

The effect of blue accounting on South African Ocean-Based companies' environmental performance: Evidence from Johannesburg Stock Exchange listed companies



A dissertation submitted in partial fulfilment of the requirements for Master of Accountancy degree at the University of KwaZulu-Natal

By

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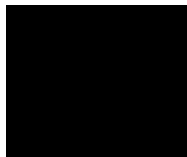
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DECLARATION

I, Ntombizandile Mbiza, declare that:

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DEDICATION

My dedication is to Christ Jesus, my personal Lord and Savior, who enabled me to complete this master's programme. He was my strength and hope even when I was discouraged and could not see my way to finishing. His grace enabled, sustained, and was found to be sufficient when I needed it the most. He gave a willing heart to everyone who assisted me in completing this programme. He made my aspiration to complete the programme become a reality. His grace was never found lacking as I worked to complete this programme from day one until the end. Had it not been for His grace and mercy, this would not have been possible. I can, with humility, confess that I have attained this qualification by the grace of God.

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ABSTRACT

Marine resources are vital for economic, social, and recreational use but are often undervalued because the measures for assessing and reporting on their usage are limited. Blue accounting seeks to systematically identify, measure, value, recognise, and report on marine resource use and impact. This study examines blue accounting practices in South African marine-sensitive companies, such as those in fishing, aquaculture, and logistics, listed on the Johannesburg Stock Exchange (JSE). The research assesses factors influencing blue accounting adoption and the way blue accounting disclosures in integrated reports impact environmental performance. Stakeholder, signalling, and legitimacy theory underpin this study. A hybrid methodology combining qualitative and quantitative research, including scoping reviews, correlational analysis, pooled regression, and content analysis, was used to identify factors influencing blue accounting adoption and how blue accounting influences environmental performance. Key factors influencing blue accounting adoption include stakeholder pressure, alignment with sustainable development goals, and a lack of frameworks and regulatory guidelines. Significant positive correlations were found between environmental performance and firm size (coefficient: 16.07; p-value: 0.00), adherence to environmental guidelines (coefficient: 7.48; p-value: 0.02) and reporting costs (coefficient: 6.35; p-value: 0.01). Conversely, environmental obligations (coefficient: -3.92; p-value: 0.02) and firm age (coefficient: -0.18; p-value: 0.00) negatively correlated with performance, reflecting legacy challenges. Findings suggest that blue accounting enhances environmental performance through transparency and accountability. However, inconsistent regulatory enforcement and lack of uniform frameworks hinder adoption, highlighting the need for stronger oversight and standardised practices. The findings align with stakeholder, signalling, and legitimacy theories, demonstrating that blue accounting disclosures are valuable for meeting stakeholder expectations and legitimising corporate actions. Marine-sensitive companies are encouraged to adopt sustainability guidelines, like the Global Reporting Initiative (GRI). At the same time, policymakers should develop a blue accounting framework and enforce compliance to promote sustainable marine practices. This study contributes to the field of blue accounting, providing a foundation for future research on sustainable marine resource management in corporate reporting.

Keywords: Blue accounting, environmental performance, marine-sensitive organisations, sustainability reporting, and sustainability.

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CHAPTER 1: INTRODUCTION

1.1 Introduction

This chapter discusses the context of the research, the issue being addressed, the study's objectives, the questions guiding the research, the study's significance, scope, assumptions, limitations, and an outline of how the study is set out. Corporate reporting has evolved to encompass voluntary disclosure of non-financial information. The marine organisation's integrated report is expected to include a voluntary disclosure of how the organisation's operations interact with the marine resources (blue accounting). Thus, the study will evaluate the influence that blue accounting by marine-sensitive companies may have on the organisation's environmental performance. The following sections present the study's background, problem statement and research framework, defining its purpose and direction.

1.2 Background to the Study

Over the years, corporate reporting has evolved to provide comprehensive applicable information to meet users' needs, evolving from the balanced scorecard, triple bottom line, sustainability reporting, and, lately, integrated reporting (Massingham et al., 2019; Struwig et al., 2024; Syah et al., 2020). Thus, the reports are progressing from containing purely financial information to encompassing non-financial information to meet users' growing demand for holistic information to enable and enhance making informed strategic decisions (Maama & Mkhize, 2020; Manes-Rossi et al., 2018). Such holistic, comprehensive corporate reporting, called integrated reporting (IR), aims to address users' concerns about the limitations of the financial statements based on historical information in providing valuable and relevant financial information for informed decision-making (Caglio et al., 2020; Maama & Mkhize, 2020). IR is the new norm for corporate reporting, in which South Africa is regarded as a pioneer of integrated reporting (de Villiers et al., 2020a; Phaswana, 2018). South Africa's mandatory application of integrated reporting applies to all the Johannesburg Stock Exchange (JSE) listed companies as part of adherence to the principles of the King Code on Corporate Governance, currently King IV, a JSE listing requirement (Dinh et al., 2023; Phaswana, 2018). The JSE is the only stock exchange in South Africa and the biggest exchange in Africa (Imhanzenobe, 2023; Sukhari & De Villiers, 2019). Integrated reporting entails reporting on the companies' social, environmental, and financial performance in an integrated manner (De Villiers et al., 2020b; Mans-Kemp & Van der Lugt, 2020). Integrated reporting consists of reporting on each of the six capitals and reflects how the organisation creates or destroys value

over time. This includes value in relation to its stakeholders (aligning with stakeholder theory), value for future generations (aligning with sustainability) and value to society (aligning with social and environmental accounting) (De Villiers & Sharma, 2020; Phaswana, 2018). Despite the growth of IR as a comprehensive and holistic form of corporate reporting, only a limited number of blue accounting studies are available in the African context, especially in the South African context, which may be an indication of the availability of room for research on blue accounting (Failler et al., 2023; Winarsih et al., 2020). There is, in fact, little available empirical evidence on how companies in developing countries account for environmental disclosures (Elshabasy, 2018). As sustainability performance, which includes environmental performance, reflects entities' activities and accomplishments relating to sustainability, it is considered worthwhile to evaluate whether it is enhanced by blue accounting (Papoutsi & Sodhi, 2020). The environmental performance of an entity can be evaluated through IR environmental reporting, which reflects the way an entity uses one of the natural capitals, the water / maritime ecosystem. IR environmental reporting triggers blue accounting, which is accounting for the maritime system and its assets, which are critical boosters of the ocean economy (Shahab et al., 2020; Syah et al., 2020).

The components of the study, including the marine system, blue accounting, and environmental performance, will be explored. The natural ecosystem, including the marine ecosystem, comprises vast resources that benefit the human population, and at times, these resources are enjoyed by humans and organisations without incurring a cost (Abreu et al., 2019; Winarsih et al., 2020). Blue accounting seeks to provide the company and its various stakeholders with useful information that will enable them to recognise, evaluate, gauge, and ultimately report on the ocean opportunities, risks, and sustainability of the company's interaction with ocean life (Abreu et al., 2019). The systematic reporting of the organisation's activities, impact and practices in relation to marine sustainability is referred to as blue accounting disclosures (Abreu et al., 2019; Rahmayanti & Sari, 2023). Therefore, blue accounting disclosures serve as a reporting mechanism of blue accounting i.e. the communication of all the findings concerning the organisation's marine sustainability practices. This area of blue accounting is not well-researched compared to other spheres of sustainability reporting, such as green accounting, which has gained popularity since the 1970s (Pattinaja et al., 2023; Syah et al., 2020). There is, however, a need to understand the ocean and ocean economy in view of the evolution and growth of the blue economy, which is at the core of the fairly new research field of blue accounting (Abreu et al., 2019). The growth of the ocean economy is not without challenges,

such as how to evaluate and report on degradation, reuse, and destruction of the maritime resources, thus necessitating blue accounting as a means of accounting for all these impacts on the sustainability of the maritime resources (Abreu et al., 2019; Winarsih et al., 2020). This is relevant for both developed and emerging economies as consequences such as increased pollution and over-exploitation of the ocean resources have a negative impact that may cause irreversible damage and unquantifiable adverse effects, especially considering that the ocean covers 72% of the earth (Rahmayanti & Sari, 2023; Struwig et al., 2024). Due to this impact, the ocean has areas called “dead zones” due to the pollution, which has caused oxygen deprivation over time and led to some marine waters being without active marine life (Remmert, 2019).

As this study is focused on South African listed companies, it will delve into South African marine-related literature. According to the literature, South African marine resources can be attributed to the location of South Africa, with access to the sea routes that connect the East to the West, the Atlantic to the Indian Oceans, thus providing a coastline of approximately 3924 kilometres and the exclusive economic zones of South Africa, which span over 1.54 million square kilometres (Findlay, 2018; Robinson et al., 2020). These coastal spheres house approximately 12,000 marine species, accounting for approximately 15% of global species (Robinson et al., 2020). Furthermore, the South African marine economy comprises about eight major seaports with 42 coastal marine protected areas (MPAs) offshore and in near-coastal and coastal locations; however, the full potential of this economy is hampered by the poor state of the ocean, poor infrastructure, the high rate of illegal plastic disposal into the sea and other types of marine pollution from sources such as commercial farming via the chemicals and fertilisers used in farming, which affect the water sources, mining waste products, industrial discharges, recreational boaters, offshore oil and gas platforms, and the general population who use the ocean (Fayiga et al., 2018; Walker, 2018). The literature reflects the numerous marine resources and significant maritime infrastructure South Africa possesses despite the poor state of the infrastructure, which hinders the ocean economy making a maximum contribution to the gross domestic product (GDP) despite the various initiatives in the National Development Plan (NDP) such as Operation Phakisa (Struwig et al., 2024; Walker, 2018). Operation Phakisa seeks to unlock the ocean economy by analysing constraints and taking the necessary action that will enable increased productivity of these marine sectors: Shipping and transport by sea, production and manufacturing related to marine activities, exploration of oil and gas in offshore areas, extraction of diamonds from offshore locations, fish farming and aquaculture practices,

services for marine environmental protection and ocean management, development of small harbours and coastal and marine tourism activities (Findlay, 2018; Kirkman et al., 2021). These marine resources, properly and effectively used, can provide employment, especially in the rural and marginalised areas close to the coastline, where aquaculture and tourism are viable opportunities, and contribute to the broader South African economy through the use of the potential undersea offshore oil and gas, where the yield is approximately nine billion barrels of oil. All the above spheres could contribute uniquely to the economy (Struwig et al., 2024; Walker, 2018). The ocean economy of South Africa contributes approximately R57 billion and 35% of the GDP. These figures have been increasing over the years, highlighting the significant value the marine resources add to the sustainability of the economy, especially considering that 58% of the GDP comes from trade, which depends 98% on sea shipping (Struwig et al., 2024; Walker, 2018)

However, South Africa has not escaped the challenges the marine ecosystem is exposed to, such as the poaching of rare ocean species like crayfish and abalone, which are sometimes harvested and sold illegally, and the high level of non-adherence with the relevant legislation and regulatory requirements that govern the ocean economy of South Africa including laws to prevent overfishing. Unfortunately, this non-compliance is underplayed due to corruption in South Africa and therefore, the potential of the ocean economy is under-realised (Findlay, 2018; Pfaff et al., 2019). Further sources of marine pollution in South Africa are industries such as construction, households, packaging and coastal tourism (Alpizar et al., 2020).

There is, therefore, a need for insight into ways to sustainably develop and increase maritime life to create a conducive environment for an eco-friendly sustainable future (Abreu et al., 2019; Kirkman et al., 2021). The marine economy depends on marine and freshwater resources, e.g. seas, lakes, rivers, groundwater, river banks, and coastlines, all of which are continuously exposed to development and human activities such as drinking, fishing, swimming, shipping, and travelling (Failler & Seisay, 2021).

Blue accounting is meant to close the gap in accounting, which has mainly focused on financial concepts without an equivalent focus on environmental sustainability and social considerations relating to an organisation's practices (Syah et al., 2020). Sustainability refers to an organisation's performance in all its areas of operation. Sustainability is mainly reported on in annual reports (Haryono et al., 2016; Narula et al., 2024; Silva, 2021). Sustainability is of great

value, considering how important natural capital is for various organisations, governments, and society, especially seeing that natural capital cannot be replenished should it be destroyed. Traditional financial reporting shows the financial effects of an organisation's practices without encompassing the social and environmental effects of the decisions made. This illustrates the need for natural capital to be measured and reported on so as to enable organisations to take cognisance of the effect of their usage of natural capital (Agyemang et al., 2021; Khan, Zhang, Kumar, et al., 2020). Marine assets are part of this natural capital; however, their usage is not currently being assessed through a framework, which points to the urgent need for a global accounting standard that can be used internationally and uniformly provides a framework on how to identify, measure, value, recognise and report on maritime resources (Abreu et al., 2019; Udo, 2019). However, this does not necessarily demand a complete reorganisation of the way in which organisations attempt to account for marine resources. It simply demands that organisations integrate that information with the social effects to enhance decision-making and accountability (Perkiss et al., 2022). Such integration would require a standard or framework that would help to achieve uniform accounting for marine resources, which will aid the decision-making process and achieve uniform information infrastructure for marine ecosystem policies, marine spatial planning, marine environmental management, and international reporting (Perkiss et al., 2022). This urgency has been heightened by United Nations conferences on the Law of the Sea from 1958 to recent developments in 2016, Ocean 2030: Sustainable Development Goals (SDG) and Ocean Business Community, specifically culminating in SDG 14: Life Below Water, which is considered critical for the achievement of the other goals (Lubchenco & Haugan, 2023; Souza-Piao et al., 2022). To the author's knowledge, there is limited empirical evidence on blue accounting due to the absence of similar research outputs on blue accounting. This is evident even in the African and South African context, thus indicating a possible need for information on blue accounting (Failler et al., 2023). While there are many indicators of the sustainability performance of maritime-sensitive companies, this study focuses on environmental performance. This study investigates the effect of blue accounting on marine-sensitive JSE-listed companies' environmental performance (Abreu et al., 2019). The background discussion highlights the need for research on blue accounting, specifically in the South African context, where there are limited studies that address blue accounting disclosures and the effect this might have on environmental performance. This leads to the problem statement, where the research gaps are discussed in further detail.

1.3 Problem Statement

Despite advancements in corporate reporting, including the development of reporting frameworks such as the Environmental, Social and Governance (ESG) framework, blue accounting remains unexplored, particularly in developing nations like South Africa (de Villiers et al., 2020a; Syah et al., 2020). This gap is particularly significant in South Africa, where marine-sensitive companies listed on the JSE have substantial environmental impacts. Despite the identified trendy topics in environmental accounting, blue accounting has not made it to the list as it has not yet gained significant popularity, as evidenced by the limited studies on the concept globally and in Africa (Failler et al., 2023; Perkiss et al., 2022; Rahmayanti & Sari, 2023). This study was triggered by the growth of the ocean economy and the consequent growth of ocean pollution and degradation of ocean life due to increased ocean use and exploitation (Castro-Cadenas et al., 2022; Potgieter, 2018). Ocean pollution is a rapidly growing area that is less recognised and managed. At least 80% of ocean pollution is due to land sources such as run-off from agricultural activities, plastic pollution, heavy metals, especially mercury, coal usage, and other gases generated by the transport sphere (Herbert-Read et al., 2022; Landrigan et al., 2020; McGlade et al., 2020; Stafford et al., 2022; Struwig et al., 2024). The question that arises is how effective the measures employed at the international, national, and regional levels are in curbing this pollution, especially given that one such measure is fishing quotas, which provides some benefits but does not holistically address the ocean's environmental health (Remmert, 2019).

This study notes that blue accounting information is presented in the integrated annual reports despite the lack of an established uniform framework guiding blue accounting, thus resulting in fragmented information (Failler et al., 2023; Failler & Seisay, 2021). The absence of a standardised blue accounting framework creates challenges for stakeholders, such as investors and regulators, in assessing the environmental impact of marine-sensitive companies (Winarsih et al., 2020). This discrepancy restricts their capacity to make knowledgeable choices regarding sustainable practices and resource management. The study will focus on blue accounting practices by South African Johannesburg Stock Exchange (JSE) listed entities, where the effect of blue accounting on the environmental performance of organisations will be assessed, thereby helping to clarify one of the current murky areas in the accounting reporting field. Thus, investigating blue accounting and environmental performance for organisations and their various stakeholders might provide some insights, especially considering the absence of literature in this area and the current global drive for organisations to be environmentally

sustainable. The study will provide information that could assist organisations in the maritime-sensitive industry to understand how their activities affect the marine ecosystem and how they could improve their activities. This problem statement highlights the lack of a blue accounting framework that can be consistently and uniformly applied by ocean-based organisations. It also highlights the potential value this study provides in addressing the environmental challenges facing South Africa's marine economy. Blue accounting and environmental performance provide the rationale for the objectives of the study.

1.4 Objectives of the Study

- To identify factors that influence the organisation's adoption of blue accounting disclosure.
- To determine whether blue accounting has a significant effect on the environmental performance of South African maritime companies listed on the Johannesburg Stock Exchange.

These objectives enable an enhanced understanding of the concept of blue accounting and the possible extent to which it might affect a company's environmental performance.

1.5 Research Questions

The study seeks to answer the following:

- What are the factors that influence organisations to adopt blue accounting disclosures?
- Does blue accounting have a significant effect on the environmental performance of South African ocean-based companies listed on the JSE?

1.6 Significance of the Study

The study investigates whether blue accounting for South African maritime-sensitive JSE-listed companies enhances environmental performance. The expected contributions are as follows:

1.6.1 Ocean-based Organisations

The study provides critical insights for marine-sensitive organisations on the impact of their activities on the marine ecosystem, highlighting both positive and negative effects. This empowers these organisations to integrate sustainable practices into their operations,

addressing the urgent need for marine conservation. The findings will help marine organisations assess how their activities affect marine resources and environmental performance. Moreover, the study offers insights for the government and other stakeholders into effective marine resource management while supporting the maximisation of the blue economy.

1.6.2 Policymakers and Regulators

The research equips policymakers, regulators, and stakeholders with data on the environmental impacts of various operational activities within marine ecosystems. These insights can guide the alignment of activities to foster productive management of the blue economy and marine assets. The findings are expected to facilitate policy interventions that promote sustainable marine resource management and ecosystem protection.

1.6.3 Academic and Research Community

This study contributes to the accounting field by enhancing understanding of the blue accounting concept within the South African context. It could serve as a foundation for developing a blue accounting framework and addressing the scarcity of literature in this field. The study also identifies areas for future research, potentially enabling further exploration of blue accounting in other regions, including Africa and the global maritime economy.

Additionally, this research enriches the academic discourse on environmental performance and blue accounting, creating opportunities for interdisciplinary studies and expanding the literature on marine sustainability and accounting practices. It opens avenues for investigating unexplored areas related to blue accounting disclosures and their role in environmental accountability.

1.7 Delimitations (Scope) of the Study

The study used integrated annual reports of organisations listed in South Africa on the JSE and operating in marine-sensitive sectors, such as companies with shipping and logistics, fishing, oil, and energy operations. The study was conducted over five years, from 2019 to 2023, as this was considered a fair coverage period over which the companies have applied integrated reporting principles, providing environmentally related information through which blue accounting-related information was presented.

1.8 Research Methodology

The study employs a mixed methods approach, integrating qualitative and quantitative research methods to achieve the research objectives. A qualitative scoping review is conducted for research objective 1, while a quantitative content analysis with econometric modelling is conducted for research objective 2. The data for the listed companies' blue accounting and environmental performance was obtained from the audited annual reports and integrated annual reports, which comprise the sustainability performance reports. The study is grounded in the pragmatism philosophy, which allows the integration of both qualitative and quantitative methods to provide a comprehensive understanding of the research problem. It is acknowledged that the mixed method approach applied might yield different research than if only the qualitative or quantitative method were adopted for the study. The study's results were noted to be relevant and applicable only to marine-sensitive South African JSE-listed companies and limited to disclosures on environmental factors related to their operations. Therefore, companies operating in areas other than shipping, logistics, fishing, and the oil and energy sectors were excluded.

1.9 Assumptions of the Study

- The period of five years was assumed to be sufficient to provide comprehensive information about the blue accounting practices of the listed companies, considering that the listed companies have implemented the integrated reporting framework for a sufficiently significant period.

1.10 Limitations of the Study

The few studies in this area lead to the scarcity of studies in the areas explored by the study, which means that only a limited comparison of its findings could be made with those of prior research. The study focused on South African marine-sensitive companies listed on the JSE, excluding those not listed on the JSE. Therefore, the findings of the study apply to this context.

1.11 Organisation of the Study

This section provides an outline of how the report is organised:

Chapter 1: Introduction and Background to the Study

Chapter 1 introduces the study by providing a high-level outline of the research topic and the study. A rationale is provided for the performance of the study to establish what influences marine-sensitive organisations to adopt blue accounting practices and, if an organisation adopts them, what effect the blue accounting disclosure has on the organisation's environmental performance. The chapter also sets out the research problem being investigated, the objectives of the study, the research questions, and the significance of the study. Furthermore, the methodology and the study's scope, assumptions, and limitations are briefly highlighted.

Chapter 2: Literature Review

Chapter 2 provides information on the literature reviewed for the topic, focusing on blue accounting considerations, the blue economy/ocean value, sustainability, and environmental performance. Consequently, a synthesis of national and international literature regarding the abovementioned concepts and their related ideas is provided. The theoretical framework relevant to the study is also defined with respect to blue accounting and environmental performance for marine-sensitive companies.

Chapter 3: Research Methodology and Research Design

Chapter 3 outlines the research methodology used to address the study's research question, including specifics about the population, sample, data collection techniques, data elimination processes, and the utilisation of annual integrated reports as a source of secondary data. It further provides a rationale for the methods and techniques selected for the study. Finally, it addresses the strategies implemented to ensure the validity and reliability of the information utilised in the research.

Chapter 4: Data Presentation and Analysis

Chapter 4 discusses the information extracted from the scoping review. The descriptive statistics calculated from the data are examined, and the correlation and regression analysis calculations are performed on the variables of the model. Lastly, the data from the above analysis are examined and summarised.

Chapter 5: Summary, Conclusion and Recommendations

Chapter 5 provides a summarises the findings, conclusions, and recommendations emanating from the data analysis. A critical review of the findings is presented in relation to the literature review in Chapter 3, with reference to the objectives and questions the research seeks to

address. Lastly, the gaps identified throughout the study highlight the limitations and suggest potential areas for future research /studies.

1. 11 Chapter Reflections and Conclusion

This chapter introduced the study and detailed its background, objectives, significance and scope while identifying the critical gaps in blue accounting research for ocean-based companies in South Africa. This entailed briefly discussing the nature of corporate reporting, non-financial information disclosure, blue accounting, and environmental performance for marine-sensitive organisations in the context of South Africa's JSE-listed organisations. The chapter concludes by laying a foundation for limited non-financial reporting in relation to blue accounting disclosures for marine-sensitive organisations in South Africa's JSE-listed organisations, despite the ocean being one of the greatest natural resources. The chapter ends with a discussion of the study's limitations and the structure of the dissertation. The following chapter is a review of the study's theoretical and empirical literature. It lays the foundation for understanding blue accounting's potential impact on environmental performance, thereby providing a context for the study's objectives.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter provides information on the literature reviewed for this study, focusing on blue accounting considerations, the blue economy/ocean value, and environmental performance. Accordingly, the theoretical framework guiding the study, that is, stakeholder theory, legitimacy theory and signalling theory, was also discussed as a means to interpret blue accounting and its impact on environmental performance for marine-sensitive organisations. The literature review indicates that the main facets of the research were covered by various articles, as evidenced by the citations of various authors. Recent sources were used except in instances of classic articles, and these were structured in a logical and orderly manner so as to highlight the various insights from the publications that pertain to the research subject (Walwyn & Chan, 2019). This was meant to provide a broad understanding of the research topic, identify research gaps which can be further explored or studied, provide assistance in determining the research topic and questions and provide methodologies that can be adapted for the purpose of future research (Walwyn & Chan, 2019).

This gave rise to a discussion of the theoretical framework with reference to three theories, namely stakeholder, legitimacy and signalling theory, as the theoretical foundational principles that anchor this research. The review of both international and national literature was aimed at understanding the effect blue accounting has on the environmental performance of a JSE-listed marine-sensitive organisation. The literature reviewed formed a background for the study to delve into the South African context and appropriately lay the foundation for evaluating South African JSE-listed marine-sensitive organisations. Lastly, the empirical findings were discussed in line with the relevant literature. This chapter will, therefore, provide the theories, concepts, key variables, methods and historical background relevant to the study (Randolph, 2019). The following discussions contribute various scholarly views on blue accounting and environmental performance to identify research gaps and data that could advance this emerging area.

2.2 Theoretical Literature Review

This section explores the existing theories that underpin the study and discuss how these theories explain and interact with the study (Randolph, 2019; Walliman, 2021; Xiao & Watson, 2019). The use of multiple theories is important, considering the complex nature of the studies

that have investigated environmental activities. This complexity demonstrates that it is not possible to comprehensively explain environmental activities by means of a single theory (Wirawan et al., 2020). This is supported by numerous studies that have investigated and elaborated on the multi-theory approach. These earlier studies highlight that the disclosure of non-financial information, as well as the connection between environmental performance and environmental disclosure, can be understood through various theoretical frameworks, including legitimacy theory, agency theory, stakeholder theory, signalling theory, and information asymmetry theory (Alsayegh et al., 2020; Bellamy et al., 2020; Hassan et al., 2021). Other studies support the application of these theories in research on environmental disclosure and performance (Martiny et al., 2024; Ngole & Mabonesho, 2023; Silva, 2021). Other studies suggest different theories for explaining environmental reporting and environmental performance, such as the voluntary disclosure theory, institutional theory, positive accounting theory and intergenerational equity theory (Doan & Sassen, 2020; Hassan et al., 2020; Maama & Mkhize, 2020).

While these theories provide valuable insights into disclosure practises, not all were considered relevant for this study. The following sections explain why voluntary disclosure theory, institutional theory, positive accounting theory, and information asymmetry theory were not considered relevant for this study, while signalling, legitimacy and stakeholder theory were selected as the underpinning theories for the study. Information asymmetry theory is incorporated in signalling theory and will thus not be discussed separately. Therefore, though blue accounting is voluntary, this theory would not explain why organisations disclose particular blue accounting requirements. Thus, stakeholder theory was considered more appropriate as it explains the effect of the external pressures by the broader body of stakeholders in influencing organisations to adopt blue accounting.

2.2.1 Information Asymmetry Theory

This is one of the pivotal theories in contemporary accounting, management, business studies, economics and finance (Cui et al., 2018). This theory assumes that when it comes to making decisions, the organisation's management has access to more information than external stakeholders, which leads to an imbalance of power (Cui et al., 2018). Therefore, organisations reduce this gap by disclosing more information, and transparency helps improve stakeholder relationships and reputation (Alsayegh et al., 2020; Lakhani & Herbert, 2022). Thus, organisations use quality reports of their sustainability activities and integrated reports to

reduce this asymmetry, especially for non-financial information (Alsayegh et al., 2020; Zyznarska-Dworczak, 2020). The signalling theory discussed in detail below responds directly to this, and thus, this theory is incorporated into the signalling theory (Lakhani & Herbert, 2022; Zyznarska-Dworczak, 2020).

2.2.2 Voluntary Disclosure Theory

This theory suggests that organisations strategically disclose information that is not mandatory to enhance their reputation and signal their superiority (Lakhani & Herbert, 2022). It promises that organisations that are performing well present more environmental disclosures, whereas poor-performing organisations tend to disclose selective or minimal information as a means to manage scrutiny (Lakhani & Herbert, 2022). Therefore, this theory was scoped out for this study since blue accounting disclosures do not solely depend on voluntary disclosure but rather indicate the growing necessity for sustainability rather than a strategic choice. Furthermore, this theory does not explain why organisations disclose certain environmental information beyond what is required; thus, stakeholder theory was considered more appropriate as it speaks to the broader stakeholder pressures.

2.2.3 Institutional Theory

Institutional theory suggests that organisations adjust their practices to align with the regulatory, normative and cultural pressures of the environment they are operating in to achieve legitimacy (Lakhani & Herbert, 2022). This theory explains how complying with regulations and industry standards influences organisations' disclosures (Maama & Mkhize, 2020; Rouf et al., 2024). Hence, this theory is considered more relevant when regulatory compliance drives the organisations' disclosures. Therefore, since blue accounting is emerging and is voluntary in that there is no regulatory requirement that enforces its adoption, this theory would thus not fully explain why organisations voluntarily disclose marine environmental information. Rather, the legitimacy theory was considered more appropriate as it focuses on organisations using voluntary disclosures to legitimise their operations.

2.2.4 Positive Accounting Theory

This theory, also known as the political cost theory, investigates how companies select which accounting policies maximise financial and strategic benefits (Maama & Mkhize, 2020). This theory primarily applies to financial accounting practices that focus on managerial incentives,

taxation, political costs and earnings management (Maama & Mkhize, 2020; Nasution et al., 2020). Based on the above explanations, blue accounting entails non-financial reporting; it does not fall within the scope of positive accounting theory, which explains how management manipulates the financial statement to meet their interest. Therefore, the positive accounting theory was excluded because the study focuses on blue accounting adoption and its effect on environmental performance rather than accounting policy decisions.

The establishment of the applicable theoretical framework provides a basis for creating a framework for understanding the study, assists in providing a structure for the study, and improves the study's credibility by employing the shared common language used by researchers and practitioners (Martiny et al., 2024). Considering the excluded theories, the study applies signalling, legitimacy, and stakeholder theory. These theoretical perspectives were assessed to identify and assess the role blue accounting plays in the organisation's environmental performance. The information from this study area provided evidence of why organisations adopt blue accounting as part of their corporate reporting and how this influences their environmental performance. These theories will be discussed in detail as follows.

2.2.5 Legitimacy Theory

Legitimacy theory was first mentioned in the literature by Max Weber in 1947. Lindblom and Suchman Mark further developed it in 1994-1995, where legitimacy was explained as a state in which an organisation coordinates its affairs in such a way that the organisation is aligned with the society or community of which it is a corporate citizen of (Hora & Subramanian, 2019; Manes-Rossi et al., 2018; Pittrakkos & Maroun, 2020). This definition supports the definition of legitimacy applied in other research works (Aluchna et al., 2022; Santos et al., 2021; Tingbani et al., 2020; Udo, 2019). This theory suggests that organisations, especially those that conduct environmentally harmful activities, should manage their operations constructively and in accordance with environmental laws and regulations (Mgilane, 2023). This is considered one of the formerly and currently most usual ways to explain why organisations report on their environmental performance (Silva, 2021). Hence, it was considered for evaluating environmental performance, taking blue accounting disclosures into account. This indicates that legitimacy requires organisations to adhere to all the recognised societal standards and social expectations (Mgilane, 2023). However, with respect to blue accounting, it might be challenging for an entity to fulfil all the varied demands and requirements of its community, especially considering that because the phenomenon is new, it might be difficult for the

organisation to establish what these needs are. This, therefore, confirms that an organisation operates in line with a social contract, a key concept in legitimacy theory, where the organisation ensures that its operations are aligned with the social values that the society upholds (Braam & Peeters, 2018; Drempetic et al., 2020a; Udo, 2019). This is consistent with other researchers' emphasis on the role played by abiding by the terms of the social contract to ensure and enhance the organisation's legitimacy and credibility with its constituencies (Deegan, 2019; Pittrakkos & Maroun, 2020; Wibowo & Lasdi, 2022). To enable society to assess legitimacy, the organisation provides relevant disclosures, at times voluntarily, especially for social and environmental aspects, which are not regulated in some instances (Datt et al., 2019; Elshabasy, 2018; Gallardo-Vazquez et al., 2019).

The terms of this social contract are an expectation regarding the extent to which the organisation can conform to these terms and can be influenced by mandatory environmental reporting, which enhances the quality and the amount of environmental disclosures (Aluchna et al., 2022). Overall, organisations need to recognise that they are not isolated from the society within which they operate and that, therefore, they should operate within acceptable parameters. Hence, organisations should recognise that their survival and continued success are dependent on how well they reflect their commitment to their stakeholders (Carandang & Ferrer, 2020; Hora & Subramanian, 2019; Jiang & Fu, 2019; Manes-Rossi et al., 2018). This commitment is evident in the way an organisation manages to embed societal and stakeholder values into its operations as a means to legitimise its standing in the environment or society where it functions (Al-Jalahma et al., 2020; Maama & Mkhize, 2020; Tadros et al., 2020).

Additionally, this theory is premised on five principles, which will be discussed in the context of environmental reporting. These five principles are as follows: principle 1 alludes to the correlation between authority and acquiescence, principle 2 alludes to organisational support, principle 3 alludes to approval by society and the authority society has, principle 4 alludes to interaction, and lastly, principle 5 alludes to acquiescence in the social context (Hamm et al., 2022). The first principle of legitimacy theory, which is fundamental to its application, describes the organisation's attempts to influence the community and, ultimately, the community responding positively or negatively to those attempts (Chiu et al., 2020; Hamm et al., 2022; Rosa Portella & Borba, 2020). Therefore, the organisation's blue accounting disclosures can enable it to establish its authority over the community, and the community's response determines whether this form of environmental reporting confirms its legitimacy.

Therefore, when an organisation operates in a manner that contravenes the terms and conditions of the social contract, whether implied or explicit, the organisation stands to lose its legitimacy and is seen as unacceptable by society, which then adversely affects its reputation and operations (Bellamy et al., 2020; Gregory, 2024; Maama & Mkhize, 2020; Manes-Rossi et al., 2018). The reputation and operations of the organisation may suffer (Aluchna et al., 2022; Haque & Ntim, 2018; Jiang & Fu, 2019).

To summarise the above discussion, legitimacy is anchored in the organisation's relationship with the community. The organisation, therefore, needs to understand its community, just as the community needs to understand the organisation's needs to ensure reciprocal and effective satisfaction of needs and sustainability (Deegan, 2019; Mgilane, 2023). The concept of legitimacy thus enables organisations to achieve their goals and meet stakeholder needs. Therefore, organisations communicate their marine environmental activities using blue accounting disclosures in the annual integrated and sustainability reports, thereby enabling society to assess the organisation's standing as regards the social contract.

Consequently, as these environmental disclosures extend beyond financial disclosures, they have been considered to compensate for the distorted picture that organisations sometimes present when they only report on the financial aspects of their operations, which is not a holistic representation, and enable users to understand the effect the operations of an organisation have on the environment (Agyemang et al., 2021; Maama & Mkhize, 2020; Manes-Rossi et al., 2018; Mukhtar et al., 2023; Silva, 2021). Environmental disclosure underlines the fact that the legitimacy of an organisation influences the extent to which the organisation is able to attract resources to support its operations and ultimately continue operating sustainably. Therefore, if the organisation is not seen to be legitimate by society, this might affect its bottom line and, ultimately, its survival (principle 3) (Carandang & Ferrer, 2020; Deegan, 2019; Narula et al., 2024; Wang et al., 2020). This principle has also been alluded to in other studies (Hamm et al., 2022; Jiang & Fu, 2019; Tingbani et al., 2020). Consequently, since the organisation's legitimacy also affects its sustainability and profitability, organisations are likely to make the necessary efforts to meet the terms of their environmental-social contract.

From the legitimacy point of view, extending beyond financial data reporting entails environmental reporting, which reflects the entity's transparency, accountability, and the extent

of information asymmetry achieved by the organisation, as these factors indicate how the stakeholders perceive the identity of the organisation (Alsayegh et al., 2020; Baalouch et al., 2019; Doan & Sassen, 2020; Dremptetic et al., 2020b; Hamm et al., 2022; Silva, 2021). Ultimately, such non-financial data disclosures enhance the credibility of an organisation, especially when its environmental performance is under scrutiny (Datt et al., 2019; Elshabasy, 2018; Maama & Mkhize, 2020; Pitrakkos & Maroun, 2020). However, the organisation should not see this merely as an obligation. As a result, environmental disclosures will increase, and these disclosures are designed to reassure stakeholders that their concerns have been noted and are being responded to. This response could even take the form of changes in the entity's policies, strategies and processes where the organisation commits to responsible environmental performance (Christensen et al., 2021; Luo et al., 2019; Pitrakkos & Maroun, 2020). Consequently, the growing need for an entity to efficiently manage its legitimacy and report on its environmental performance through corporate reporting is part of the response to external pressures regarding how the organisation is performing in meeting society's reporting needs (Dremptetic et al., 2020b; Elshabasy, 2018; Hassan et al., 2021; Helfaya & Whittington, 2019; O'donovan, 2002; Sun et al., 2024).

The organisation's main communication tool for this is its annual integrated report, which is one of the reports provided by the organisation to enable the public to assess the standing of the organisation on matters such as environmental reporting, thus making it a tool that the organisation can use to legitimise its operations to society at large (Deegan, 2019; Elshabasy, 2018; Hora & Subramanian, 2019; Maama & Mkhize, 2020; O'donovan, 2002; Phaswana, 2018). The increasing publicity given in the media to the growing degradation of natural resources, including the marine ecosystem, is making society increasingly sensitive to environmental damage, which is likely to put an organisation's legitimacy under scrutiny (Deegan, 2019; Gunawan et al., 2020; Maama & Mkhize, 2020; Mukhtar et al., 2023). Therefore, the organisation's environmental disclosures, which include blue accounting disclosures, will aid in maintaining, repairing, or enhancing its legitimacy in the eyes of its various stakeholders (Arvidsson & Dumay, 2022; Baalouch et al., 2019; Deegan, 2019; Pitrakkos & Maroun, 2020; Winarsih et al., 2020). This provides evidence of the fourth and fifth principles, highlighting the fact that society responds to organisational practices based on how it perceives an organisation. This perception is influenced by personal beliefs regarding what is important (Hamm et al., 2022; Udo, 2019).

From the above discussions, it can be deduced that the organisation's report on sustainability performance can serve as a tool to highlight its current sustainability practices, its new sustainability initiatives, and the way its core operations speak to sustainability (Benjamin et al., 2023; Brogi & Lagasio, 2019; Doan & Sassen, 2020; Drempetic et al., 2020b; Shahab et al., 2020; Silva, 2021). It is, therefore, evident from the above discussion that it is crucial to be seen by the community as legitimate and legally compliant and to confirm by means of reporting that the terms of the social contract are being met.

However, the crucial need to be seen as legitimate, unfortunately, sometimes leads organisations to adopt “blue washing” or management practices aimed at making a certain impression where the organisation makes environmental decisions that will improve their image in society when, in fact, they are simply managing perceptions and are not interested in improving the sustainability of their environmental activities (Al-Shaer & Hussainey, 2022; Haque & Ntim, 2018; Silva, 2021). This ‘impression management’ could also entail disclosing more environmental information as a means to divert stakeholders’ attention away from shortcomings, especially when the organisation has been found to have fallen short of its expected environmental responsibilities (Maama & Mkhize, 2020). Admittedly, organisations may be challenged by unreasonable and intolerable societal demands, thus making it challenging for them to satisfy the needs of the various people within the society in which the organisation operates, with the result that the organisation's legitimacy may be under threat (Izzo et al., 2020; Mgilane, 2023). This theory is also affected by limitations such as a lack of clarity and specificity about the identity of stakeholders and by the fact that, at times, financial stakeholders may be prioritised over the broader spectrum of stakeholders (Haque & Ntim, 2018). This theory was considered less suitable for studies relating to the non-financial data of organisations in developing countries and more suitable for developed countries, whereas stakeholder theory is more appropriate for developing countries (Ngorima, 2019). Though legitimacy theory is used to examine corporate disclosures, its applicability to blue accounting in South Africa might have limitations due to the lack of prior disclosures. Many marine organisations in South Africa may not have historically reported blue accounting information; they may not face strong legitimacy pressures. However, stakeholder and signalling theory provides additional insights, as companies are more likely to adopt blue accounting due to stakeholder demands and the need to differentiate themselves rather than purely to maintain legitimacy. Thus, these theories mitigate the limitations of legitimacy theory by offering alternative explanations for corporate disclosure behaviour in this context.

In light of the above discussion, this theory was used to underpin this study as it is also primarily used in social and environmental literature studies as a mainstream theory to support the studies (Deegan, 2019). Another consideration is that various studies have applied legitimacy theory to explain why organisations need to report on their environmental performance (Deegan, 2019; Mgilane, 2023). Overall, legitimacy theory underscores the function of blue accounting as an instrument or framework to align corporate practices with societal expectations, ultimately aiding marine-sensitive companies in demonstrating their environmental stewardship. Another theory that should be discussed is the stakeholder theory.

2.2.6 Stakeholder Theory

Stakeholder theory was developed by Freeman in 1984 on the basis that disclosure of information by businesses might be intended to address pressure from stakeholders on the organisation, especially powerful stakeholders, for strategic reasons (Alsayegh et al., 2020; Baalouch et al., 2019; Christensen et al., 2021; Dremptetic et al., 2020b; Freeman, 2010). This notion has been highlighted in some of the blue accounting, oil and mining sector-related studies as a means of explaining how the negative environmental effects of organisations tend to influence the disclosures of such organisations (Carandang & Ferrer, 2020; Rahmayanti & Sari, 2023). This theory is in fact, focused on an organisation's stakeholders and their competing priorities (Tingbani et al., 2020).

It is reasonable to expect that an organisation has various stakeholders who form a living entity that contributes to the organisation's activities. Understanding the term 'stakeholders' is pivotal for this theory, despite arguments that existing research has not adequately defined the term (Katuruza, 2020). However, various studies have sought to define stakeholders as internal and external persons and bodies, including the community at large, customers, suppliers, shareholders, creditors, employees, government, environmentalists etc, with a stake in the organisation in the form of past, current or future ownership or vested interest in the organisation so that they are or potentially may be impacted by the decisions taken by the entity (Albitar et al., 2020; Aydoğmuş et al., 2022; Freeman, 2010; Rahmayanti & Sari, 2023; Tadros et al., 2020). After mentioning the various stakeholders in the organisation, it is clear that these stakeholders differ in nature and also in their level of influence and interest in the organisation's activities (Tingbani et al., 2020; Udo, 2019). The above definition of stakeholders was applied to this study. Having understood its stakeholders, an entity needs to make decisions that will serve the best the interests of the various stakeholders/individuals who could be affected by the

organisation's decisions, both internally and externally (Adriana & Dewi, 2019; Aydoğmuş et al., 2022; Bellamy et al., 2020; Gunawan et al., 2020). This notion is supported by other studies that explained corporate disclosures and environmental disclosures (Ngole & Mabonesho, 2023; Nkundabanyanga et al., 2021; Santos et al., 2021).

This theory encompasses three functions: descriptive, instrumental, and normative (or ethical); their relevance will be explained, and they will be applied in the context of this study (Beck & Storopoli, 2021; Maama & Mkhize, 2020; Nkundabanyanga et al., 2021). It is usual for organisations, as part of the continued success of their operations, to report on what their primary stakeholders deem to be of great importance for their decision-making needs (managerial branch) (Cho et al., 2019; Clementino & Perkins, 2021; Freeman, 2010; Morrison et al., 2023). Furthermore, an organisation will provide information that meets the needs of its secondary stakeholders to ensure that it conforms to the ethical part of stakeholder theory, which entails legitimising its operations by disclosing information to meet the needs of its various users. This is the right thing to do, considering that all stakeholders ought to be afforded such information (Drempetic et al., 2020b; Freeman, 2010; Maama & Mkhize, 2020; Mata et al., 2018; O'donovan, 2002; Syah et al., 2020).

Therefore, due to the diverse nature of stakeholders and their varied needs, organisations usually decide what information to disclose to meet their stakeholders' needs, as there may be no restrictions in terms of the disclosures an organisation can share with its stakeholders. This raises the question of which stakeholders should be prioritised in providing information, as it might not be possible to meet all stakeholders' needs equally. This has led to suggestions that this theory is inadequate in describing the holistic and multifaceted relationships between an organisation and its stakeholders, which in turn exposes the limitations of the theory in explaining the power dynamics that exist in these relationships (Dambuza, 2022; Kheireddine et al., 2023; Maama & Mkhize, 2020). However, as suggested by various authors, the normative function provides a reliable framework for resolving this challenge. It involves an organisation's considering three key elements: power, urgency, and legitimacy, all of which are requirements for one to qualify to be a stakeholder (Beck & Storopoli, 2021; Hörisch et al., 2020). Power is an influence or force; legitimacy is the view that is held by different people as one that is acceptable and correct by society at large; and, lastly, urgency is the evolving and immediate nature of a claim by a stakeholder or stakeholders who are laying a claim on any object premised on time, ownership, sentiment, expectation and/or exposure (Beck &

Storopoli, 2021; Jiang & Fu, 2019). The providers of capital, therefore, tend to be critical stakeholders since they embody all three attributes concerning the company's operations. Similarly, stakeholders' power can influence an organisation's attitude and endeavours towards environmental performance (Antara et al., 2020; Jiang & Fu, 2019).

Overall, this theory highlights the ability of external stakeholders with control over the resources of the organisation (i.e. primary stakeholders) to influence the internal management of the organisation (Elshabasy, 2018; Freeman, 2010; Martiny et al., 2024; