in Buhr (2007) and Pérez-López et al. (2015)	**Interviews discussing this motivation[36]**
Moral or ethical duty	5
Competitive advantage	1

[36] Interviewees were asked "What are your top reasons for sustainability reporting?" not specifically asked about each motivation included here. Some motivations may thus apply but were not a primary factor or a focus of the interviewee's role.

Motivations identified in Buhr (2007) and Pérez-López et al. (2015)	**Interviews discussing this motivation[36]**
Standard setting	1
Peer pressure	1
Image management	3
Social license to operate	2
Financial benefits	3
Compliance	6
Operational strategy	4
Diffusion	2
Data collection	2
Stakeholder pressure, general	7
Other	0

Each motivation was discussed by at least one respondent. All interviewees spoke to some form of stakeholder pressure even if it had not yet led to reporting. The primary other themes discussed include **Compliance**, **Moral or ethical duty**, and **Operational strategy**. No motivations were presented that were clearly distinct from the literature, though a few answers were not exact matches but were close enough to a motivation listed to be categorized accordingly. For each of the three interviewees whose sustainability reports were previously reviewed, interviews presented motivations that were not clear in reporting.

5 Discussion

5.1 Discussion of Findings

Literature, sustainability reports, and interviews alike showed the diversity of focus issues and motivations for shipping industry sustainability reporting.

5.1.1 Themes and Frameworks

Reports covered a large number of the Roadmap themes, as discussed in Section 4.1.3, and most reports analyzed were comprehensive and met at least one internationally accepted reporting framework. There was however a notable difference in reporting depth and standardization between issues which have clear reporting methodologies and metrics (emissions and climate, safety, diversity) and most other issues where reporting was more scattered or qualitative.[37]

In both sustainability reports and interviews climate, safety, and labor rights emerged as focal points for sustainability reporting in the shipping industry across the value chain. These themes apply in all parts of the value chain and are among the few themes where supply chain activity is considered essential to business operations downstream, as many large companies have received negative press for poor supply chain labor conditions, and GHG reporting often includes Scope 3 emissions which would include shipping. Many international and national laws require certain activities in each of these issues (e.g., SOLAS) and corporate code of conducts very frequently address safety and labor rights. There are also often common metrics used that are consistent across businesses for these themes.

Themes that applied only in certain value chain subsectors, were very business specific, or did not have clear metrics tended to show much more variability in reporting and were discussed more as working areas than mandates in interviews. These include themes such as **circular economy** and **air and water quality** (common but highly variable) and ones such as **natural capital accounting and ecosystem valuation** (rarely discussed).

Points of Interest

No meaningful variations in sustainability reporting based on the broad geographic classifications in Section 4.1 were identified, when controlling for missing data and disproportionate weighting of certain subsectors by geography. However, companies based in China were far more likely to have no or poor-quality reporting, with 3 of 7 Chinese companies included in the screening list lacking any reporting, and two of the others having data only on their website or lacking a framework and thus having minimal coverage of the Roadmap themes. South Korea was the only other country with multiple companies non-reporting, but there 3 of 6 companies did produce a full sustainability report. Given the growing concentration of shipbuilding specially in China and South Korea, international action focused on improving reporting standards in these countries could have disproportionate impact.

No meaningful correlation was found between a company's revenue and the amount of themes it discusses in reporting, despite some preliminary expectations as based on Dienes et al. (2016) that larger companies would have more detailed sustainability reporting due to a) greater business impact in the relevant sustainability areas, b) a wider range of stakeholder pressures,

[37] Nonetheless some issues had high coverage even if in a variable manner, such as circular economy as discussed in Section 4.1.4.

and/or c) more turnover that could support a larger internal CSR department. This held for both the full set of 60 companies reviewed and operators and cargo owners separately (as the two largest data subsets). However, as all players were still comparably large in their subsector, this finding is not conclusive, and a qualitative score of reporting strength may have revealed more differentiation than a simple tally of themes addressed.

The two most common frameworks were GRI and the SDGs. However, in both cases ports had far lower use of either standard.[38,39] This finding aligns with literature such as Stein & Acciaro (2020) and Vejvar et al. (2018) which also noted gaps in existing reporting for ports, and interviews which revealed fewer institutional or stakeholder incentives for port reporting. This finding supports the Roadmap's particular focus on ports as an area in need of more relevant reporting frameworks.

The theme **Supply chain accountability** declined in prevalence as one moved down the subsectors on the value chain, i.e. it was nearly ubiquitous in cargo owners but was discussed by 83% of operators, 63% of ports, and only 38% of shipyards. This provides additional support for the value chain-influenced model of sustainability disclosure discussed more in Section 5.1.2.

