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Strategic Adaptation of Greek Shipowners under Environmental Pressures: Fleet Investment, Renewal, and Sustainability Challenges

By

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Aknowledgements

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ABSTRACT

The paper is exploring the strategic actions between the Greek shipowners and the restricting environment of existing environmental regulations, including the decarbonization efforts at the IMO as well as the Emissions Trading System (EU ETS) at the European Union level. Based on four semi-structured interviews with managers and executives of major Greek shipping companies, the study comprises a qualitative study of the perception and interpretation of various actor groups and their responses to regulatory pressure. The results indicate a diverse industry, defined by size of the firm, age of the leadership generation, and philosophy on investing. Although some shipowners are defensive and focus on minimizing costs, others are actively turning to ESG frameworks and low-emission tactics as channels of competitive means of differentiation. Strategies selection also includes risk management, choice of the vessel, and the time of investment which are discussed in the work. Regulatory clarification, transitional financial instruments and institutional encouragement in the integration of ESG are among the policy recommendations. The study is concluded with the description of upcoming bifurcations within the sphere of activities and the offers of the further routes of sustainable studies on maritime governance.

Keywords

Greek shipping, environmental regulations, strategic decision-making, ESG, EU ETS, IMO decarbonization, maritime sustainability, investment strategy, risk management, qualitative interviews

1.Introduction

1.1 Background and Context

Shipping is extremely important for the world's trade, as nearly all global trade by volume travels on the water (International Maritime Organization [IMO], 2020). Therefore, it is at the heart of environmental talks about sustainability, stopping climate change and making logistics less carbon-intensive. Lately, increased regulation resulting from agreements at both global and regional levels (such as the Paris Agreement, the European Union's ETS and IMO standards) has led maritime firms to revise their regular procedures and investments (Psaraftis, 2019; Notteboom, Pallis, & Rodrigue, 2021). The merchants who are particularly at the center of this changed situation are Greek shipowners, overseeing a substantial part of the worldwide merchant fleet which corresponds to about 20% of the world's deadweight tonnage (UGS, 2023).

The success of Greek shipowners has come from their flexible ownership models, low running costs and traditional ability to respond to changes (Harlaftis & Theotokas, 2004; Stopford, 2009). Even so, today's environmental regulations bring major changes such as IMO 2020 for sulfur emissions, new energy efficiency targets (EEXI) and soon, carbon intensity indicators (CII), plus local measures such as the FuelEU Maritime (as stated by the European Commission in 2023). These new regulations bring the need for technology changes, switching to different fuels, new fleets and replanned risk procedures, especially in sectors like bulk and tanker shipping, since their margins are unpredictable and their vessels usually last longer (Creswell & Poth, 2018).

Greek shipowners therefore have to deal with two important responsibilities. They have to comply with regulatory changes and remain in the market, while also ensuring profitability and keeping a flexible approach to problems caused by uncertain markets, unpredictable freight rates and changing technology (Gekara & Nguyen, 2020). It gets even more complex when regulations are created at different speeds and markets are not fully prepared. Even though laws to decrease carbon emissions often require quick changes, both ammonia-ready ships, systems that use hydrogen and technologies for carbon capture are not yet ready or available for everyone (Psaraftis, 2019). In addition, companies are changing their strategies due to the growing importance of decarbonization in the shipping sector. Sustainability, environmental details and certifications are now an important part of discussing and selecting vessels for charters and cargo (Notteboom et al., 2021). Access to capital in finance is now often influenced by green criteria such as the Poseidon Principles and the EU guidelines for sustainable investments (Tracy, 2010). In this situation, Greek shipowners must be more than just operators, they have to think strategically and look after compliance, innovation and being competitive over time.

Making this area of strategy more complex are features that are special to Greek shipping. Most companies that Greeks owns and control are family businesses that have small management teams and are led by family members of the original founders (Harlaftis & Theotokas, 2004). This structure can help companies change fast and think ahead, but limits their capability to handle many different policies, spend on new technologies or try new fuel options. Since many ships in Greek fleets come from previous owners, it is taking longer for the sector to update its technology as carbon reduction deadlines become more urgent (Stopford, 2009; Poulsen et al., 2018).

Overall, Greek shipowners have repeatedly shown strong ability to change and grow. A lot of companies are upgrading their vessels, turning their fleets to either use LNG or scrubbers and working together with classification societies and consultants to ensure their compliance (UGS, 2023). Firms and leaders in shipping industries are also joining consortia, public-private projects and pilot schemes about alternative shipping routes and fleet innovation. The urgency and potential from the environmental transition mean that first movers may take greater market share, command higher prices and have a greater say in setting regulations (Notteboom et al., 2021).

Against this situation, this thesis looks at how shipowners in Greece are adjusting to the growing restrictions on the environment. By doing this, it outlines why decisions are made as a result of different regulations, available funds, past experience and what is expected by the market. The goal is to explore not only the strategies employed, but also how Greek maritime entities respond to and interpret regulatory challenges. These responses often depend on whether the regulations are perceived as a risk, an opportunity, or both. In addition, this thesis aims to highlight potential strategies and actionable insights that could assist Greek shipowners in improving their response to environmental and regulatory pressures. Analysis of these concerns with interviews and qualitative research supports both discussion and real-life solutions in the field of maritime logistics.

1.2 Problem Statement

The global shipping industry is being changed dramatically by stricter environmental rules. The upcoming sulfur cap, carbon intensity indicator and the involvement of shipping in the EU

Emissions Trading System (EU ETS) are resulting in new ways of thinking and making decisions for industry players (Psaraftis, 2019; Notteboom, Pallis, & Rodrigue, 2021). For Greek shipowners, who hold a significant control over the merchant fleet, these adjustments mark a significant point: depends on skills such as fleet flexibility, economic efficiency and family management may not be sufficient to compete under new environmental rules.

It is mainly because there is a difference between the regulatory demands and the ability of Greek shipping firms to satisfy them. More involvement with environment regulations calls for replacing most vehicles, changing some vehicles with new tech and using alternative and digitally operated fuel systems (European Commission, 2023). Numerous small to medium-sized Greek shipping companies depend on ageing ships, rather than making large updates to their fleets (Stopford, 2009). This leads to wondering if the traditional strengths of resilience and practicality in the sector survive with the pressures for reducing carbon emissions from around the world.

Furthermore, environmental regulation puts both technical constraints and changes the strategy that competing firms adopt on the market. It is becoming more important to follow the rules to be able to get contracts, funding and better positions in the market. Those involved in shipping are increasingly supporting operators who are environmentally friendly which is changing the whole industry by making it more transparent about emissions and ESG performance (Tracy, 2010; Notteboom et al., 2021). In the modern marketplace, Greek shipowners are expected to have a clear plan for environmental sustainability combined with profits, if they are to keep their relevance.

While these challenges are major, there is not much research that looks at how Greek shipowners view and react to the move toward low-carbon shipping. Most research concentrates on the rules and technologies in the maritime sphere, but rarely examines how decision-makers assess risks and make financial or strategic choices in the context of Greek shipping (Gekara & Nguyen, 2020). Consequently, there remains a major gap in understanding how this crucial segment of the global fleet plans for and adapts to regulatory changes. This study investigates how Greek shipowners are coping with evolving environmental policies, how they interpret the green transition—as risk, opportunity, or both—and what consequences this has on their operational and fleet investment strategies. Importantly, it also evaluates whether these strategic responses are sufficient and adaptive enough, given the fast-changing regulatory and market landscape.

It investigates how Greek shipowners are coping with the new rules about environmental protection. It investigates how these actors judge the green transition and if they treat it as a risk, a chance or both—and the consequences this has on their ship and fleet improvements, adoption of various fuels and ways they follow regulations. To find out about the strategies used by Greek shipping companies, the study talked to key stakeholders using semi-structured interviews.

1.3 Research Objectives and Questions

The central aim of this thesis is to look at how Greek shipowners are adjusting their practices to meet the tough new environmental rules changing the maritime sector. The study tries to understand how the Greek shipping industry determines solutions and future direction by closely observing its investment moves, fleet innovations and sustainability approaches (Psaraftis, 2019; Notteboom, Pallis, & Rodrigue, 2021).

More generally, this research adds to a growing collection of studies that look at how environmental governance relates to corporate strategy within the highly international maritime logistics industry (Tracy, 2010). The example of Greek shipping, due to its worldwide fleet and family businesses, lets us study how age-old members of the maritime community view and enact sustainability rules (Harlaftis & Theotokas, 2004; Gekara & Nguyen, 2020). The results can help people working in education, as well as companies that use this research to adapt their business plans to accommodate the rise of new green standards.

To help with the study, the next objectives are brought forward:

- To find out how Greek shipowners regard the consequences of environmental regulations, including IMO 2020, the Carbon Intensity Indicator (CII) and the EU Emissions Trading System (EU ETS).
- To find out the major considerations influencing the way shipping companies manage selecting vessels, upgrading ship technology, choosing fuels and investing in environmental projects.
- Looking at organizational factors (like firm size, fleet age, ownership structure) to understand how they support Greek shipping companies in dealing with change.
- To analyze if environmental accountability changes in the Greek shipping sector are chosen because they have to be followed or if they are seen as opportunities to improve.

These objectives lead to the main research questions being developed for the thesis.

- RQ1:What strategic actions are Greek shipowners taking because of the new environmental rules in the maritime industry?
- RQ2: What factors influence companies when deciding whether to renew their fleets, adopt new fuel technologies and practice sustainability include what they see outside the company and factors they manage themselves?
- RQ3: What steps do Greek shipping companies take to be profitable, competitive and still focus on making their activities more environmentally friendly?
- RQ4: Do Greek shipowners tend to prioritize compliance, seek new ways of operating or avoid risks and what is common across various company types?

Through qualitative data collection via semi-structured interviews with four typical Greek shipping companies (see Table 1 for their characteristics), these questions aim to obtain both a descriptive and explanatory answer. Rather than focusing on a wide range of topics, the study talked in detail to industry leaders, seeking to uncover the hidden strategic thinking behind different decisions under challenging circumstances in the health sector (Creswell & Poth, 2018; Kvale & Brinkmann, 2015).

The reason for this research is to study present-day shipping and learn how Greeks in the shipping sector view environmental laws: do they see them as holding them back, inspiring progress or something to simply comply with? Having this understanding helps shape better policy decisions, bring different industries together and promote the environmentally friendly development of maritime transport.

Table 1: Profile of the Four Interviewed Shipping Companies

Participant	Size of Fleet	Capital Structure	Market Orientation	Willingness to Take Risks	Technological Assimilation	Interaction with Regulators	Respondent Profile
P1	6–7 small modern feeder & multipurpose vessels	Privately owned	Premium trades, ESG sensitive	Medium–High	Early adoption of green tech	Proactive	Managing Director, mid-40s, second-generation leadership
P2	8–10 Handysize & Supramax	Family-owned	Global tramp (spot)	Low–Medium	Limited retrofits	Reactive	Senior Fleet Manager, early 50s, long tenure in the firm
P3	~12 vessels (regional & short sea)	Family-owned	EU/Non-EU routes	Medium	Selective adoption	Active	Operations Director, late 30s, third-generation
P4	5–7 Handymax	Mixed ownership	Bulk, long-term use	Low	Minimal	Limited	Technical Superintendent, early 60s, nearing retirement

1.4 Scope and Limitations

Shipowners in Greece are a main subject of this study, examined while the regulations related to protecting the environment become more intense. This study contains qualitative analysis by interviewing Greek shipping experts such as executives, fleet managers and officers responsible for sustainability. Most companies in the Greek shipping industry work from Piraeus and Athens, although they often manage ships that sail internationally (Union of Greek Shipowners [UGS], 2023). Environmental regulatory impact (for example, IMO 2020 and CII), investment behaviors and the forming of sustainability-focused strategies are the main themes investigated in this analysis.

Companies in the dry bulk, tanker and container vessel sectors are examined by the research to reflect differences in the rules they have to follow and the ways they operate. Still, the study does not intend to cover every single part of the Greek maritime sector. So, this case study checks in detail how selected firms respond to environmental challenges by looking at their strategic responses (Etikan, Musa, & Alkassim, 2016).

It covers the recent progress made since the IMO 2020 regulations and the quickening steps planned for the future like compliance with FuelEU Maritime and more stringent EU ETS. It sees that the process of decision-making in shipping can cover many years and be influenced by plans for ships, sustainable fuels and lawful compliance (Stopford, 2009). So, the findings describe the current situation in adaptation as well as anticipate future actions and considerations.

Nevertheless, a number of complications temper the ambitious efforts. Since the research is qualitative, not much data can be processed, so the findings cannot be applied to bigger populations. Although the companies chosen cover different fleets, forms of ownership and types of markets, the research cannot speak for the industry as a whole (Guest, Bunce, & Johnson, 2006). Instead of trying to apply results everywhere, qualitative research aims to uncover trends and meanings from what participants share (Creswell & Poth, 2018).

Also, interviews bring a risk of bias because the participants can give certain details to suit their interests and because the way the researcher sees things can shape their conclusions (Fisher, 1993; Berger, 2015). Dealing with this issue happens through reflexive memo writing, gathering secondary data alongside interviews (such as reports and public statements) and anonymizing sources to secure more honest replies (Silverman, 2020; Flick, 2018).

Also, the changing nature of regulations leads to periods where regulations are not in effect. Environmental policies that guide maritime transport can be fast-changing, experience political discussion and use advanced technology. All the positions discussed here reflect what was happening in securities regulation at a particular time, not what is always the case. Shifts in fuel pricing, new rules set by nations or world events might change what this research explores (Psaraftis, 2019; Notteboom et al., 2021).

Technical reviews of vessels, evaluations of emissions and financial modeling of opportunities were not included as part of the study. Instead of focusing on analysis, it looks at these matters based on perception and strategy, making management narratives more important. This cutoff is intended to keep the research close to what interpretivist research aims for, as it tries to understand how shipowners interpret and handle environmental requirements in real organizations (Schwandt, 2014).

All in all, this study looks into Greek shipowners' adjustment to environmental rules using qualitative, perception-based and strategy-based methods. Even though setting these boundaries adds some restrictions, they allow us to learn more about the influences and factors that guide decisions at sea for sustainability.

1.5 Structure of the Thesis

This research consists of five main chapters that together describe how Greek shipowners prepare for more environmentally friendly shipping. A flow is established by starting with context, proceeding to evidence and finishing with analysis.

This opening chapter provides the background information, gives the main research problem and states the aims and key research questions. It also defines the boundaries for the investigation and for the approaches and themes it will use.

Chapter 2 merges what has been published by other scholars and by businesses in the fields of maritime sustainability, investment and Greek shipping. It discusses evolving rules around the world (IMO, EU ETS), the latest technological advances in ships and their power sources and Greece's long history in shipping. An aim is to place the study among current and future scholarly and practical talks.

Chapter 3 details the way the research was conducted, including the reasons for relying on qualitative methods and semi-structured interviews. It explains the way respondents are selected, how answers are collected, the analysis tools that will be used (e.g., thematic analysis) and what ethical rules exist. In addition, it presents the interpretivist basis for how the research is conducted.

In Chapter 4, it is shown and explained the results of the empirical study. It investigates the approaches Greek shipowners use when making decisions, investing and thinking about strategies due to environmental issues. Certain findings are interpreted alongside research findings, focusing on trends, group differences and strategies.

Chapter 5 draws together the most important points and reviews their meanings for theories, practical uses and public policy. It suggests approaches for Greek shipping businesses and suggests topics for study, mainly on whether the current adaptation ways will work well over time in a fast-changing regulatory climate.

Therefore, the thesis aims to give a thorough, data-based and evidence-informed picture of how one of the main shipping communities is handling climate change in travel by sea.

2. Literature Review

The current chapter provides the overview of the existing academia discourse and policy background that led to the current policy governing the strategy of Greek shipowners due to the rapid evolution of environmental regulation. Four thematic parts are used to group the material. The introductory part discusses the major sustainability trends and maritime regulations that include IMO 2020, the Carbon Intensity (CII) Indicator, and the European Union Emission Trading Scheme (EU ETS). The second part proposes a questioning of investment behaviour in the shipping industry with managerial decision-making under the predicament. Section three takes into account the strategies of vessels choice and the implementation of technological advances connected with it under the influence of environmental and market conditions. The fourth and last section will make an empirical frame of the Greek shipping industry focusing on its historic development and strategic background. All these analyses provide the conceptual skeleton to the interpretation of the empirical data discussed in the following chapters.

2.1 Global Sustainability Trends and Maritime Regulations (IMO, EU ETS, etc.)

Over the past few decades, the issue of climate change and harming the environment has brought about changes in regulations, with a major emphasis placed on maritime transport because it contributes almost a third of all global greenhouse gas (GHG) emissions. While the transport of freight by ship saves a lot of energy, it is responsible for about 2–3% of global CO_2 emissions (IMO, 2020) which is similar to some major countries' total emissions. Because of this, various international and regional institutions have put in place a collection of regulations directed at making maritime activities match the broader sustainability ambitions described in global frameworks, including the Paris Agreement.

The International Maritime Organization (IMO) which is part of the United Nations, is chiefly responsible for shipping regulation. In 2018, the IMO introduced its first GHG strategy aimed at reducing the total GHG emissions from shipping by at least 50% by 2050 compared to 2008 values and attempts to phase them out entirely before the century ends (IMO, 2018). This goal is made possible by the IMO by using a mix of technological and market regulations. The Energy Efficiency Design Index (EEDI) for new ships, the Ship Energy Efficiency Management Plan (SEEMP) and the more recent Carbon Intensity Indicator (CII) and Energy Efficiency Existing Ship Index (EEXI), are some of the most important ones, starting in January 2023 as stated by Psaraftis (2019).

They play a major role in changing the landscape by asking for more attention on shipping carbon emissions and better energy efficiency. This regulation covers older vessels, not just new ones and this is why ship operators need to consider refitting, slow steaming, digital monitoring and in a few cases, removing vessels from service ahead of time (Notteboom, Pallis, & Rodrigue, 2021). For shipowners who manage older fleets in Greece which is common, the safety upgrades may lead to much higher costs, compared to the value of those ships (Stopford, 2009).

At the same time as IMO moves, the European Union has adopted its own climate measures for the maritime sector. It was a significant decision for shipping to be included in the EU Emissions Trading System (EU ETS) and it is due to be implemented fully in 2024. This means that companies involved in shipping in EU waters must purchase and give up emission allowances depending on the CO_2 from trips to, from and in EU ports (European Commission, 2023). Companies have to pay extra for carbon which encourages them to choose cleaner technology to save money. This new policy, FuelEU Maritime, requires ships to use greater amounts of eco-friendlier fuels which helps move the sector toward more sustainable practices (Transport & Environment, 2022).

Such shared governance structures which contain both IMO and the EU regulations, mean shipowners face both unified and sometimes differing rules and requirements. The lack of consistent regulations is a major challenge since different areas may set their own deadlines, record-keeping rules and requirements for success (Psaraftis, 2019). The coexistence of global and regional regulatory frameworks—such as IMO measures and the EU ETS—introduces significant complexity for shipowners. Variations in deadlines, enforcement mechanisms, and emissions targets across jurisdictions hinder the predictability of compliance planning (Psaraftis, 2019). This regulatory fragmentation often reduces investor confidence and leads shipowners to adopt cautious or delayed strategies, particularly when navigating cross-regional operations. Critically, this lack of harmonization may unintentionally disadvantage smaller or more globally diversified operators, who must allocate resources toward managing multiple compliance systems simultaneously. For example, a vessel operating both within and outside EU waters may face two distinct carbon pricing schemes, distorting competitive neutrality.

For Greek shipowners, who operate substantial tonnage in international trade routes, such fragmentation complicates investment in new technologies and fuels. Strategic uncertainty about which regulations will prevail in the long run may delay commitments to alternative propulsion systems or decarbonization pathways, thereby impacting long-term competitiveness.

Simultaneously such trends indicate the changing approach to sustainability in the maritime logistics sector. Participation in environmental programs is seen by business partners as shaping decisions for vessel contracts, insurance rates, loans and port privileges. Some important financial organizations have adopted the Poseidon Principles which attach the emissions of vessels to the level of risk in maritime lending (Global Maritime Forum, 2021). Cargo owners and shippers are also asking for information about emissions and certifications, showing that ESG priorities are spreading in the supply chain (Tracy, 2010; Notteboom et al., 2021).

Technological progress shapes and progresses regulatory changes at the same time. Companies are investigating alternatives to fuel like LPG, biofuels, green methanol and ammonia and at the same time, they invest in systems such as air lubrication, hybrid battery systems with diesel motors, wind power for ships and carbon capture. On the other hand, technological advancements have not been consistent and a lot of these projects are struggling with issues like scaling up, lack of infrastructure, training staff and emissions analysis (Psaraftis, 2019). Because of this landscape, it is very difficult for shipowners to plan their strategies, especially those operating in tough or underserved markets.

For the Greek shipping industry, these have caused both problems and opened up new opportunities. On one side, fulfilling new rules can make it hard for older ships and old ways of operating to stay economically sound. However, the long tradition of entrepreneurial thinking in Greek shipping which places importance on flexible, prompt actions and careful risk management, could help select businesses lead the way to profit from opportunities related to new clean fuels, environmentally friendly finance and new rounds of digital fleet efficiency (Harlaftis & Theotokas, 2004; Gekara & Nguyen, 2020).

In general, trends in sustainability around the world and maritime laws are having a major impact on the economics, technology and management of shipping across countries. The way shipowners react to these changing rules will decide their ability to remain compliant and still remain competitive in a global economy moving to decarbonization.

2.2 Investment Behavior in Shipping

Shipping businesses have to deal with complex rules, risks and think ahead for years before making investments. Shipping organizations frequently find themselves in an unpredictable market, with large capital requirements and long life cycles for their assets which make choices about how to allocate their money both vital and risky (Stopford, 2009). Because the sector works closely with environmental rules and the drive to be sustainable, investment plans now need to cover the costs linked to emission management, fuel development and following policies (Psaraftis, 2019; Notteboom, Pallis, & Rodrigue, 2021).

Shipping cycle theory and other conventional investment approaches believe that decisions about purchasing vessels, hiring charters and building a fleet are highly tied to fluctuations in freight rates and assumptions of periodic recovery (Stopford, 2009). Following this logic, Greek shipowners have grown successful by buying low and selling high which is why they duplicate their purchases of used vessels several times over a period (Harlaftis & Theotokas, 2004). But this model is being tested by the growing role of rules shaped by the environment which force businesses to spend money without considering the demands of the market (Psaraftis, 2019).

Now that sustainability is legally required and mentioned in business agreements, many investors are looking at companies' green performance. It means that besides economic choices, shipowners must adjust their institutions to comply with regulators, charterers, financiers and social norms related to the environment. Nowadays, green or ESG-centered funds for the industry are not only given out based on a company's emissions, replacements of their fleet and how openly they report their environmental actions (Global Maritime Forum, 2021). The recent trend in the shipping industry in the modern sea operations has necessitated the shift in the choice of shipping vessels not only restricted to economic performance. Rather, these decisions are being made more and more on the basis of how well they meet standards with regards to emissions and how environmentally efficient they are. The new ship must therefore not only demonstrate the reliability of its operations but should also be in tandem with the future regulation systems and sustainability standards.

The emergence of new fuel technologies that are still in its formative stage has made new investment decisions even more complex as their growth process is not very clear. Although liquefied natural gas (LNG), ammonia, and methanol are commonly touted as feasible alternatives, none of them has become a universally safe alternative as infrastructural coverage, including in developing countries and the safety provisions, as well as fuel supply, is still inadequate (Transport & Environment, 2022).

It is also notable that environmental conformity and economic payoff meet. A lack of meeting the future levels of carbon intensity and emission can also trigger financial costs, limited market access, or reputational reasons. This has resulted in charterers and logistics partners already preferring environmentally certified fleets and consequently, environmental sustainability is a condition of sustained profitability in the maritime transport sector (Global Maritime Forum, 2021).Decisions about shipping investments are now more uncertain because the field involves many developing technologies. Although LNG, ammonia and methanol are being suggested as future or transitional answers, at this point none is reliable for everyone. Since the infrastructure, safety measures and rules for new fuels are not well developed at the global level, making long-term promises carries a lot of risk (Transport & Environment, 2022). Because of this, numerous shipowners decide not to invest in new technology until the technology or rules are more certain. As a consequence of construction or equipment changes, this issue is called investment hesitation: if something is built or altered for a certain fuel, it is hard and costly to switch to another fuel, often requiring technology-heavy changes (Psaraftis, 2019). In the shipping sector, Roeland (2024) notes that the trend is even stronger and stems directly out of uncertainty over what kind of future fuel standards they will be obligated to meet and where the required global supply network will be available to accommodate new fuel forms like ammonia or methanol. These outcomes emphasize the fact that investment inertia is not only an issue of fiscal concern but a determinate strategy that is determined by regulatory fragmentation and an exaggerated sense of risk.

In Greece, how people invest is also influenced by how ownership is organized and what the culture values. The fact that most Greek shipping companies are built by families, without plans for IPOs, supports long-term planning but may make it difficult for them to access significant capital from large banks or form major research collaborations (Gekara & Nguyen, 2020). At the same time, being able to decide independently helps Greek shipowners take advantage of fresh opportunities such as cut-price vessel purchases or environmental subsidies (Harlaftis & Theotokas, 2004). But this open approach could also cause the investment sector to become fragmented, with different companies making very different decisions about adopting sustainable practices (Creswell & Poth, 2018).

A recent study suggests that shipowners now fall into two groups: those who are actively investing in sustainability as it brings them new ideas and an advantage in the market and those who prefer to follow the rules but not invest further (Notteboom et al., 2021). The way this works is affected by financial status, organizational size and how management sees risks, regulation and the future market development. A firm that thinks tougher environmental regulations are coming will buy the technology earlier, even if it costs more, in contrast to a firm that doubts the need for such policies. An opposition between active environmental investors and compliant minimalists found in the shipping business exists across business. The willingness to use the electric vehicle (EV) platform at an early stage granted some firms a regulatory and reputation benefit, but others postponed this move because of the risk-aversion factor and the fear of sunk costs before the industry accepted such changes (Bohnsack, Pinkse,

& Kolk, 2014). Similar situations arose in the energy industry as utilities contemplated the extent to which it would invest in renewable sources of energy in unstable subsidy systems and carbon pricing systems (Rogge & Reichardt, 2016). These cases prove that regulatory anticipation and organizational learning and perceived legitimacy form cross-sectoral growths of sustainability-driven investment, so they are equally applicable to the Greek shipping companies. In the Greek shipping industry, it is observed that concentrated ownership structure and idiosyncratic governance structure compound behavioral separations. Risk aversion is highly probable when the operational authority is located within inner circle of the principals and the management is casual rather than formal. In this situation, external indicators, above all policy directives and market demand to environmental, social, and governance (ESG) compliances are often underestimated. This has as a result worried firms on their defensive stance at risk of being marginalized in high value charter segments that are environmental friendly.

Investment behaviors in the shipping industry have been explored by behavioral economics which now highlights issues such as limited thinking, wariness toward risk and irrational biases. These executives, along with people who drive the economy, operate with imperfect knowledge, are guided by prior experience, common messages in their industry and how their peers behave (Berger, 2015). So, sticking too closely to past routines and traditional models might delay companies from reacting to new environmental demands, even as financial reasons for adopting sustainability get clearer.

Simply put, the way people and firms handle investment in the shipping market has changed from merely following the market cycle toward managing changes brought by rules, technological progress, stakeholder expectations and unique company strategies. Major changes in the shipping industry are challenging the usual practices of Greek shipowners and asking them to show strategic flexibility. Choices made now such as retrofitting, dual-fuel newbuilds or joint efforts in green projects, will guide whether the sector remains strong and relevant in the maritime economy of the future. The modern transformation of the shipping industry is also forcing the Greek shipowner to rethink traditional paradigms of operations and to develop strategic flexibility as a new competence that is often considered a key to coping with uncertainties in respect to both decarbonization pathways and regulatory alignment (Poulsen, Ponte, & Sornn-Friese, 2018). The choices that are made right now will be what defines how well or in how fast the industry will remain relevant in the maritime economy of tomorrow either through retrofitting its current vessels or through the introduction of dual-fuel new builds or through green-tech development efforts.

2.3 Vessel Selection and Technological Innovation

Figuring out which types of vessels and the best technological setups is now a key strategy for owners as the global push for greener solutions shapes both the rules and marketplace. Vessels were chosen in the past mainly to suit the needs of the voyage, the type of cargo involved and the conditions of the freight market. These days, making ships long-term viable, in compliance and competitive depends on ship design, the fuel chosen and the technologies used to cut emissions (Stopford, 2009; Notteboom, Pallis, & Rodrigue, 2021).

Key to this trend is that environmental performance has become an important factor in making decisions about both buying new ships and upgrading existing ones. Vessels must meet certain criteria when the IMO's Energy Efficiency Existing Ship Index (EEXI) and the Carbon Intensity Indicator (CII) come into effect which can influence their use and value in the market (IMO, 2020). Ships not rated well may end up with strictly limited functions, retired early from service or unable to get requested charters from clients. This means that the choice of vessels now requires careful strategic thinking and depends on long-term forecasting and risk management (Psaraftis, 2019).

Today, shipowners have to choose from a wide variety of technological solutions and each option comes with distinct charges, rules to follow and system requirements. Some of the most commonly chosen eco-friendly methods are dual-fuel engines (for example, LNG-capable), systems that use air as a lubricant, cleaning systems for exhaust gas (also called scrubbers), battery electric systems and wind-assisted power. Certain shipyards are now constructing ships that are already set up for either ammonia or methanol, in case these fuels become available on a large scale (Transport & Environment, 2022). Such decisions can make things easier for owners, but they can also cost more and be more complicated to run, mainly for those who manage smaller and medium businesses.

For Greek shipowners, choosing ships is often affected by trying to save money and seize opportunities in the market, following how much the industry has grown to prefer buying vessels that were used before (Harlaftis & Theotokas, 2004). Before, this approach was affordable, but facing the latest decarbonization goals, there is a call for up-to-date ships that comply with future emission limits. Adapting old ships for EEXI and CII is often challenging technically and expensive, especially if the vessel has little remaining service life (Gekara & Nguyen, 2020).

Also, the choice of fuel sources for vessels is now shaped more by what alternatives are available and their price trajectories. Because LNG produces less SOx and NOx, it has become a favored transitional fuel, but its long-term impact is debated because of methane slip

(Psaraftis, 2019). Although green methanol, bio-LNG and ammonia could be valuable for zero or near-zero carbon operations, there are problems with providing enough supply, how much energy they produce, how safe crew members are and converting current vessels. Because of their careful approach, Greek shipowners often keep important fuel decisions on hold until there is stronger agreement among countries, smooth rollout of new infrastructure and clarity that the market would accept the change (Creswell & Poth, 2018).

Technological changes are focused on more than the power source. Having smart ship systems and moving to digitalization is now key for both safe operations and less harm to the environment. Monitoring the hull, optimizing fuel use, predicting when maintenance is needed and smart planning of vessel routes are being used to achieve CII benchmarks and reduce emissions in real time. Although diversified shipping companies may join forces with technology companies, many Greek firms prefer modular solutions that adjust to their old platforms (Global Maritime Forum, 2021).

External stakeholders' expectations have a big effect on how vessels are selected. Both charterers and cargo owners select greener vessels to match their ESG goals and financial institutions are adding terms for fleet decarbonization based on the Poseidon Principles (Tracy, 2010). It makes companies want to pick vessels that are both up to the technical standard and show a readiness for future regulations and expectations.

As a result, the decision process is now riskier and filled with gaps, so choosing vessels depends on many swiftly developing regulatory, technical and public image factors besides simple commercial needs. Therefore, shipowners are required to predict what technologies will be accepted, regarded and supported as the next cycle of rules is put forward. This increases the need for Greek shipowners to reflect on whether it is better for them to be top performers in maritime decarbonization, match the competitors or take a more conservative approach.

In the end, finding the right vessels and embracing new technologies play central roles in making smart maritime investments. Because of the combination of regulations, available technology, uncertain fuel sources and demands from stakeholders, the shipping industry in Greece has to adjust the strategies it used for assets. Such decisions will affect both how companies comply and where they stand in the future when shipping is carbon constrained.

2.4 The Greek Shipping Sector: Current Profile and Strategic Legacy

Within the shipping industry, Greece plays a very important role around the world. Greek shipowners currently control around 20% of the world's DWT and close to 60% of the fleet capacity within the European Union (as reported by the Union of Greek Shipowners [UGS], 2023). This broad impact is possible because of a special business culture, the firm's long history and how well it reacts to market signals, not only due to location or how large the fleet is (Harlaftis & Theotokas, 2004).

Its presence in trading nations, combined with dynastic family control, has been a main factor behind Greek shipping's strong performance worldwide (Harlaftis, 2014). Shipping firms in Greece are often not influenced by stock market trends, so they are able to arrange their timings, use assets and give back through investments as and when there are changes in the market (Stopford, 2009). Also, a number of international shipping companies' organizational systems which may feature locations offshore and favorite flag registers, have helped them lower their labor and regulatory costs, as well as avoid much taxation (Gekara & Nguyen, 2020).

Strategically, those who own Greek shipping fleets prefer to purchase vessels when the opportunity is right, mainly in the second-hand industry. Their success has been supported by finding their way through freight market ups and downs, purchasing discounted assets and using cost reduction and limited loans to keep them profitable (Harlaftis & Theotokas, 2004). Because of this model, Greek owners have been able to stay strong and even add more ships when the market improves, allowing them to remain important in dry bulk, oil tanker and gas carrier areas (Vroomans et al., 2023).

Still, this traditional approach is now being questioned by new environmental rules and the need for big changes in technology. As a result of the IMO's CII, EEXI and the EU ETS, plus other measures, the industry now faces additional risk that cannot be handled only by adjusting fleet timing or working on operating costs (Psaraftis, 2019; European Commission, 2023). In fact, effective compliance means spending on new technologies, efficient IT and green financing, since existing models are not useful here.

Although there are hurdles, the Greek shipping industry is now making changes. Big companies in the shipping industry are ordering new LNG vessels, taking part in green corridor projects and turning to smart systems for fuel economy and emission measurements (Global Maritime Forum, 2021). Certain firms are working with classification societies and financial institutions so they can meet and apply to the Poseidon Principles and the Sustainable Shipping Initiative. On the other hand such initiatives have not been established everywhere. The gap between those who innovate and those who use traditional practices is still present and a large number of medium- and small-sized companies take a wait-and-see approach instead of acting on changes (Notteboom, Pallis, & Rodrigue, 2021).

There is further difficulty because regulations are not always the same between countries. Even though IMO standards are worldwide, the EU puts in place regional measures such as the EU ETS and FuelEU Maritime that make companies comply differently based on their routes and where they operate (Psaraftis, 2019). Since a lot of Greek shipping firms operate worldwide, they have to respond to different regional laws while also maintaining flexibility in a changing global regulatory climate.

Pragmatism in running companies is another strong trait in Greek shipping which mostly depends on practical skills and experience instead of business plans (Harlaftis & Theotokas, 2004). Usually, one person or a small group (the family or the executive) handles the decision-making. Even though this is convenient and allows flexibility, it can make it hard for institutions to deal with changes that involve different fields like environmental science, digital technologies and capital markets (Creswell & Poth, 2018). Because shipping is so important to Greece, people there work hard to keep and update their shipping industries when facing challenges.

The government of Greece has traditionally supported shipping by creating friendly laws and by lobbying for the sector in international meetings. Its achievements in the economy, especially in creating jobs, earning foreign exchange and providing services, have helped tourism gain a strong political position (UGS, 2023). As environmental policy gains importance in the EU, Greek stakeholders are more and more involved in shaping how to introduce decarbonization rules and monitor their implementation, paying attention to technical concerns, fleet size and staying competitive on the world market.

Simply put, the Greek shipping industry can be described as conservatively strategic and dynamically adaptive. It is coming under pressure because its model opens it to strict environmental rules and changes in current technology. Nonetheless, thanks to its knowledge networks, strong financies and entrepreneurial spirit, it is well placed to lead, as long as its investment strategy, approach to rules and attitude to technology are updated to face the upcoming changes.

3.Methodology

3.1 Research Design

The design of the research in this thesis utilizes a qualitative exploratory perspective in order to understand how Greek ship owners escape the consequences of ever rising environmental regulations by strategic investment and fleet planning. Due to the complexity and contextual character of these choices (typically bearing the imprint of institutional orders as well as firm capacities), a qualitative research design was considered aptest to uniquely project the specific perceptions of important decision-makers in the Greek shipping industry. This design allows to observe more than what is decided: how and why those decisions are arrived at in the current regulatory and operational environment.

The qualitative approach ranks high in examining phenomena in which theoretical underpinnings are just developing or where earlier literature has little to offer on localized reactions (Creswell & Poth, 2018). They are faced with a situation where the decision-making structure for the Greek ship owners who often have strong family ownership and informal networks, and long term experiential knowledge, traditional quantitative methods will possibly not uncover the rich detail and diversity of strategic reasoning (Tsoukas, 201 The qualitative design therefore lets the research keep open to rich and diverse experiences of shipping firms when they are responding to the changes in expectations in the environment and market conditions.

The present research is organized according to case-informed strategy wherein the semi-structured interviews with the exponents of Greek shipping companies' executives and managers will be used as the main data source. The research aims to discover by directly interacting with industry professionals, the lived experiences and rationales behind investment decisions, and operational adjustments, especially up against regulations like IMO 2020, the EU's Emissions Trading System (EU ETS), and forthcoming indicators of carbon intensity These are both a regulatory threat and a strategic opportunity and the research design is aimed at understanding how shipowners understand and come to terms with this duality (Notteboom et al., 2021).

The research design is based in the interpretivism, a philosophical paradigm stressing the role of subjective meaning-making in social research. The interpretivist methodologies permit exploring phenomena from the perspective of people dealing with them as recognizing that reality is co-constructed by individual perceptions, cultural norms, and institution constraints (Schwandt, 2014). This way of knowing fits the maritime environment, in which decisions are not often made by sacrificing rational models to intuition, precedent, and emergent but to a mixture of all.

Additionally the study is longitudinal, in terms of it examines how Greek shipping companies have responded historically to changing environmental concerns. Capturing insights about historic and current decision making patterns, the research can access trends and predict future strategies. Temporal considerations are especially pertinent because while shipping offers the very long horizons that characterize much of the industry, fleet renewal and vessel selection decisions typically have multi-decade horizons and must respond to uncertain future regulatory developments (Stopford, 2009).

Finally, although the main approach gained is qualitative, supporting industry data will be included at appropriate places e.g. fleet age profile, emission records or capital investment measures to triangulate results and strengthen findings. This practical convergence of qualitative insight with sectoral indicators increases the credibility and transferability of the study's results (Yin, 2018).

In conclusion, the research design follows a qualitative, interpretivist, and exploratory paradigm shifting from more breadth-like approaches to focus more on depth and the desire to capture the strategic thinking of Greek shipowners within a radically changing regulatory context. The mixture of semi-structured interviews, contextual understanding and longitudinal vision is expected to offer a play by play account of how the Greek shipping industry prepares for long-term competitiveness in the age of environmental accountability.

3.2 Qualitative Method: Semi-structured Interviews

The dominant methodological instrument of choice in this research is the techniques of semi-structured interviewing which provides a flexible yet focused technique for collecting rich complex qualitative data from the key stakeholders in the Greek shipping industry. Semi structured interviews can be used to elicit themes previously known and emerging ideas that surface during conversation with the participants. Such an approach applies particularly well to maritime studies aimed at untangling complex decision-making processes based on practical experience, strategic thinking, and the contextual interpretation (Kvale & Brinkmann, 2015).

Unlike structured interviews or quantitative surveys, semi structured interviews allow the researcher to be flexible enough to lead the respondent by both the expertise and interests of the interviewee. This flexibility is especially necessary in such industry as shipping where strategic choices of each firm may depend on a specific compendium of historical legacy, ownership structure, risk appetite, market orientation, and access to capital (Harlaftis &

Theotokas, 2004). Greek shipowners among others tend to work through family owned, non-listed enterprises where long-term tradition, trust-based management and tacit knowledge intergenerational are deeply embedded. No methodology would be able to capture such multi-faceted dimensions unless it allows for the associations of depth and nuance that semi-structured interviews would easily elicit (Rubin & Rubin, 2012).

The semi-structured nature of the research allows the researcher to probe deep into both the visible elements of maritime operations (ship type preferences, fuel technology adoption or conformity with regulations) and invisible elements (learning forethought, environmental attitudes or perceptions of future risk). Through firsthand conversations with executives and senior managers, the interviews reveal how leading actors frame the changing sustainability agenda and what options they envision as viable or optimal following a change in the rules, including the IMO's Carbon Intensity Indicator (CII) and the European Union's F

This method makes it also possible to explore how shipowners read global environmental frameworks and whether they see them as opportunities for innovation or as external challenges to profitability and operational autonomy. Considering that much of the sustainability compliance involves large scale capital investment and long term commitment, semi-structured interviews offer researchers a real time basis to understand the trade off's, constraint, and strategic dilemma's of decision afflicted. This supports the interpretivist epistemological position of the thesis which identifies that the subjective interpretation of the world as the construction of meaning and not merely observation from a distance (Lincoln, Lynham, & Guba, 2011).

Interview questions are built with reference to the same but left open ended to enable participants to give room to what they consider important. For instance, the participants are prompted to consider past fleet renewal choices and present plans for decarbonization, as well as future trends involving vessel option. Follow-up questions are employed to clarify or add to important points and as such increase the depth and the genuineness of data gathered. The interviews are audiotaped with the permission of the participants after which they are transcribed for thematic analysis to ensure that the empirical insights are based in real language and situation, and not through strict categorical filters (Silverman, 2020).

Another benefit of semi-structured interviews is also their ability to establish rapport and trust, which is essential when handling a close-knit, and most of the time discreet industry such as the Greek shipping. There is a need for the researcher to be able to develop credibility, convey the sense of familiarity with the maritime domain and, so, avoid response bias. This degree of participation enables the study not only to record discernible patterns but also derive the implicated rationales and strategic reason for actions.

In sum, resort to semi-structured interviews as the primary qualitative method is justified by the necessity to enter into the complex, often tacit, decision-making landscapes of Greek shipowners while struggling with environmental and regulatory pressures. This approach gives scope to be responsive to different points of view, the complexity of which to grapple with, and the interpretive richness required to grasp the changing maritime world in those creating it. To ensure methodological transparency, the semi-structured interviews were guided by a predefined interview protocol, which included the full list of questions used during the data collection process (see Appendix A for details).

3.3 Sample Selection and Company Profiles

The process of selecting the sample for this research was guided by the fact that there is need to collect meaningful information from people who have direct knowledge about fleet management, investment strategy and regulatory compliance in this industry within the Greece. The sampling procedure used was purposive with special interest in maritime companies that operate in international markets where their business is highly affected by recent and upcoming environmental regulations. One is the purposeful sampling, also called judgmental or criterion-based sampling which is commonly used in qualitative research to guarantee that the participants have information relevance towards the study's key queries (Patton, 2015).

In the context of this research, the chosen participants are high-level executives or senior managers in Greek-owned shipping concerns, such as: Fleet managers, technical directors, environmental compliance officers and commercial strategy advisors. These are best placed to debate such internal dynamics of vessel acquisitions and retrofitting choices, plan investment horizon agenda, and respond to regulatory change, like the IMO 2023 CI measures, or imminent EU ETS inclusion of maritime. According to Etikan, Musa and Alkassim (2016) purposive sampling also allows the researcher to tap into the very population whose experience directly touches on the research themes; a mechanism that enriches and validates the gathered qualitative data.

The composition of companies chosen to participate was also guided by an interest in representing a spectrum of operational models and types of vessels within the Greek shipping universe. Since a few years, Greek shipowning controls about 20% of the world's total tonnage, with significant deep involvement in the dry bulk, tanker and container sectors (Union of Greek Shipowners [UGS], 2023). Consistent with these subsectors, the sample has firms representing all these subsectors to ensure that the study factors in sectoral variations in regard to regulatory exposure, technological adoption, and strategic planning.

Attempts were made to involve massive internationally diversified shipping companies and smaller family oriented firms in order to capture the heterogeneity which prevails within the Greek Shipping industry. Greater enterprises are sometimes characterized by more organized decision making systems, professionalized managements, and green financing tools or collaborative research ventures. On the contrary, small firms can heavily rely more on experiential knowledge, personalized leadership and conservative investment procedures. This broad variation in the profile of companies studied facilitates comparison of responses in terms of the various organizational frameworks and scale thereby further enriching the overall study (Stopford, 2009).

In geographical terms, most of the companies interviewed are based in Athens and Piraeus (the traditional maritime centers of Greece) where clusters of ship management, legal, insurance and classification societies have settled. Not only was this location logistically favorable for researcher, but also continues to find a seeming empirical reflection in Greek maritime practices still heavily concentrated in such urban and port zones (Gekara & Nguyen, 2020). Furthermore, the sample was designed to represent firms that own or manage vessels of different ages because age of the fleet and preparedness to technology are key variables for studying vulnerability to environmental regulation and viability of decarbonization strategies.

Through the industry network, academic contacts and through publicly available registries (Equasis and Clarkson's Research), an initial list of potential participants was created. Ethical clearance, development of relevant informed consent materials as well as contacting the targeted firms and inviting them to participate in confidential, semi-structured interview is what researcher did after. The number of participants obtained will thus depend on availability and response (Guest, Bunce, & Johnson, 2006); however, ideally, this will be thematic saturation – the point at which further interviews will not provide significantly new insights (Guest, Bunce, & Johnson,

In sum, the sample selection process adopted purposeful strategy to reflect diversity, as regards size of firms, sectors and strategic orientation, while retaining focus on relevance to study's basic research questions. The selected firms and participants are ideally placed to provide grounded insider insights on the way that the Greek shipping industry is adapting to environment pressures by strategic investment and fleet adaptation. The rigor of the methodology feasible for selection of the sample strengthens the credibility and versatility of the finding through the wider range of Greek maritime operations.

3.4 Data Collection and Processing

The process of the data collection for this research was organized with the view to obtaining rich, contextually located qualitative information from the decision-makers in Greek shipping sector. Since the study is informed by a qualitative methodology with interpretivist leanings, the major method for data collection was semistructured interviews with selected respondents from Greek-owned maritime enterprises. The interviews were meant to generate descriptive accounts of specific strategic responses of these companies to changing environmental regulations and pressures for sustainability. Conformity to best practices in qualitative inquiry design made the interviews open concerning topic elaboration by participants on elements being relevant to experience or strategic emphasis (Creswell & Poth, 2018).

Interviews were made after initial contact via email and telephone and the researcher presented information sheet and consent form explaining the purpose of the study, its voluntary nature and confidentiality. After securing consent, interviews were arranged at the convenient times of the participants and carried out face to face, or over secure online platforms, depending on logistical factors and preferences of the participating students. Each interview lasted 45-75 min and took place in English or Greek depending on the language that was more convenient for the interviewee. Within this semi-structured format, however, it was possible to arrive at a consistent core set of questions to be explored in all the participants while still allowing for follow-up questions and digressions which might reveal novel themes or perspectives (Kvale & Brinkmann, 2015).

All interviews were audio recorded with the permission of the participants. Making these recordings allowed the researcher to remain fully focused on the conversation without taking extensive notes, which promoted a more natural flow and uninterrupted discussion. During each session, the recordings were transcribed verbatim to enable an in-depth thematic analysis. Manual transcription was conducted by the researcher to ensure accuracy and closeness to the data, while any identifiable information was anonymized to safeguard the confidentiality of both participants and their organizations.

The recordings and verbatim transcripts are treated as strictly confidential and are therefore not included in this thesis. Access to the transcripts has been granted only to the researcher and the academic supervisor upon request. All participants signed an informed consent form prior to the interviews (see Appendix B), and although the names of the respondents are known to the supervisor, they have been fully anonymized in the presentation of the results. Verbatim transcription not only guarantees fidelity to participants' voices but also supports refined coding and interpretation during subsequent analysis (Silverman, 2020).

The processing of data related to interviews has been conducted in a systematic way (thematic analysis), a method frequently encountered in qualitative research for finding patterns within data (Braun & Clarke, 2006). Following transcription each interview transcript was read several times to increase familiarity and initial efforts at detecting recurrent ideas or emergent categories. The first level coding process entailed a process of labeling chunks of text with short phrases or keywords with concepts representing critical themes of strategic investment decisions, regulatory interpretations, fleet renewal rationale, and decarbonization problems. This initial coding was then aggregated into broader groups of codes, reflecting the research questions as well as the theoretical underpinnings of the research.

During the coding and classification of the data, NVivo software was applied to help in structuring and collection of data. Although modal analysis (analysis based on interpretation) eventually depends on the investigator's interpretive skill, digital tools, like NVivo allow for more expeditious sorting, probing, and comparison of themes across several interviews (Woolf and Silver, 2017). The software was especially useful in illustrating frequency and co-occurrence of codes that revealed dominant narratives and deviations from company perspectives.

In order to add analytical rigor in the study the researcher used the process of constant comparison to compare themes emerging from one transcript to the other to establish commonalities and contradictions. This iterative comparison heightened the credibility of the findings and facilitated the rise of well supported conclusions based on the participants' collective experiences. Triangulation was also done by applying supplementary data sources including company sustainability reports, regulatory announcements and industry white papers, which helped to give contextual positioning and external verification of patterns emerging from the interview data (Flick, 2018).

In addition to that, during data collection and analysis, reflective memos were maintained. These memos became a place for the researcher to jot down impressions, tasks, and likely bias' that could taint interpretation. This habit is consistent with qualitative research traditions that take reflexivity as an approach for increasing transparency and analytic richness (Lincoln et al, 2011). In documenting the emergence of analytical insights, such memos fulfilled the need to provide a coherent narrative that connects empirical observations with the larger implications of the study in terms of both theory and policy.

Finally, the data collection and processing stages of this research were deliberately designed to maximize reliability, richness, and context relevance of the information obtained. Based on semi-structured interviews, systematic transcription, thematic coding, and analytical triangulation, the study has in place a solid basis for explaining the degree to which Greek shipowners are adapting to the complex and dynamic pressures of sustainability in the global maritime industry.

3.5 Ethical Considerations and Research Limitations

Ethical considerations are of paramount importance in qualitative research, particularly when engaging with industry professionals on topics that involve strategic decision-making, commercial sensitivities, and potentially competitive information. This study has been designed and conducted in alignment with the ethical guidelines set forth by the hosting academic institution, as well as established international research ethics standards. All necessary steps have been taken to ensure that the rights, privacy, and autonomy of participants are fully respected throughout the research process.

Prior to data collection, each prospective participant received an informed consent form outlining the objectives of the study, the voluntary nature of participation, the expected duration of the interview, and the handling of data. The form clearly communicated that participants could withdraw at any point without explanation or consequence. Participants were also informed about how their data would be stored, anonymized, and ultimately used in the writing of the thesis and any future publications. Ensuring transparency in this initial stage helped establish a relationship of trust between the researcher and the interviewees, which is a cornerstone of ethical qualitative research (Orb, Eisenhauer, & Wynaden, 2001).

Confidentiality was maintained rigorously throughout the study. No names of individuals or identifiable company details are included in the thesis unless explicit permission was granted. Instead, generic identifiers such as "Company A" or "Fleet Manager 1" were used to protect participant anonymity. Audio recordings, transcripts, and all related documentation were securely stored on password-protected devices, and access was restricted solely to the researcher. These measures align with the principle of non-maleficence, which seeks to avoid harm or risk to participants, including reputational or commercial harm that might result from public disclosure of strategic practices or opinions (Bryman, 2016).

In addition to confidentiality, the research adhered to the principle of beneficence, by aiming to produce knowledge that is not only academically rigorous but also practically relevant to the maritime sector. Participants were encouraged to view their engagement as a contribution to a broader dialogue on sustainability in shipping, with the potential to inform policy development, industry benchmarking, and academic discourse. This reciprocal approach fostered a more open and engaged atmosphere during the interviews, further enriching the data collected (Tracy, 2010).

Despite these ethical safeguards, certain limitations inherent in the research design must be acknowledged. One primary limitation is the relatively small sample size, which is typical of qualitative studies but may restrict the generalizability of the findings. Although the companies selected represent diverse subsectors of Greek shipping, the strategic behaviors and interpretations captured in the interviews may not be universally representative of the entire Greek maritime community. As a result, the study's findings should be interpreted as indicative rather than conclusive, and further research with larger or different samples would be necessary to validate broader patterns (Patton, 2015).

Another limitation pertains to the potential for response bias. Given the sensitive nature of environmental compliance and strategic investment, participants may have been inclined to present their firms in a favorable light, downplaying operational weaknesses or overemphasizing proactive measures. This phenomenon, often referred to as social desirability bias, can affect the authenticity of responses in interview-based research (Fisher, 1993). The researcher mitigated this risk by building rapport, emphasizing confidentiality, and phrasing questions in a neutral and non-judgmental manner, but it remains a methodological consideration.

A further limitation is linked to the rapidly evolving regulatory environment in global shipping. Environmental standards, such as those introduced by the International Maritime Organization (IMO) and the European Union, are subject to frequent revisions and policy updates. As a result, the data collected represent a temporal snapshot that may be rendered partially obsolete by subsequent policy developments or technological shifts. This temporal specificity underscores the importance of viewing the research as a contribution to an ongoing conversation, rather than a definitive account of Greek shipping strategy under environmental regulation (Psaraftis, 2019).

Finally, the dual role of the researcher as both interviewer and analyst introduces the risk of subjective interpretation. Although measures such as verbatim transcription, thematic coding, and peer consultation were employed to enhance objectivity, qualitative research inevitably involves interpretive judgments that are shaped by the researcher's prior knowledge, assumptions, and theoretical orientation. Reflexivity—the continuous process of self-awareness and critical examination of one's role in the research—was therefore actively practiced to reduce bias and enhance the credibility of the findings (Berger, 2015).

In conclusion, this study has been conducted with a high level of ethical integrity, ensuring informed consent, confidentiality, and participant welfare throughout. At the same time, it acknowledges several methodological limitations, including sample representativeness, response bias, the dynamic nature of the maritime regulatory environment, and the interpretive nature of qualitative analysis. By recognizing and reflecting on these limitations, the research maintains transparency and strengthens the trustworthiness of its conclusions.

4.Findings and Discussion

This chapter examines four semi-structured interviews with the representatives of four Greek shipping companies, P1, P2, P3 and P4 who are examined as a means to understand how the respondents perceive modern environmental rules and respond to them strategically. The study analyses four mandates namely the International Maritime Organization (IMO) 2020 Sulphur Cap, and the Carbon Intensity Indicator (CII), EU Emissions Trading Scheme (EU ETS), and FuelEU Maritime; thus, creating knowledge on decarbonization initiatives at the industry.
From the data analysis, four interrelated themes emerged:

- **Regulatory Awareness** – an overview of how Greek shipowners perceive and respond to environmental regulations, with attention to perceived inconsistencies between EU and non-EU enforcement.
- **Investment Horizons and Risk Management** – the role of short-term asset play, aversion to technology lock-in, and the challenge of long-term strategic planning.
- **Operational Adaptation** – small-scale changes such as slow steaming, routing optimization, and intermediary retrofitting solutions that shipowners adopt before committing to radical fuel transitions.
- **ESG and Generational Shifts** – the emerging role of ESG frameworks, their uneven institutionalization, and how generational leadership changes affect sustainability attitudes.

The sample of four companies included in this study forms a representative cross-section of the Greek shipping industry, both in terms of fleet composition, asset size, and market orientation**.**P1 Shipping is a young company which manages a small fleet of modern container feeder and multi-purpose vessels, so the company focused its operations on maritime routes where environmental credentials are gaining importance. P2 Maritime includes an intermediate dry-bulk carrier with about eight to ten vessels (mostly Handysize and Supramax types) and trades in global tramp voyages. The P3 Shipping operates approximately a dozen ships mainly in the regional and short-sea trading areas and this subjects the company to the regulatory gaps that exist between EU and non-EU jurisdictions. P4 Maritime is a family controlled bulk carrier which operates a smaller fleet of between five and seven Handymax vessels with a focus on the long term operational utilization of its assets and apposite capital deployment. Taken together, these companies form a representative cross-section of Greek shipping companies, representing the various positions with respect to strategic responses to environmental regulations.

Table 2: Profile of the Four Interviewed Shipping Companies

Participant	Size of Fleet	Capital Structure	Market Orientation	Willingness to Take Risks	Technological Assimilation	Interaction with Regulators	Respondent Profile
P1	6–7 small modern feeder & multipurpose vessels	Privately owned	Premium trades, ESG sensitive	Medium–High	Early adoption of green tech	Proactive	Managing Director, mid-40s, second-generation leadership
P2	8–10 Handysize & Supramax	Family-owned	Global tramp (spot)	Low–Medium	Limited retrofits	Reactive	Senior Fleet Manager, early 50s, long tenure in the firm
P3	~12 vessels (regional & short sea)	Family-owned	EU/Non-EU routes	Medium	Selective adoption	Active	Operations Director, late 30s, third-generation
P4	5–7 Handymax	Mixed ownership	Bulk, long-term use	Low	Minimal	Limited	Technical Superintendent, early 60s, nearing retirement

4.1 Environmental Awareness

All of the interview respondents showed explicit knowledge of changes in environmental regulation. However, opinions on the validity and effectiveness of these tools were not the same. The representative of P3 stated: *the shooting is good and required but done in an extremely uneven way and its enforcement is quite patchy and its regulation in the EU and non-EU jurisdiction is inconsistent*. The P3 fleet is a mid-sized fleet involving mostly regional and short-sea routes of operation, which makes its operations structure especially vulnerable to disparities in regulatory frameworks between the European Union and non-EU areas. Jurisdictional differences are evident in the different enforcement regimes where the requirements related to compliance may often vary between successive voyages.

The same statement of P2 participant could be echoed: we do not ask the small operator to retrofit a vessel in three years when the policies change every two. P2 focuses on dry-bulk tramp shipping and often has tonnage that is fairly mature in age, thereby further extending the scheduling process of the retrofitting process. These dynamics further seem to support the desire of the firm to avoid speedy capital intensive modernization programs in the ever changing regime of regulations.

The other side, P1, perceived EU ETS and CII more as an opportunity rather than a constraint: "*we see it as an opportunity to differentiate and future-proof our fleet. Sustainability is not an option anymore*." In the cohort of companies analysed, P1 is relative young company. The company has strategically aimed to have an appearance in trades with very high sustainability demands among the chartreers particularly the container-feeder and high-value cargo spheres. This type of market positioning contributes to shaping the attitude of the company toward the factor of regulatory compliance as a strategic strength as opposed to a barrier. This disjunction highlights the spread of strategic mind-sets in the Greek maritime industry, as measured on a scale between reactive compliance and active participation in green innovation.

Building on these diverse perspectives, the interviews also highlighted how environmental regulations may amplify competitive inequalities within the Greek shipping industry. Some of the difficulties peculiar to the smaller firms operating in the Greek shipping industry are reflected in the interviews. The difference in capabilities and the access between a small and a large shipping enterprise is accentuated regularly by respondents of P2 and P4, two medium sized companies. As the representative of P2 mentioned, EU ETS will result in tiering. Larger players are able to subsidise that or to cross it on to charterers. These views indicate increasing competitiveness disparities because of inequitable decarbonization preparations. This was reinforced by P3, who said that, consolidation would soon come, and that many small owners may be displaced or swallowed up.

4.2 Decision-Making Criteria for Vessel Types

In the current environmental focusing on the decarbonization efforts, writings the choice of vessels has become a strategic decision that Greek shipowners have to engage in. According to the interviews, the seafaring asset preferences are no longer determined by the classic market cycles and/or chartering opportunities but are rather dictated by the estimates of the compliance expenses, technological preparedness, and fuel flexibility. Even though legislative compliance costs, technological readiness, and flexibility of the fuel are some of the most important considerations in selecting vessels, the market forces and the shipper are the most great determinants. The pricing of freight rates and contractual obligations as well as the preferences of the cargo owners among vessel types, or green credential enablement all have direct bearing on the commercial viability of alternative vessel configurations, with these considerations often constituting as a balancing factor between compliance and opportunity when it comes to regulatory standards.

The flexibility of operations has been always a key criterion. The point is, as a representative of P4 Maritime emphasized, we are not interested in being locked in one particular trade route or particular type fuel. It has to be able to be flexible in the technical as well as the commercial side of our ships." This exit focus can be concurred with the observation which is illustrated by Thanopoulou (2007) that Greek maritime strategy has been premised on optionality, market timing and espouses it to a large degree via multi-purpose, or long-range vessels. The current paper confirms the findings of Thanopoulou (2007) about the dependence of the Greek maritime industry on the use of flexibility and optionality. The recent literature, in particular studies established by Poulsen et al. (2021), also suggests that, in a volatile freight markets context, asset flexibility operates as a hedge against an uncertain regulatory regime as well as cyclical downturnds. This penchant is reinforced, in the Greek context, by the cultural focus on the opportunistic entry and exit in the marketplace, which is registered in the literature of domestic shipping (e.g., Harlaftis & Theotokas, 2009). It becomes clear that being flexible is not only a tactical but rather a well-established strategic doctrine when aligning the actual information gleaned during the interview with these scholarly views.

This emphasis on flexibilities was confirmed by the interviewee at P2 Maritime, who said, "*eco-tankers and bulkers are not only chosen due to them being greener, but due to the additional CII headroom they provide over the range of voyage profiles*." Therefore, design judgments are becoming dominated by the intention to adhere to an approaching Carbon Intensity Indicator (CII) regulations - at least on the lines characterized with unpredictable speeds and port stops.

The interviews also revealed notable differences in investment strategies among companies when deciding on vessel types and green technologies. Plans towards the capital expenditure also differed. P1 took a conservative stance: of investing only when it is certain of a payback and before the regulation is talked about but not yet final. P4 had a more prospection approach, however, with the early compliance initiatives rolling out as being capable of opening up new market opportunities and providing a competitive advantage in some charter markets.

Building on this emphasis on flexibility, the interviews also revealed a more gradual, cautious approach to investing in green technologies. P4 Maritime stressed on a wait and see approach: "*we are following the development of fuels and technologies and we will commit. Placing a wrong bet on the wrong fuel can be disastrous*." P4 Maritime is a small-to-medium bulk carrier-fleet with long asset lifecycle ratios, and little exposure to cargo sectors where low-carbon credentials are currently capitalised. This conditions the conservative, "wait-and-see" approach of the company: commitment excessively early to a fueling technology would unravel their asset value during decades. This position can be explained by the prevailing investment logic of smaller Greek shipping firms, whose decision-making is driven by aversion to risk, as well as long asset lifecycle. However, there is a small number of firms which have started to experiment with energy saving devices (ESDs) and dual-fuel engines. Because, as P1 pointed out: We have put in shaft generators and better hull coatings: not game changers, but at least they are steps in the right direction. These findings thus exhibit the inclination towards low-capex, reversible steps as opposed to transformational investments like LNG or methanol propulsions, which supports the fact that the industry is not willing to commit to a fuel when it is still uncertain.

There was also apprehension against earlier fuel pledges, especially on the part of the smaller and medium-size fleets. P3 Shipping has noted: "*We are not selecting a vessel on one type of fuel since we still do not know which fuel will prevail*." In this connection therefore, a trend is growing towards use of fuel-flexible engines, including dual-fuel LNG or methanol-ready engines at an incremental additional cost. This position exemplifies broader sources indicating that the fractured nature of the fuels in the industry, including ammonia and hydrogen as well as biofuels and e-methanol, is making picking the right form of investment more challenging (Rehmatulla et al., 2017; Zhang, Yang, & Yang, 2022).

P1 Shipping highlighted the practical consequences: «*You can not retrofit your way out of this every five years. We wish a one that will conduct us to paths,--not in blind alleys*.” The approach proposed by them would be the use of ships offered with modular fuel systems or with prior approval to be retrofitted in the future in accordance with EEDI Phase 3 and EEXI.

Although there is much regulatory constraint, this does not pre-empt the prevailing orientation towards financial prudence. It was no wonder that when P2 Maritime the question was asked, he was explicit; “*we are not going to purchase a ship that does not make business sense to us, not even a green ship*.” Contemporaneous interviews showed that despite the new rules of the game, ROI can and must not be ignored, as it coincides with the existing charter-oriented trends and potential future resale trends. This focus, as Stopford (2009) reports, can be called the asset-play logic of conventional Greek shipowning and addresses the ship itself as a means of production and a tool of speculation simultaneously.

This has led to a strong preference by Greek owners on second hand eco-vessels but not all newbuilds. P4 put the current sentiment into words: “*Newbuilds are meant to be taken by those who want to bear risk in the long term of 20 years. No, we can not*.”

Vessel acquisition is currently being transformed by environmental regulation under the aspect of techno-economic parameters. P1 noted that in case a ship fails to achieve an A or a B rating in the CII, it is devalued. “*That has become a buying filter*.” Contributors agreed on the fact that CII and EEXI ratings are the part and parcel of the procurement requirements because they affect time-charter arrangements and financing mechanisms. This empirical finding is in line with the existing scholarly evidence that finds that a positive environmental performance is increasingly reflected in vessel valuations (Poulsen, Ponte, & Sornn-Friese, 2018). Interviewees from P1 and P2 both stressed that these environmental ratings have become decisive not only for compliance but also for securing competitive financing. As one respondent from P1 explained, “*banks and leasing companies are starting to ask for the CII profile before they even look at the financials*,” underscoring the growing interdependence between environmental compliance and access to capital. Similarly, P2 highlighted that charterers now include performance clauses tied to these metrics, which can either unlock premium rates or, conversely, lead to reduced marketability of the vessel if targets are not met. However, as insisted by P3, overfitting to the rules that currently exist exposes an organization to a danger of being shielded against subsequent change in said rules: *“you buy a boat that will pass all the fuss, and tomorrow they change the rules.”* The interviewees therefore take on a permanent quandary: find a balance between new regulations and vessel sustainability. Empirical evidence showed that the sustenance of the balanced composition of fleets is typically achieved by means of a portfolio-driven approach to renewals. As an example, P3 deliberately buys a small group of adult, lower-rated ships on attractive market terms to defray the heavy capital costs of recent, eco-friendly models and supports general compliance with regulatory demands with the fleet. Similarly, P2 mentioned that the introduction of time-limited and aiming strategic tonnage of compliant charters in place of vessel ownership can close the gap in compliance provisionally and, at the same time, corroborate the risks of investment.

Another emerging issue that is becoming progressively more innovative due to its fast development, meanwhile, being especially relevant to charterers involved in ESG reporting, is vessel lifecycle emissions, otherwise known as the well-to-wake profile. P1 identified a growing inquiry: "*There is an increasing number of inquiries of non-stack emissions. That is another cup of tea."* This question is not as pervasive as it may be, but it is indicative of a potential trend to eco-friendliness holistically in the institution of vessel procurement. In this proposed framework, maturity in the management information systems in the firms is assumed to be high so that the performance, compliance, and market data can be captured, processed, and integrated in real time. These systems have become essential to policing of fleet-wide measures of efficiency and to matching procurement to the regulatory imperatives and commercial objectives, according to interviewees. The expertise and strategic farsightedness of decision-makers were always on the list of the most important: the respondents who had decades of experience in the industry were based not only on the insights obtained by the use of data tools but they also had their intuitive knowledge about the cyclical processes, changes in the regulatory environment and needs of strategic positioning in the long run.

To conclude, the modern decisions related to the vessel type are multidimensional and not only include a combination of economic analysis, trade patterns, and regulatory foresight, but also the more clinically defined charterer expectations and the highly uncertain fuel-infrastructure environment. The ability to act as an adaptive follower rather than committing prematurely as a first mover is thus becoming an enormously important competitive advantage in a constantly changing legislative environment and shifting technological boundaries.

4.3 Strategic Responses to Environmental Regulations

In the scenario of rising trends of international/EU environmental regulation, Greek shipowners businesses are forced to seek a range of strategic solutions, consisting of adaptive or defensive responses, to hedge against cost of compliance and to be able to remain globally competitive. The research on four shipping companies citing the usages of a semi-structured interview reveals that the level of strategies followed depends on the size of the firms, capital structure, market orientation and the willingness to take risks. Even though majorities of the respondents were found to have adopted a pragmatic attitude towards regulatory paths, there were sharp differences in how they pursue it in areas of technological assimilation, business elasticity, financial modelling, and the interaction with regulatory agencies.

One of the most significant themes that we gain is that the issue of regulatory compliance is not merely cast in the negative direction as a constraint but also as a market differentiator. The representative of P1 Shipping noted, as an example, that nowadays it is perceived as a branding problem. "*When you want to get access to the right cargoes, you should look cleaner than the person sitting by you*". Such a view harmonizes with positive academic evidence of the relationship between environmental performance and increased chartering opportunities, especially in ESG-sensitive customers (Poulsen et al., 2018; Vroomans et al., 2023). Operation framework of P1 Shipping is one of the good examples of deliberate incorporation of sustainability in the business sphere. The company has made sequential interests on fleets refresh and energy-efficiency improvements to ensure that A or B CII rating is applicable to most of its ships. The statement is therefore a corporate policy as well as the personal belief and the respondent confirms that the strategy has already increased access to the premium cargoes of ESG-sensitive charterers.

However, leveraging sustainability as a market advantage requires not only strategic intent but also technical and financial capabilities. In addition, the technical skills and financial engineering (e.g. green finance, ESG reporting) were raised as being more and more important. However, according to one of the participants, small companies cannot afford entire departments that deal with sustainability, or carbon analysts. These observations contribute to the observation that the regulatory push can be associated with the structural change within the Greek shipping ecosystem.

Some companies have even incorporated CII reporting and EU ETS forecasting in the process of operational planning. "*At present we are doing quad dope on our voyages, to monitor CII and modify speed. This is in our routine*", P3 Shipping stated. This can be defined as a cost-saving or rather cost-containing measure and citation made by Acciaro and her co-authors (2013) is now referred to as a proactive operational adjustment.

Building on these operational adjustments, the interviews also revealed several examples of strategic adaptations that companies are adopting to navigate regulatory uncertainty. Recommendations of operational and contractual changes were eminent in all the firms. P4 involved negotiations of the introduction of cost-sharing clauses in compliance cost in the charter agreements. P1 stated that it changed its operating patterns in reaction to the desire to increase CII ratings, whereas P3 used short-term charters as a hedge against the regulatory uncertainty, which demonstrated the ability to capture the market in a non-committal approach.

On the other hand, other interviewees took up the strategy of passive or tactical delaying citing regulatory uncertainty and technological flux as the significant deterrent of the long run investment. “*We do not want to invest millions and next year the rules will again be changed as P4 Maritime wrote. We see, we adjust but we do not leap”.* This is a form of regulatory arbitrage: such caution reflects the general approach of strategic compliance, first identified by Rehmatulla et al. (2017) to discuss the compliance that companies aim to maintain at a minimal cost and delay heavy-capital changes until a necessary point.

With the focus on relatively short organisational time horizon, the company P2 Maritime has established a strategic orientation that emphasises on control of costs in turbulent environmental situation andय recent medium aged tonnage used in established regional trade. When an empirical evidence is sought among the company interviews, the preference towards gradual steps instead of the transformative capital expenditures can be outlined, such as the adoption of slow steaming on certain intra-Mediterranean routes selectively and the optimisation of the port turnaround times on a systematic basis. As one respondent noted, *“At the current point, it is slow steaming and efficiency of ports. There is retrofitting only when it has to be.”* This strategic position protects cash flow and at the same time maintains operational flexibility by chose to postpone capital and technology-intensive investments until there is a more fixed definition of fuel pathways and cost structure through the emergent fuel pathways. Unlike its competitors, P2 Maritime has a more conservative general stance, which emphasizes the preservation of its current operational efficiencies at the expense of being a benchmark of the emerging green-technology embrace.

Survey conducted to help evaluate how close the Greek shipping industry is to decarbonization revealed that the only company that acted proactively to report specific green spendings (including installation of energy-efficient gear and the order of new methanol-capable ships) was P1 Shipping. As the interviewed representative explained, it is believed that early compliance is leverage, on charter rates, on bank loans, and even on resale. This statement is in agreement with the past findings that early developers of green innovation are capable of gaining strategic benefits in an industry commonly regarded as risk-averse (Acciaro et al., 2013; Zhang et al., 2022).

Respondents (all) admitted however, that there was much reluctance to make commitments to unproven fuels or propulsion mechanisms. P3 admitted, as concerns about lack of infrastructure aligns with those across the industry about fuel availability, safety regulations, and the uncertainty of lifecycle emissions (Smith et al., 2019): "*Until there's a support structure, we aren't betting on hydrogen or ammonia. Instead of the mentioned commitments, the majority of shipowners preferred the option of the ship with retrofit capability and modular design that allows them to transfer the fleet and adjust to technological maturity and regulatory certainty".*

Beyond technological and financial readiness, the interviews also revealed that organizational culture and ownership structures strongly influence strategic responses. Through interviews, we also learnt how the ownership culture is deep-rooted and that it stills the decision-making process of the Greeks. Independent, family-controlled structures identified by most of the participants played a critical role in strategic decisions. *"We are only accountable to ourselves as P4 noted. That opens us to flexibility as well as being slower in matters that are not of immediate priority."* The lack of control by external shareholders (believed to be an aspect of independence) as well as regulatory non-control (which can be previously reviewed as independence) might be examined as a dual-use feature. On one hand, it is a strategic asset that can be used to make quick adjustments in relation to the changing conditions within the market. On the other, it may be a liability: organisational self-regulation can inhibit forward proactive commitment to incipient regulatory structures (or technological developments). This process is of particular importance in the environment of the decarbonisation agenda, as the available time-horizon during which it is cost-effective to comply diminishes.

This cultural independence also shapes how Greek shipping firms balance flexibility with the growing pressures of ESG compliance and transparency. Interestingly, although such ownership model provides the flexibility, it can also hinder change in strategies. The participant at P3 has said, P3 has been developed around the principle of being agile, but the new rules necessitate transparency and long-term planning. "*It is a different ball game.*" P3 has historically been successful as a result of taking advantage of flexible opportunistic chartering strategies. These approaches are, however, in conflict with the efficiency, written methods that are entailed in sustainability compliance. This natural disparity will most probably create tension in the organizational culture. This ambivalence- flexibility or inertia- appeared as one of the common paradoxes in the data set.

The four interviewees acknowledged increasing pressure in recent years due to charterer and financial pressures to prove environmental compliance and an ESG focus. It is necessary "*to demonstrate that you are clean, both on paper and in practice*," P1 observed. Others were however doubtful of such expectations maturity. P2 observed, at this moment green criteria is more talked about than doing. but it does not always have to be like that."

Strategic choices are also complicated by cultural dimensions in the context of the Greek shipping. Familiarity over decades, family control, and informal governance was also referred to as a two edged sword. "*We may go fast when we want, as there is no board to persuade. However we do both have a tendency to do what we are used to doing*," said P4. The linked generational familiarity sprouting as a result of long-term familial control and loosely structured governance arrangements often creates familiarity among shareholders, directors and managements, which the literature views as potentially a two-edged sword because, on the one hand, it can lead to the quick decision making in certain circumstances; however, on the other hand, it can contribute to the cultural sluggishness and inability to shift to sustainability, especially in smaller or culture-centric businesses (Thanopoulou, 2007; Pallis & Ng, 2011). P3 confirmed this trend when he noted the fact that the company had "*delayed the adoption of new technology*" until when proven benefits could be identified by other older competitors of the firm. On the other hand, two respondents of the younger generations (P1, P2) also experienced a measurable change, with one explaining that ESG strategies and digital surveillance are pursued by younger owners and this trend matches the predictions of another study (Poulsen et al., 2018), and it can be concluded that the effect of generational dynamics can speed up responsiveness to the environment and tackle the sustainability challenge. The ensuing dialectics between heritage and the renewal at the generational level therefore points at the fact that the cultural aspects can both restrict, and, in case of favorable management, provide the opportunities to pursue sustainability-oriented strategies.

Interestingly generational change is establishing itself and rewriting these trends. P1 stated, noting that ESG strategies and digital surveillance are being advocated by our younger owners, prompting the idea that environmental responsiveness may be an implicit part of the contemporary leadership renewal and succession phenomena. According to Poulsen et al. (2018), the changing profile of maritime leadership affects how corporations address the issue of decarbonization.

P3 was the only player who said that they continued their interaction with the regulatory institutions. The respondent added, the firm attempts to maintain an association with industry organizations so that it can shape and predict the regulations. The other companies felt a regulatory distance/fatigue, P2 said, "*By the time we have figured out the regulation it has been modified already*." In studying the organisations of the same size, one finds that the way of understanding the new regulatory systems was quite different. The target company (P3) did this internally, with top management personnel leading the bulk of the work and sometimes consulting legal experts on ad-hoc basis, although bigger, networked organisations tend to have in-house counsel, policy monitoring departments or ESG experts. This kind of organizations enables them to be able to anticipate changes in regulations and implement preventative measures.

This observation means there is a potential difference between the capacity of larger, networked businesses and smaller ones. By recruitment of legal counsel, policy intelligence, or ESGS, the responsible people are able to take action to be compliant in advance, unlike others subject to mandatory adjustment or regulatory surprise.

4.4 Investment Horizons and Risk Management Approaches

Investment horizon and corresponding philosophies in risk-management are core elements that determine how Greek shipowners adopt strategic behaviours in reacting to the gradual stricter environmental regulations. Farmer Greek shipping is characterised by owner-managed firms, short cycle planning and decentralised governance, as opposed to long-cycle planning and institutionalised governance in capital-long industries. As shown using interview data, these characteristics are realised into prudent, flexible and, at times, defensive investment practice, above all, when facing regulatory uncertainty and technological uncertainty.

One of the frequent patterns among the interviewees was the solidification on short- to medium-term horizon of investment based on previous and constant volatility of the freight market, as well as asset-play culture that pervades Greek shipping sector. It is impossible to take action 25 years down the road as P4 Maritime had noted: “*You do not plan 25 years ahead in shipping. There are five which you have planned. In case the market changes, then you must switch quickly”*. Such view is corroborated with the literature characterising the Greek ship owner as opportunist who use time, liquidity of second hand market, and recycling value of ships as the main elements of profitability (Thanopoulou, 2007; Stopford, 2009).

In turn, the decision of fleet renewal is frequently estimated in a context of resale value and appeal to charter. P2 Maritime has been keen to note to the effect that in case we purchase a vessel, it has to be of good value, whether it is green or not. “*Nobody wants a ship which is compliance ready and no one would want to fix.*” That is why investing in green assets cannot be considered a long-term sustainability goal in itself but rather a one that is conditionally feasible and is based on estimated ROI and general market mood.

The perception of risk, in particular relating to technology lock-in, has been enhanced by environmental regulation. Every interviewee protested against committing funds to capital costs of ships or propulsion systems that could become prematurely obsolescent in the event of regulatory change or lack of fuel infrastructure. As P3 Shipping retorted with a touch of sarcasm: “The ammonia is a popular topic marketed today, and tomorrow it maybe nuclear.” Deadly serious is the addition by the firm: “*we dont gamble on a fuel when we do not know where to bunker it and what will be the cost of it*”. The reluctance that the firm currently shows can be located within a broader unwillingness to invest in fuel technologies the bunkering arrangements of which have not been solidified and the prices of which are highly volatile. Despite the fact that in some enterprises these risks may also be mitigated with the help of fuel-hedging instruments or long-term bunkering contracts, the respondent argued that hedging could not be a fully effective response since there were no defined chains of supply of the alternative fuels. Moreover, the managers on whom the survey team consulted acknowledged that regulatory and market forces of green shipping have started to drive management practices-institutionalizing formal sustainability-reporting systems, cross-functional ESG committees, and increased coordination between the technical and commercial roles so that environmental awareness is built into operational planning exercises.

The feelings are shared beyond the sector about path dependency and stranded assets (Rehmatulla et al., 2017). The extent of mitigation strategies involves a choice of many companies to invest in acquiring new vessels with the option of dual fuel or investment in vessels that have been pre-certified and can be retrofitted in future. “*We would like to keep doors open*,” P1 Shipping observed. It is not good to write off that asset of 30 million if you can retrofit it.”

As the larger shipping conglomerates grow progressively to include financial hedging instruments and green-linked finance as part of their strategic inventory, operational hedging is seen by the majority of small- and medium-sized vessels owner interviewed (most of whom are found in the Greek-dominated part) as their area risk management stance. P4 noted that “*we diversify our risk by dispersing our fleet within different sizes of vessels and also the trades. It gets the job done but it is not rocket science*.” P1 has introduced another aspect: “*We check the carbon exposure through our voyages. We are also planning differently, not only freight, but also emissions*.” Such pronouncements indicate a very new orientation towards holistic risk management, where commerce and environmental risks will be co-managed, especially where the costs of compliance (such as the EU ETS charges) become politically prominent.

Even though the questioned interviewees had the same single-minded dislike to big-money, long-shot wagers, they showed great variance with respect to how they characterize regulatory risk. P3 and P2 were focused in defense and delay, and that was their attitude, which is summarized as, we have no need to jump early, we obey when we have to. P1 on the contrary, seemed to have seen the regulatory change as an opportunity: "*You get better charter terms and financing as long as you are first and correct. and that is worth the gamble*." This division highlights two existing archetypes of actor types in past literature conservative, portfolio-smoothing actors and proactive, innovation-oriented actors (Poulsen et al., 2018; Acciaro et al., 2013). The ex-camp obfuscates with fleet agility and controlled capital investment; the new one seeks to become a leader by purposefully embracing decarbonized technologies at certain levels and developing association with green chartreuse and financiers.

Succession planning and task transfer between generations are also factors that became clear during the interviews to affect investment horizons. The second gen is more at ease thinking long-term as P1 admitted. The second generation has been gravitating to long-term perspective as discussed by P1 a contributing factor of the strong financial position of the company, lowering of level of indebtedness and also the diversification of the revenue model of the business stand beyond the spot-market rates of freight rates. This kind of stability cushions the business against any short-term market fluctuations without affecting the operations the enterprise is engaged in day-by-day, and hence the resources are available to last several years, such as alternative-fuel pilot projects and vessel-retrofitting plans. Further formalization of corporate governance, that has coincided with the change of leadership, the creation of strategic-planning committees, closer cooperation with financiers and classification societies has all contributed to a prospective-based approach to investment thinking. At the same time, the generation is concerned with corporate image and ESG statistics and supports alternative performance measures.

Image and ESG matter to them and they are demanding alternative metrics. Comparatively, the founding owner-led firms usually focus on the short-term returns and capital protection, particularly when there is confusion in the market. Such a generational contrast can become a decisive advantage or barrier to investments in decarbonization technologies in the future as long horizons and sustainability targets are projected to be embedded into financing and chartering in the industry (Zhang et al., 2022).

4.5 Discussion

The systematic study of interview data elicited in four Greek maritime companies has shown a set of emergent patterns that will shed light on the firm specific strategy on the one hand and the overall transformations in the sector on the other hand. The totality of these trends serves to highlight an area of shipping that is in transitional disequilibrium, and faced with a combination of converging pressures, in the forms of regulatory restrictions, financial demands and constraints, technological advances, and the working relationship with generations. All the evidence suggests that, on the one hand, Greek shipowners remain embedded within their traditional asset-focused culture, but, on the other hand, the manifestations of change, and in some cases, revolution, are already becoming palpable.

The traditional view of the Greek shipping has been to refer to regulation as a restriction incongruously caused by outside forces instead of considering it as a strategic asset (Thanopoulou, 2007). The current results, however, record a minor yet significant change: a growing number of respondents perceive regulatory compliance as a possible competitive advantage in the market. commented the interviewee from P1 Shipping, "*When you are cleaner, faster, and transparent, you are able to receive better rates and better clients.*" Such a changing stance can be aligned with the works showing that in ESG-sensitive spaces, regulation can be present as a factor of competitive differentiation (Poulsen et al., 2018; Acciaro et al., 2013). However, this tendency of the strategy to adopt compliance as an asset is not even. The smaller organizations like P2 Maritime also had a highly reactive stance as they said, we adjust when we must not before. This is a generational size-related dichotomy, where firm size, leader tenure and information network access become important determinants of regulatory position and timing. All the four companies respond to operational solutions (rather than technological). Some of the strategies listed were; slow steaming, expedited port turnaround, and emissions-based voyage planning. P3 Shipping encapsulated the dominant opinion, and it said, "*Until the fuels are leveled off and the tech has matured, we will do what we have.*"

Such an operational focus is consistent with some research concluding that there exists an energy-efficiency gap in shipping: there are high-payback technologies that are under-used and fewer behavioural interventions that are less risky (Rehmatulla et al., 2017; Acciaro et al., 2013). The evidence shows that this orientation is continuing through the Greek sector particularly among the companies interested in evading technology lock-in.

Even though the informants unanimously admitted the increasing importance of environmental, social, and governance (ESG) considerations, P1 was the only interviewee who mentioned the existence of clear sustainability frameworks or funds designed on the basis of ESG factors. The new generation of the company prioritises communicating its performance on ESG indicators — such as carbon intensity, energy efficiency scores, and crew welfare statistics — over traditional commercial metrics like average freight rates. The other companies, in comparison, viewed ESG as a narrative that is emerging but not institutionalised:

as P4 put it: *I think it is something that is on our radar but it is not a priority yet*. This diversity confirms broader sectoral evidence that ESG adoption within shipping is not distributed and that formal acceptance is more extensive within the publicly listed or bank-driven enterprises (Vroomans et al., 2023). The relatively small implementation of ESG principles into the working practice on behalf of privately owned shipping companies may be explained by a set of reasons. To begin with, this type of firm is often funded with proprietary capital or even some other form of privately sourced capital, hence not falling under the demands of ESG compliance that loan providers meet by using the lending products provided by the banking firms. Second, publicly traded firms and companies which rely upon institution-based money flow tend to bargain express ESG reporting provisions and performance guidelines either into covenant terms or investor-relations requirements.

Some of the interviewees expressed fears that the current trend in environmental regulation can trigger the consolidation of the sector as smaller companies will face the costs of compliance and capital expenditures. P2 Maritime spoke it out loud, saying, "*We do not even know whether we will still be in 10 years when things continue happening in this way."* These concerns correlate with the existing representation of consolidation caused by compliance expenses, which serve as thresholds to enter or survive (Poulsen et al., 2018).

The succession ended up being a silent but conclusive variable in all firms. The companies that have undergone leadership change showed an increased openness to strategic planning and digitalisation and long-term decarbonisation. This was the case described by P1: "*Our second generation is not thinking three-year increments, but 20-year increments*." In comparison, the liquidity and the flexibility of operations were given precedence over sustainability due to traditional firms run by a first generation of owners where P4 remarked, in case the freight is strong, everything is second priority. This generational shift compares with previous comments that inter-generational leaders hold the future of Greek shipping either to embrace change or to not allow change to happen (Thanopoulou, 2007; Zhang et al., 2022).

When comparing the four companies based on the characteristics presented in the sample table, several distinctions and similarities become evident. P1 Shipping, as a young, mixed-owned company active in ESG-sensitive trades, adopts a proactive and innovation-oriented approach, integrating sustainability frameworks and prioritising early compliance to secure competitive advantages. P2 Maritime, a medium-sized dry-bulk operator, follows a conservative, cost-driven strategy, focusing on operational efficiency and avoiding capital-intensive investments until regulations and fuel technologies stabilise. P3 Shipping, with its diversified regional fleet, demonstrates a cautious and adaptive stance, relying on short-term operational adjustments and flexible chartering to hedge against regulatory and technological uncertainty. Finally, P4 Maritime, a family-controlled Handymax operator, maintains a traditional, risk-averse strategy, valuing optionality and fleet flexibility but showing lower prioritisation of environmental innovation. Despite these differences, all four companies converge on a shared emphasis on operational adaptability and preserving investment optionality, illustrating how ownership structures, fleet profiles, and market positioning shape distinct yet interconnected strategic responses within the Greek shipping sector.

5.Conclusion and Recommendations

5.1 Summary of Key Findings

This study investigates how Greek shipowners are coping with evolving environmental policies, how they interpret the green transition — as risk, opportunity, or both — and what consequences this has on their operational and fleet investment strategies. Importantly, it also evaluates whether these strategic responses are sufficient and adaptive enough, given the fast-changing regulatory and market landscape.

In this chapter, strategic responses of four Greek shipping companies, three of which are privately-owned, small- and medium-sized firms, and one larger family-owned corporation, to the more stringent environment-related regulations rebalancing the maritime industry, are studied. Using semi-structured qualitative interviews, four major research questions (RQ1-RQ4) are addressed to ascertain collective behaviour in light of decarbonisation efforts, fleet renew, adoption of energy-sources and ESG incorporation.

RQ1: What strategic actions are Greek shipowners taking because of the new environmental rules in the maritime industry?

Each of the four companies is aware of the major regulatory tools, the International Maritime Organization Carbon Intensity Indicator (CII), the European Union Emissions Trading System (EU ETS), and the FuelEU Maritime Regulation, but there is a significant difference in the extent of such connections. The small privately-owned companies take these rules more as a set of requirements to be complied with and place a relatively higher value on cost reduction and control over operations.

RQ2: What factors influence companies in deciding whether to renew their fleets, adopt new fuel technologies, and practice sustainability?

The findings reveal substantial variation linked to company size, leadership style, and financial capacity. To maintain liquidity and prevent technological lock-in on the uncertainty about the future fuel supply and regulatory paths, smaller enterprises turn to the short-term asset-management strategies that include the purchase of second-hand vessels. All these aspects make the bigger company more ready to consider planning their gradual inclusion of technology.

RQ3: What steps do Greek shipping companies take to remain profitable and competitive while improving environmental performance?

Current decarbonisation activities are based on operational measures. They have all reported gradual steps, such as slower steaming, optimisation of weather routing and energy-efficiency refurbishments but no one has yet taken the step of seeking radical fuel switching or zero-emissions ships. Such an approach is characteristic of the industry in general, which does not yet want to initiate long-term decarbonisation projects until more clarity on technological routes and market stimuli emerges.

RQ4: Do Greek shipowners tend to prioritise compliance, seek innovative ways of operating, or avoid risks, and what is common across company types?

The awareness of the ESG principles is growing, yet the institutionalisation is rather low, especially in the smaller privately-owned firms. The bigger, more internationally exposed company has codified the ESG structures into its strategic planning guidance as well and consistently reports Environmental, Social, and Governance metrics as part of its financial performance. The context of ESG is verbalised in the form of a more significant narrative in the smaller organisations, although prioritising its operations remains a fledgling effort.

The above findings collectively indicate that although the four companies have been long-standing committed towards flexibility and adaptability, their progress on the path of sustainability remains uneven. A growing gap between new-generational ownership who are conservative and risk-averse and have limited liquidity and innovative players who see environmental regulation as a way of creating competitive advantage are taking shape. Long-term viability of the sector will be dependent upon regulatory clarity, the extensive alternative fuel infrastructure and the ability of smaller firms to obtain transition financing and the ability to obtain specialized technical knowledge. Besides expert technical skill set, small firms need to develop highly developed management competences. These are the ability to cope with both regulatory and market uncertainty in managing risk, the ability to reengineer organizational culture to a more open attitude towards innovation, the ability to form alliances and create access to resources and to new technologies. Also, strategic portfolio management is required to ensure the existence of traditional assets combined with new green investments. Lacking these managerial competencies, it is possible that having acquired technical skills may not be adequate to guarantee long-term competitiveness.

5.2 Strategic Implications for Greek Shipowners

The outcomes of the current study also have conclusive organisational repercussions to the Greek ship owners, who will need to bargain a more unpredictable ecosystem of regulations and operations. Traditional methods, such as: the expediency of capital deployment, the re-sale of second-hand vessels, a laser focus on minimising costs is increasingly inept to adequately meet the concurrent demands of reducing carbon emissions, corporate responsibility, and regulator soundness.

Another topical strategic imperative is that of temporally enlarging the framework in which planning of investment is done. Freight-rate-centric forecasting methods continue to be impossible to do without, although they fall short when used alone. Rather, environmental compliance timetables e.g. the dates by which International Maritime Organization (IMO) CII ratings must be achieved or by which European Union Emissions Trading System (EU ETS) allowances must be met will need to be harmonised with the broader integration of long-term asset management and energy-transition goals. More specifically the acquisition or retrofit decision has to be aligned with the expected maturity of other marine fuels, deployment of port bunkering facilities and the likelihood of future regulation tightening, all of which will interact to determine the operation life of the vessel. An example of this is the assessment that must be carried by a firm looking at a five-year old tanker: the firm will need to ask not just about the current state of the freight markets but will also need to enquire about the five-year old tanker eligibility under the emission rules as seen in the projected period of ten to fifteen years. Combining these temporal aspects, the industry will be able to counter the threat of a stranded asset and retain its appeal to the environmentally conscious charterers and financiers.

The second central issue is scalable adaptation. Even though the maritime shipping industry is dominated by small- and medium-sized businesses with limited funds at their disposal, the ability to implement various and capital-heavy green technologies is essential. Scale may be achieved by merging and acquiring (M&A), by strategic alliances, or pooling, and the companies thus sharing investment and protecting themselves against technological risk. Without this scale, however, adoption of advanced solutions, including dual-fuel ready vessels, broad retrofitting efforts, and involvement in construction of alternative-fuel infrastructure, will be limited to a small segment of the market.

Environmental regulation compliance is related (but not synonymous with), the scale demand. The compliance-driven interventions, e.g. slow steaming, retrofits, or even carbon offsetting aims to reach the set level of emissions, whereas the scalable adaptation allows companies to achieve more than the simple compliance to the emissions threshold by moving simultaneously in different transition paths at the same time. A small operator might be kept compliant by making relatively trivial retrofits, but a bigger operator aided by the alliance can diversify into LNG-Ready vessels, battery-hybrid decks and biofuel experiments. As a result, compliance is not substituted with scale but it expands the presence of technological adoption and futurization of investment decisions.

Not less important is the institutionalization of ESG frameworks. The requests of the charterers, investors, and insurers worldwide to be transparent on sustainability rates require an embedding of the ESG principles to the work of corporations into their corporate governance, vessel management, and finance processes. Such alignment improves bilateral relationships with stakeholders and opens the access to preferable facilities, including green loans, loans according to the Poseidon Principles, and transition funds funded by the EU. The capability of accessing, validating, and reporting data pertaining to sustainability is a strategic necessity which requires an adequate size. Firms with different scopes have the benefit of spreading the costs of complex data-management infrastructure, compliance software and dedicated human resources across a greater asset platform. As a result, smaller organizations can struggle to afford this kind of spending, which is why they require alternative routes of achieving a similar amount of compliance preparedness in the form of partnerships, data exchanges, and third-party services.

In addition, human capital development is an impossibility in the strategy positioning. Generational change brings risks and opportunities: younger leaders are more likely to have a higher sense of awareness of long-term environmental risks and of the validity of sustainability targets but unless institutional change involves knowledge transfer and mentoring, change can be blocked. To harmonize the commercial impulses and regulatory vision, proactive companies would be advised to invest in training programs, intergenerational governance systems and strategic planning instruments that can help the emerging leaders settle the tension between business compulsions and regulation futures.

Lastly, Greek shipowners should be able to consider the geopolitical, and reputation aspects of green compliance. When much access to trade routes, insurance rates and port rights are becoming dependent upon emissions performance, strategic compliance is no longer simply an operational requirement but an access issue and a determinant of market access and legitimacy. Businesses without credible proof of alignment to climate targets can be rejected when it comes to premium cargo, top-quality chartering pool or even national decarbonisations groups.

To sum it all, the market savvy, combined with the ability to envisage, internalise, and yet be strategic with the global environmental agenda, shall determine the future competitiveness of the Greek shipping industry. Regulatory arbitrage, preferential financing, and competitive differentiation are some of the factors that actors with an early-mover and forward-looking strategy are bound to achieve. The latter, in turn, run the risk of not only jeopardizing short-term liquidity but also losing long-term strategic significance in a marketplace that is becoming more normative and not exceptional in terms of sustainability.

5.3 Policy Recommendations

The results of the current research single out a set of strategic issues facing the Greek shipping industry and outline industry-specific processes that cannot be resolved by a generic policy approach. The broad finding is that stringent, homogenous assessment of environmental regulation poses danger of putting small- and medium sized business- the same towards which capacity home performs its most significant part- in disadvantaged situations. Correspondingly, national and European policy-makers should be able to think of the differentiated compliance paths as well as transitional assistance that has yet to be provided.

There are four interventions which appear to stand out. To begin with, the research highlights the low availability of specific financial tools that can enable smaller companies to make investments in transitional technology and compliance infrastructure. Current ESG-linked financing instruments and green lending facilities often charge reporting overheads and basics-scale necessities that discourage privately-owned or family-run businesses. National institutions and the EU ones should therefore seek to create guarantee schemes, or tax credits, or green shipping low-interest loans to help induce early adoption without an excessive exposure of the finances.

Second, regulatory clarity and harmonisation is essential. Ship owners are forced to work in a quilt of competing systems, IMO, EU ETS, CII, FuelEU Maritime, which leads to uncertainty and cross-cutting incentives. Enhancing the synergy, harmonizing the technical requirements, and smoothing out cross-jurisdictional regulatory discrepancies would minimize the strategic ambiguity and allow more confident planning to the long term.

Third, maritime-oriented innovation clusters that enable collaboration between shipping companies, classification societies, academic and technology startups should be developed in Greece. These clusters can become breeding grounds of decarbonizing solutions, alternative fuel testbeds, and digital platforms in ESG reporting, hence creating the opportunities of sharing knowledge and costs among different firms that have different resources.

Parallel, skilling programmes and executive developments should be aimed at preparing the new generation of maritime leaders. They should integrate sustainability, ESG reporting, and green finance into the education programs of the educational institutions and maritime academies, and develop the intergenerational leadership should be promoted through industry association or national programs.

Lastly, an important role takes the leadership in the flag states. Greece as a global maritime flag is the leader in its power to affect the global maritime policy. Greek policymakers can contribute to the development of regulations within the IMO by supporting the need to develop equal and proportionate means to decarbonization that would not allow small players to experience an unfair enforced competitive disadvantage.

5.4 Suggestions for Future Research

The current discussion offers useful information about strategic initiatives of Greek ship owners towards increasing environmental regulations. However, a number of directions of future academic research are still available.

Cross-national perspective: Inquiry may productively explore the cross-national comparisons as well: the Greek experience can be compared to the patterns of adaptation in the maritime sector of other states of similar scales, i.e., Norway, Japan, or South Korea. This kind of comparative study would assist in understanding how the institutional systems and the national paradigm of policies guide sectoral resilience and develop the path-dependent paths.

Quantitative depth: There is available evidence on the qualitative level that should be complemented with a deeper study on the quantitative level. A broader generalization of such trends would be possible by surveying or econometrically modeling the ways in which firm-level characteristics (i.e. fleet size, ownership structure, financing strategies) are associated with environmental investment decisions.

Technological pathways: A targeted analysis of the economic and operational feasibility of each of the targeted fuels green Methanol, Ammonia, and bio-LNG, and other similar alternatives, to the Greek-owned fleets, in addition to an analysis of the passport preparedness and the bunkering infrastructure, would provide the necessary insight to the technological path dependency.

Generational transition: A systematic investigation of the generational transition in Greek shipping would shed light upon how the values, education and strategic perspectives differ between first- and second generation owners and of how institutional arrangements could ease the intergenerational succession combined with long-term planning of the environment.

The explanation of such problems would not only deal with empirical gaps but also contribute to theoretical insights on the topics of strategic adaptation, sustainability transition, and governance dynamics of global shipping.

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Appendix A. Interview Guide

Title: *Strategic Adaptation of Greek Shipowners under Environmental Pressures: Fleet Investment, Renewal, and Sustainability Challenges*

Research Tool: *Semi-Structured Interview Guide*

Participant Profile: Executives, Fleet Managers, Technical Directors, Sustainability Officers, or Strategic Advisors from Greek shipping companies

Section 1: Background and Context

1. Could you briefly describe your role within the company and your involvement in strategic fleet decisions?
2. What are the main markets and vessel types your company currently operates in?
3. How would you describe your company's current investment strategy in relation to its fleet?

Section 2: Regulatory Environment and Strategic Impact

4. How has your company responded to recent environmental regulations, such as IMO 2020 or the EU ETS for maritime shipping?
5. What are your views on the forthcoming regulations, such as CII and FuelEU Maritime?
6. Do you consider current environmental regulations to be a risk, an opportunity, or both? Why?
7. How do these regulations influence your decisions on vessel purchases, retrofitting, or decommissioning?

Section 3: Fleet Renewal and Technological Adaptation

8. What factors do you consider most important when selecting new vessel types (e.g., fuel type, size, age)?
9. Have you invested in alternative fuel technologies or energy-saving devices (e.g., LNG, scrubbers, wind-assist, batteries)?
10. What role does digitalization or smart technology play in your fleet management strategy?
11. To what extent is the age and technical condition of your fleet influencing your strategic planning?

Section 4: Sustainability Strategy and Long-Term Planning

12. Does your company have a formal sustainability strategy? If yes, how is it integrated into business operations?
13. How do you balance profitability with sustainability objectives in the long run?

14. What internal or external factors have the greatest influence on your company’s environmental strategy?
15. How do you evaluate the return on investment (ROI) for sustainability-driven expenditures?

Section 5: Perceptions of Industry Change and Competitiveness

16. How do you perceive the competitive landscape in global shipping in light of decarbonization efforts?
17. Do you think Greek shipping companies are well-positioned to adapt to the current sustainability transition? Why or why not?
18. What do you see as the main strategic risks for Greek shipowners over the next 5–10 years?
19. Are there collaborative efforts (e.g., research projects, industry alliances) that your company is involved in to address these challenges?

Section 6: Closing Reflections

20. In your opinion, what strategic adjustments must Greek shipowners make to remain competitive in the era of environmental regulation?
21. Is there anything else you would like to add that you feel is important for understanding the shipping industry’s future direction?

This interview guide was designed to facilitate open conversation, allowing respondents the flexibility to elaborate on the most relevant topics from their perspective. Follow-up questions and probing were applied as needed to clarify points and explore emerging themes during each interview session.

Appendix B. Consent Form

Title of Study:

Strategic Adaptation of Greek Shipowners under Environmental Pressures: Fleet Investment, Renewal, and Sustainability Challenges

Researcher:

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Participant Information and Consent Form

You are being invited to participate in a research study that seeks to understand how Greek shipping companies respond strategically to tightening environmental regulations through fleet renewal, investment choices, and long-term sustainability planning.

Before you decide whether to participate, it is important for you to understand why the research is being conducted and what it will involve. Please take time to read the following information carefully. Feel free to ask questions if anything is unclear or if you would like more information.

Purpose of the Study

This research aims to explore the strategies Greek shipowners adopt to remain competitive in the context of new environmental requirements. Your participation will help illuminate key decision-making processes and contribute to broader academic and industry discussions on sustainable maritime logistics.

What Participation Involves

- You will be invited to take part in a **semi-structured interview** lasting approximately **45 to 75 minutes**.
- The interview will be conducted **in person or via a secure online platform**, depending on your preference.
- With your permission, the interview will be **audio recorded** and subsequently transcribed for analysis.

- You are free to decline to answer any question or to end the interview at any time.

Confidentiality and Data Protection

- All information you provide will be treated with the **strictest confidentiality**.
- Your identity and the name of your company will be anonymized in all written materials, unless you explicitly consent otherwise.
- Audio files and transcripts will be stored securely on a password-protected device and will be accessed only by the researcher.
- Data will be used solely for academic purposes related to this thesis and potential future publications or presentations, in anonymized form.

Voluntary Participation

Participation in this research is entirely **voluntary**. You may withdraw at any time **without providing a reason**, and any information you have provided will be destroyed if requested.

Consent Statement

By signing this form, you confirm that:

- You have read and understood the information provided.
- You have had the opportunity to ask questions and received satisfactory answers.
- You voluntarily agree to participate in this study.
- You consent to the interview being audio recorded (unless indicated otherwise below).
- You understand that your anonymity will be preserved unless you explicitly waive this right.

Participant's Name: ....

Participant's Signature: ....

Date: ....

Researcher's Name: ....

Researcher's Signature: ....

Date: ....

☐ I give permission for the interview to be audio recorded.

☐ I do **not** give permission for the interview to be audio recorded.

☐ I agree that anonymized quotes from the interview may be used in the thesis.

☐ I do **not** agree that any quotes from the interview may be used.