The theme **Diversity & inclusion** was among the most commonly recorded theme in sustainability reporting, but it was essentially not mentioned in interviews. This distinction could occur for various reasons – diversity data is generally viewed under human resources, which may not be the purview of interviewees focusing on traditional sustainability work. Alternatively, diversity data can be more straightforward to collect and present than other themes that involve complex analysis, so less work needs to be done to develop it in a reporting context. Lastly, Northern European respondents (which comprised the bulk of interviews) may consider diversity less material than those with operations in places with greater ethnic heterogeneity.

All shipping lines interviewed stressed their support for consistent application of IMO regulations, despite **Ocean policy & governance** being a relatively uncommon theme in reporting. The frustration with mismatched standards and lower cost competition that could be solved by greater IMO activity may not tie into the values-driven model of sustainability often presented in sustainability reporting and thus be viewed as less critical, or industry actors may be unaware of how they can influence broader policy shifts.

Natural capital accounting and ecosystem valuation and **Marine spatial planning** were reported on by only two and one companies, respectively. In both cases, these may be viewed as primarily academic/NGO issues at present. More work should be done to tie these into the business interests of shipping industry stakeholders and/or develop scientific or financial tools that can allow mainstream businesses to become more active in this field.

Multiple interview respondents expressed frustration at lack of standardization with existing regulatory reporting requirements, echoing findings from Lister (2015). This issue is not unique to shipping but should be taken into consideration as states and the IMO expand their own

[38] Ports had higher use of SASB and "Other" standards, but this may be statistical noise with a small sample size more than a sign there are more relevant other reporting frameworks for ports.

[39] Much lower percentages of service providers for GRI and shipyards for SDGs are also notable.

sustainability mandates. The Roadmap could fill this gap, but without greater buy-in from a larger segment of the industry it may be just one more among many reporting frameworks.

5.1.2 Motivations

The primary themes discussed include **Compliance**, which has clear standards and impacts, but also **Moral or ethical duty** and **Operational strategy**, which are far less quantifiable. It seems that both the "carrot" of corporate growth and the "stick" of avoiding legal penalties are important to a company's decision to report, and even shipping is moving beyond purely financial considerations. While these companies show both internal and external motivations for sustainability reporting even where not mandated, the relative importance of compliance shows concerted action by the IMO or port states may be especially valuable to expedite or improve reporting.

Interestingly, relatively few interviewees discussed any motivations driven by interactions with competitors: **Competitive advantage**, **Standard setting**, or **Peer pressure**. This may reflect an industry where competition is still largely defined by price or route and brand image is relatively unimportant, as several interviewees brought up. It could also result from shipping being a mature industry more affected by broader social or economic changes than by any disruptive individual players, and as such industry actors must largely react simultaneously to sustainability-related trends.

The role of **Data collection** is in certain ways contradictory to sustainability reporting. While reporting can be an impetus for sustainability data management, data issues are one of the main barriers to reporting discussed by interviewees and in many cases the sustainability report is not sufficient for other data requirements.

Regardless of the specific motivations cited, all interviewees spoke of a growing culture of sustainability at their firm. Whether or not sustainability is integrated in every business decision, it is clearly more than just an add-on and goes beyond simply following environmental and social regulations.

Barriers

The most consistent barrier to improved sustainability reporting mentioned in interviews was collecting data that would meet the needs of stakeholders. This could occur both through challenges measuring complex data (Interview 1, Interview 3, Interview 5, Interview 6) or challenges in adapting existing data to meet specific requirements (Interview 4). Data issues are among the barriers identified in Dissanayake et al., 2020 and Lozano et al., 2016, though some of their other barriers were less frequently mentioned – cost/benefit analysis (Interview 2) and concerns about inaccurate information (Interview 5) were brought up by two interviewees. Interviewees also mentioned the challenge of consolidating data from different business units in a usable manner given the industry-specific nature of reporting frameworks or disproportionate impacts in certain business segments (Interview 4, Interview 7). This barrier was not identified in literature and while it may relate to specific company circumstances it is valuable to note that many companies within shipping have begun diversifying into ports or other logistics services that may not fit neatly within a framework focused on impacts from ships.

Stakeholder Interactions in the Shipping Value Chain

One of the most prominent motivations for sustainability reporting comes via pressure from other value chain actors. Reviewing Sections 2.2.1 and 2.3.3 and the interview responses, a

view of stakeholder power dynamics within the shipping industry emerges as shown in Figure 2.2. Figure 5.1 below adapts that figure within the broader web of stakeholders impacting the industry to show the direction and scale of pressure for sustainability action.

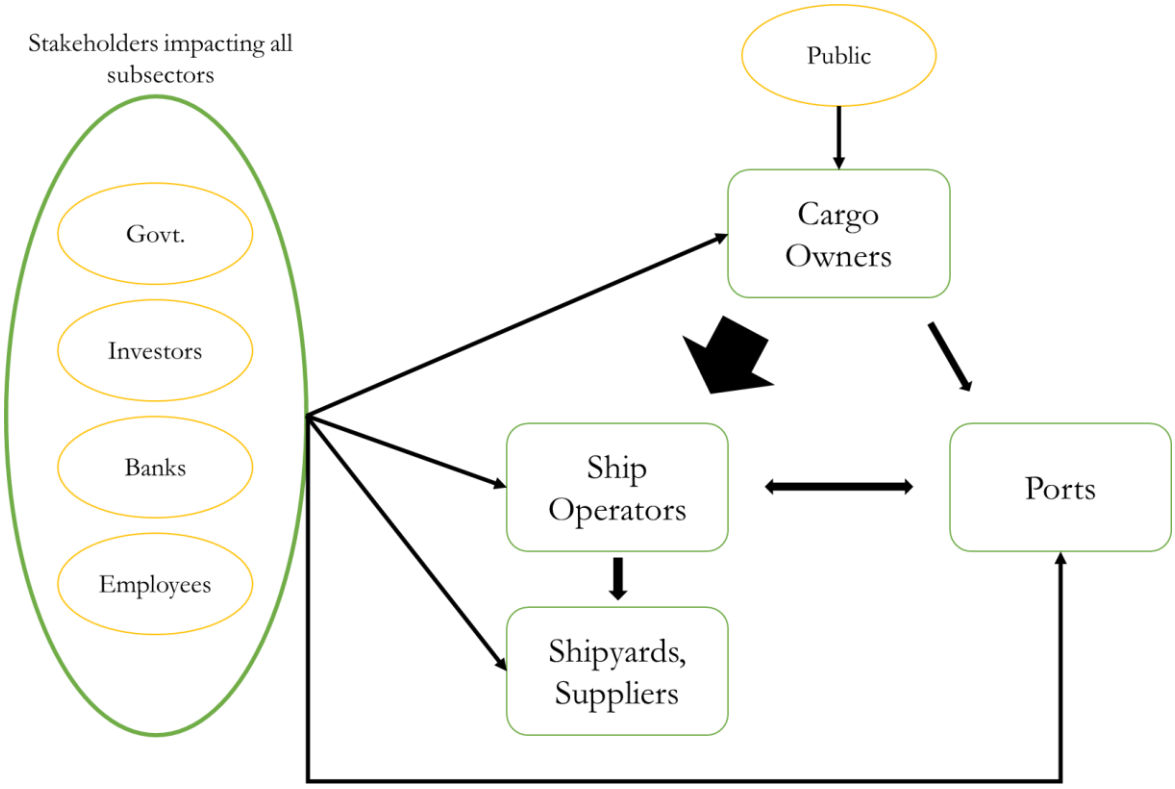

Figure 5-1. Shipping Stakeholder Interaction on Sustainability

The larger arrow between cargo owners and shipping lines shows the greater impact of cargo owners on shipping lines compared to other value chain subsectors. Shipping lines derive their revenue from cargo owners, who are generally larger companies which have the means to require sustainability commitments from their shipping suppliers.[40] For even greater detail, one could conceivably split cargo owners between retailers, brands, and commodity traders, with declining consumer pressure and increasing connection to shipping at each stage. Less of a dynamic emerges between shipping lines and shipyards, as the concentration in shipping lines means shipyards must adapt to meet the demands of shipping lines, including in areas such as sustainability, but interviews did not reveal major requirements for sustainability from shipping lines to shipyards regarding work practices at the shipyard. Shipping lines put pressure on ports too for similar reasons, but given the geographic factors surrounding port choice and the minor role port operations play in the total sustainability impacts of shipping lines (compared to shipyards, where design and fuel choices can greatly differentiate individual ship environmental and safety impacts) this pressure is much weaker and bidirectional – as shown in Interview 1, port requirements can lead to sustainable activities by shipping lines.[41]

[40] Not all cargo owners are large enough to have this power in the business relationship, but this report looks specifically at major cargo owners. Average revenue for cargo owners in this study is 12 times greater than average revenue for operators.

[41] As discussed in Section 2.2.1, these roles can be blurred for charterers which combine both the cargo owner and operator role, or for conglomerates that operate in multiple sectors.

The findings from this study show disclosure in principle follows a similar path. Cargo owners, which face the greatest public pressure, are be most active in reporting and require sustainability data from shipping lines for their sustainability reporting on their supply chain. However, as shipping is only one portion of the broader business activities of cargo owners, data specific to shipping may not always be provided in cargo owner sustainability disclosure. Shipping lines prioritize reporting data relevant to cargo owners, while potentially requiring shipyards to provide relevant data necessary for their own sustainability reporting. The role of ports here is less clear – port sustainability data is more relevant for supply chain sustainability reporting for cargo owners than shipping lines, so here the pressure may come more from the cargo owner than the shipping line, but as shown by interviews this is not common practice at this time. Even where not required by other value chain actors, governments, employees, and financial stakeholders may require sustainability reporting for their own ends. And in the absence of any stakeholder pressure, reporting may still arise due to the other motivating factors outlined in Section 2.4.2.

5.1.3 Subsector Findings

This section has specific findings consolidated from themes, motivations, and other data for the three subsectors where sufficient data was found in both reporting and interview analyses: shipping lines, ports, and cargo owners.[42]

Shipping lines

Shipping lines are clearly pushed to provide sustainability information by clients and other stakeholders. However, divergent regulations and data collection requirements between countries and clients are major burdens on firms with global operations, thus making it harder to develop a sustainability report that meets all stakeholder demands. This provides strong support for proposals such as the Roadmap that aim to unify reporting standards, though greater ambition and enforcement at the IMO-level is a more comprehensive solution.

Shipping lines tend to be particularly receptive to issues that have clear financial benefits to the company, such as energy efficiency, over ones that would require higher costs with less clear return. Nonetheless, most shipping lines clearly understand the value of technological investment in anticipation of a future with stricter emission standards.

Ports

The small scale of port-related impacts compared to those from transportation makes ports a neglected part of the value chain, with little pressure from cargo owners or shipping lines on ports to adopt sustainable practices or improve disclosure (Interviews 1 and 2). While many major ports[43] have begun a transition to sustainability and transparency driven by regulatory requirements or economic incentives, this is not universal, and more work is needed to promote greater disclosure at smaller ports, whether through regulations, MSIs, or greater interest from individual cargo owners/shipping lines in the role ports play in their supply chain.

Cargo Owners

The cargo owner category had a widely varying approach to shipping. Out of the 13 cargo owners analyzed, four had no discussion of shipping in any form in their sustainability reports,

[42] No shipyards or service providers were interviewed.

[43] Though not all – the Port of Shanghai is the largest port in the world but has not produced any public sustainability reporting since 2016. As seven of the ten largest ports in the world are in China, the lower prevalence reporting within China is problematic for the subsector overall.

two discussed only land-based transport (one of which expressly excluded maritime shipping emissions from their calculations), and one referenced shipping as a business area but had no sustainability activity specifically within shipping. Of the others, two reviewed shipping for compliance with IMO regulations, one partnered with shippers on sustainable fuel development and collected shipping GHG data, and one only referenced its membership in shipping-related organizations. Only two, both charterers, were active in discussing the role shipping plays in their sustainability strategy and outcomes.

This study reviewed a sharp division between retailers, which had minimal reporting on sustainability within their shipping supply chains, and commodity producers, many (though not all) of whom were active in promoting and reporting on sustainable shipping behaviors. This may be due to the lower materiality of shipping and the greater distance between shipping companies and corporate operations for major retailers compared to companies actively engaged in chartering and ship ownership for their business activities. Interview 3 supports the contention that retailers are more active in shipping sustainability than is represented in their reporting, as the interviewee's company engaged in detailed audits of shipping lines and mandated IMO compliance, neither of which were discussed in the company's most recent sustainability report. Nonetheless, given the major scale of retailers and e-commerce companies and their growing consideration of sustainability initiatives in other business operations (including land-based logistics), retailers have the potential to greatly influence the industry in a way that may merit inclusion in sustainability reporting. This is a ripe area for shipping MSIs to expand their activity.

5.1.4 Suggestions for the Roadmap

Certain issues were encountered using the Roadmap as an analytical framework in this study.[44] These are areas where the Roadmap could use greater clarity, or where sustainability reporting has not caught up to the issues the Roadmap focuses on.

1. **Port regulation and standards** and **Port disclosure** are particularly limited as they have less relevance for most parts of the value chain. While this research shows that ports are less active in sustainability reporting than other industry subsectors, current port reporting generally aligns with existing sustainability reporting standards.

2. **Port, indigenous, and coastal communities** encompasses impact mapping, environmental/health protections, corruption, and piracy. These issues are generally reported on separately by all companies involved and may be better arranged as separate themes.

3. **Air and water quality** and **Circular economy** should apply beyond ports, as these are key issues at every stage of the value chain and it was far less common to find reporting from a port perspective than from an internal perspective in other parts of the value chain.

4. Certain themes within an objective (e.g., **Decarbonisation** and **Emissions regulation**) overlap significantly. For this reporting analysis, they could have been combined into one topic with no loss of value.

[44] Suggestions are not provided on the specific goals or high-level vision of the Roadmap.

5. It is debatable whether **Marine and spatial planning** should be the purview of corporations versus scientific and governmental actors, and lack of reporting on this issue reflects that. More targeted guidance could aid private sector actors looking to become active in this sphere.

6. The most frequent topics discussed in reporting but not included in the Roadmap are firm governance and cybersecurity/digitalization. These are less connected to the environmental and social focus of the Roadmap but may be potential additions to make the Roadmap align closer to existing reporting.

5.2 Limitations

5.2.1 Limitations of the Sustainability Reporting Analysis

It is important to note that a sustainability report is only one piece of a company's sustainability story, many companies interviewed were active on sustainability without reporting every action, while others whose reports were reviewed may use sustainability reports to greenwash more negative results. Besides these limitations of reporting in general are certain limitations with the sustainability reporting review methodology. These include the following, many of which could be addressed through the future research suggestions in Section 6:

1. **Lack of understanding of true sustainability progress**. The scale of reports and number of issues reviewed required conducting a broad analysis instead of a more detailed examination of improvement or quality of action on each issue. This allows this thesis to make connections between value chain actors missing in a more targeted study, but also makes this analysis susceptible to greenwashing, as reporting on an issue does not necessary represent true commitment to that issue. A more granular coding methodology could better distinguish between companies that simply mention an issue vs. ones that are industry leaders.

2. **Lack of standardization.** The majority of companies reviewed produced full sustainability reports. But as sustainability reports vary significantly depending on the company and the standards used, it is difficult to conduct a direct comparison. Secondarily, issues reported by different actors in the value chain may have distinct connotations (e.g., a classification society may report on thought leadership on sustainable fuels, while an operator may discuss actually implementing these fuels in its fleet).

3. **Absence of motivations.** Beyond regulations, few motivations were consistently discussed in a manner that revealed their influence on the reporting. While stakeholder analyses are included in the reporting frameworks, a simple materiality matrix is not enough to portray the web of interactions between shipping companies and their stakeholders that can motivate companies to report in certain ways.

4. **Quantitative validity.** A selection of 60 companies is insufficient to make industry-wide conclusions, especially when each subsector was a much smaller sampling. However, a larger manual analysis would have been impractical with this approach.

5. **Lack of alignment with the Roadmap.** As discussed in Section 5.1.4, the Roadmap did not perfectly align with all sustainability reports reviewed, resulting in certain areas where coding was unclear or an imperfect representation of a company's actual reporting activity.

5.2.2 Limitations of the Interviews

Interviews provided clarity on a number of the issues listed for the sustainability reporting analysis. However, the interviews also had certain limitations.

1. **Lack of representativeness.** Interviewees were reached through SSI or the author's personal network. This resulted in a disproportionately European selection of respondents and did not cover the value chain comprehensively.

2. **Time limits.** Interview questions were targeted to the interviewees' time available, however in some cases the discussion could have been expanded.

3. **Unequal weighting of topics.** As semi-structured interviews, interviewees were asked follow-up questions or allowed to expound on areas of particular relevance to their company or role. As a result, certain interviews focused more on specific questions, motivations, or business activities than others.

6 Conclusion

This thesis analyzed the content of and motivations for sustainability reporting in the shipping industry in order to provide a comprehensive overview of shipping CSR reporting practices following the SSI Roadmap to identify alignment and mismatches between different segments of the shipping value chain, as well as to identify common motivating factors for reporting as a means to target future interventions in the sector, with a particular focus on the interactions between actors in the shipping value chain.

Reviewing the sustainability reports of 60 companies within the shipping industry shows a clear preference for the GRI and SDGs as reporting frameworks, and a large variety of sustainability issues reported on with particular focus on climate change, safety, and diversity. These issues are also largely those which are incorporated in cargo owner codes of conduct or supply chain data collection and reinforce the role of cargo owners in driving shipping sustainability reporting.

Interviews confirmed that the presence and content of sustainability reporting is determined by regulatory requirements and pressure from a number of stakeholder groups, but also from internal strategic and value-driven motivations. Each motivation identified in literature played a role for at least one company interviewed. Interviewees broadly spoke to the emerging importance of sustainability in business strategy but also the challenges arising from an individualized approach to data collection and presentation.

However, extending the value chain beyond the cargo owner-shipping line dynamic is less clear. Interviews with ports do not show large impacts to or from shipping lines using the port, while cargo owners largely ignore the role of ports as immaterial compared to the sustainability impacts of shipping lines. Shipping lines require greater sustainability performance from newly commissioned vessels in shipyards, but do not necessarily report on or require data from shipyards as part of their supply chain/ship lifecycle. Classification societies and other service providers may report on or have service offerings related to sustainability, but their own impacts are minimal and thus of minor importance to other value chain actors.

The practical implications of this work are numerous, even if more research is valuable in many areas before complete conclusions can be drawn. In some cases, this work can be performed by MSIs like SSI or individual companies, in other cases concerted international action will be necessary. The recommendations that arise from this study are the following:

1. **Greater focus on metrics and frameworks for measuring issues specific to the shipping industry:** Existing frameworks (such as GRI) work well for major issues such as climate or safety but are less relevant for others that are uncommon or very different outside of the industry. The Roadmap could address this recommendation but may need greater specificity in metrics and themes.

2. **Reporting standardization:** This thesis shows there is little consistency in sustainability reporting within the shipping industry, let alone compared to different industries. Voluntary reporting frameworks have done well at filling the gap, but still have not reached universal acceptance. One universal reporting framework would allow direct comparison between shipping lines by stakeholders looking for a clearly more sustainable alternative. Alternatively, more widely accepted KPIs for themes such as circular economy where there is high variability can promote clearer action in these areas as has happened in safety and climate.

3. **Reporting mandates:** IMO regulation may be necessary to force reporting from companies that have not decided to report voluntarily at this point or do not have home country reporting requirements. This action would level the playing field more, reducing the burden on high performers and forcing compliance by those currently lacking disclosure. Almost all interviewees mentioned regulatory requirements as important drivers of reporting.

4. **Building awareness of shipping among cargo owners:** Some cargo owners are highly active around shipping, but this does not appear to be a common practice beyond general codes of conduct and interviews with cargo owners have shown there is still little customer demand for action around shipping. Interviews and literature have shown the importance of cargo owners in promoting sustainable practices among shipping lines and other actors in their supply chains, and cargo owners are important players in MSIs. However, there is a wide breadth of global cargo owners, and the sustainability reporting review shows many could take greater action around shipping, such as specific sustainability requirements in tendering or eschewing flags of convenience.

The breadth of this study leaves many openings for future research in this field. The following list is not exhaustive but includes broad research categories and areas of particular interest that could not be addressed in the scope of this thesis.

1. **Detailed sector-level analyses:** As discussed in Section 2.4.6, few of the individual subsectors included here have existing academic literature on their sectoral sustainability reporting practices. Of especial interest would be shipyards, which were not reached in the interviews, and ports, which exhibited significant variation in reporting practices and motivations.

2. **Issue-focused research:** This study reviewed reporting for 22 distinct issues. As a result, specific detail on any individual issue (e.g., metrics used or initiatives discussed) are limited. Researchers in the field of e.g., circular economy could conduct a full analysis on reporting practices just on that theme within the shipping value chain or individual subsectors.

3. **Outcome-oriented studies:** An interesting extension would be to look at tangible impact of different motivating factors, e.g., do companies whose reporting is primarily based on legislative requirements produce higher quality reporting or achieve greater progress on sustainability metrics than those basing their activity on client demands or internal business motivations? This thesis does not expand upon the research on sustainability reporting impacts discussed in Section 2.4.5 so understanding differentiation in business impact between shipping and sectors previously studied could add further nuance to the incentive structure for shipping sustainability reporting.

4. **Comparison between shipping and other sectors:** Section 2.3.4 discusses the role MSIs play in other transnational industries similar to shipping. This analysis does not attempt to examine reporting outside of shipping given the clear difference in reporting themes but comparing governance structures and approaches to sustainability challenges between shipping and other industries could nonetheless be valuable.

5. **Big data analysis:** Researchers with experience in big data analysis and automated language processing that could automatically analyze sustainability reports could discover stronger quantitative findings than this relatively small sampling and get a stronger picture of activities in regions or subsectors that are minor components or excluded from this study.

Thus, while this thesis only touches the surface of the complex interconnections between shipping and sustainability, it is clear that progress has been made by large players in the industry and sustainability is an ever-growing topic of discussion between industry stakeholders. This thesis demonstrates the importance of approaching shipping sustainability across the industry value chain, an area heretofore unexplored, even if acknowledging particular focuses in individual sectors. Overall, this research broadens the knowledge of current approaches to sustainability reporting in shipping and in a rapidly progressing industry this topic will continue to be relevant and dynamic.

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Appendix

Appendix A – Companies Reviewed

Company	**Country**	**Primary Subsector**	**Revenue (billion USD, 2019)**	**Organizational Status**
A P Moller-Maersk A/S*[45]	Denmark	Operator	39	Public
The China Navigation Company Pte. Ltd.*	Singapore	Operator	10	Private
Oldendorff Carriers Gmbh & Co. KG*	Germany	Operator	5	Private
IMC Industrial Pte. Ltd.*	Singapore	Operator	<0.1	Private
Priya Blue Industries Private Ltd.*	India	Shipyard	0.4	Private
South32 Ltd.*	Australia	Cargo Owner	6.9	Public
Louis Dreyfus Holding B.V.*	Netherlands	Cargo Owner	36.5	Private
Bunge Ltd.*	Bermuda	Cargo Owner	45.7	Public
Lloyd's Register Group Ltd.*	UK	Classification Society	1.2	Nonprofit
Rightship Pty Ltd.*	Australia	Service Provider	<0.1	Private
Standard Chartered Plc*	UK	Bank	15.7	Public
ABN AMRO Bank NV*	Netherlands	Bank	9.6	Public
Cosco Shipping Holdings Company Ltd.	China	Operator	21.9	Public
Nippon Yusen Kabushiki Kaisha	Japan	Operator	15.3	Public
Hapag-Lloyd AG	Germany	Operator	14.2	Public
Mitsui OSK Lines Ltd.	Japan	Operator	10.6	Public
Kawasaki Kisen Kaisha Ltd.	Japan	Operator	6.8	Public
Evergreen Marine Corporation (Taiwan) Ltd.	Taiwan	Operator	6.3	Public
HMM Co., Ltd.	South Korea	Operator	4.8	Public
Wallenius Wilhelmsen ASA	Norway	Operator	3.9	Public
Kirby Corp.	USA	Operator	2.8	Public
Korea Shipbuilding & Offshore Engineering Co., Ltd.	South Korea	Shipyard	13.1	Public
Mitsui E&S Holdings Co Ltd.	Japan	Shipyard	7.2	Public
Samsung Heavy Industries Co., Ltd.	South Korea	Shipyard	6.3	Public
Keppel Corporation Ltd.	Singapore	Shipyard	5.6	Public
China Shipbuilding Industry Company Ltd.	China	Shipyard	5.5	Public
Yangzijiang Shipbuilding (Holdings) Ltd.	Singapore	Shipyard	3.4	Public

[45] *SSI Member

The National Shipping Company Of Saudi Arabia (Bahri)	Saudi Arabia	Shipyard	1.8	Public
Cssc Huangpu Wenchong Shipbuilding Co., Ltd.	China	Shipyard	1.8	Private
Hanjin Heavy Industries	South Korea	Shipyard	1.4	Public
Oshima Shipbuilding Co., Ltd.	Japan	Shipyard	1.1	Private
CK Hutchison Holdings Ltd.	Hong Kong	Port	38.4	Public
Shanghai International Port (Group) Company Ltd.	China	Port	5.2	Public
Cargotec Oyj	Finland	Port	4.2	Public
Kamigumi Co Ltd.	Japan	Port	2.6	Public
Shenzhen International Holdings Ltd.	China	Port	2.2	Public
Nissin Corporation	Japan	Port	1.8	Public
Hanjin Transportation Co., Ltd.	South Korea	Port	1.8	Public
Tangshan Port Group Company Ltd.	China	Port	1.6	Public
Adani Ports and Special Economic Zone Ltd.	India	Port	1.6	Public
International Container Terminal Services Inc.	Philippines	Port	1.5	Public
Walmart Inc.	USA	Cargo Owner	524.0	Public
CVS Health Corporation	USA	Cargo Owner	256.8	Public
Mckesson Corporation	USA	Cargo Owner	231.1	Public
Trafigura Beheer B.V.	Singapore	Cargo Owner	136.6	Private
Mitsubishi Corporation	Japan	Cargo Owner	136.0	Public
Kroger Co.	USA	Cargo Owner	122.3	Public
Home Depot Inc	USA	Cargo Owner	110.2	Public
Itochu Corporation	Japan	Cargo Owner	101.0	Public
Tesco Plc.	UK	Cargo Owner	83.4	Public
Carrefour	France	Cargo Owner	83.3	Public
DNV GL Group AA	Norway	Classification Society	2.5	Nonprofit
American Bureau of Shipping Inc.	USA	Classification Society	0.5	Nonprofit
Nippon Kaiji Kyokai (ClassNK)	Japan	Classification Society	0.2	Nonprofit
Bureau Veritas	France	Classification Society	5.9	Nonprofit
China Classification Society	China	Classification Society	0.2	Nonprofit
Korean Register of Shipping	South Korea	Classification Society	0.1	Nonprofit
Rina S.P.A.	Italy	Classification Society	0.5	Nonprofit

Russian Maritime Register of Shipping	Russia	Classification Society	<0.1	Nonprofit
Indian Register of Shipping	India	Classification Society	<0.1	Nonprofit

Appendix B – Interview Participants

Interviewee	**Role**	**Industry**
Respondent 1	Head of CSR	Large port (EU)
Respondent 2	Director of Operations (Contractor)	Small port (North America)
Respondent 3	Global Sustainability Developer for Supply Chain Operations	Cargo owner/retailer (EU)
Respondent 4	Sustainability Manager	Shipowner/operator (EU). Company also is active in ferry lines, real estate, and retail beyond commercial shipping.
Respondent 5	Director of Communications	Shipowner/operator (EU)
Respondent 6	Global Head of Sustainability	Cargo owner/charterer (EU)
Respondent 7	Head of Corporate Sustainability	Shipowner/operator (EU). Company is also active in port terminal management and land-side logistics services

Appendix C – Sample Interview Questionnaire

Variants of this questionnaire were used for all interviews. Modifications were made to the questions for cargo owners looking at expectations for reporting and data from their shipping supply chain and for non-reporting companies to examine the decision-making process behind deciding not to report. Not all questions were answered.

Purpose
My name is Christian Bakken, and I am a masters' student of Environmental Management and Policy at Lund University. I am writing my thesis on the contents of and rationale for sustainability reporting within the shipping value chain. This specifically includes shipping lines, ports, shipyards, cargo owners, and service providers or lenders to the industry. Sustainability includes in this case both environmental (e.g., climate impact) and social (e.g., human rights) issues. This study differentiates between sustainability reporting and sustainability practice, though I understand motivations for both overlap. Questions here will focus primarily on reporting motivations, as I have reviewed your sustainability report for content beforehand (if publicly available).

Procedures
This interview will consist of a series of questions taking about 30 mins to 45 mins of your time. I may ask follow-up questions on specific points and you are welcome to add insights that are not explicitly requested in the questionnaire. There are no right or wrong answers. If you do not know the answer to any question that is fine. Questions here are primarily to guide discussion and not all may be addressed. There may be follow-up via email on certain points but assume this interview is the extent of your participation in the study.

With your permission, I will record this discussion in order to make sure I have clear documentation of your responses. I can stop the recording at any time if there is something you would like to share off the record.

Ethics
Participation in this interview is completely voluntary. You do not have to agree to participate in this interview and you may decide to stop at any time. The records of this study will be kept private. You will be referred to in the study by your professional role and industry but neither your name nor company will be identified.

Content Questions

Reporting Current Status

- What are the main reasons you report on sustainability?
- How do you prioritize which issues you report on?
- Are there sustainability issues you have considered but decided not to report on? If so, for what reasons?
- How has your company's reporting changed in the last five years (if you have that length of experience at the company)?
- Are you aware if your sustainability report is used by any clients or investors?
- Do you report sustainability data directly to clients beyond the sustainability report?
    - If so, what are the most common issues you report? Are there differences between the data provided in those situations and the data in the report?

- Does your reporting process influence the actions your company takes on sustainability?

Motivating Factors

Stakeholders

- What role do different stakeholders play in influencing your reporting?
    - Which are the stakeholders whose views are the most impactful? How do they communicate their preferences/requirements around sustainability disclosure?
    - Have there been stakeholder requests for sustainability that you were unable to meet? What (if anything) have been the consequences of these?
- Are you a member of any sustainability organizations that influence your reporting process?

Regulations

- Are you required to report on sustainability to meet government or stock exchange mandates?
- Do you report on issues that are not mandated by regulations or by your choice of reporting framework?
    - If so, what issues and why (if not addressed above)?

Business advantages

- Do you believe your sustainability reporting gives you a competitive advantage? In what ways?
- Do you believe sustainability reporting serves a marketing or branding purpose?
    - If yes, can you give an example of a situation where reporting was useful in a marketing purpose?
    - Do marketing considerations play a role in determining what issues are reported on?
- Do you believe your company has benefited financially overall due to sustainability reporting?
    - If so, in what ways?

Other

- Are there any reasons not already discussed that influence your decision-making around sustainability reporting?

Barriers

- What are the main challenges you face in preparing sustainability reporting?
    - Examples: Costs, data, expertise, difficulty meeting regulatory standards
    - Do you have suggestions for how these challenges could be addressed?

Final Remarks

- Do you have any additional points to add?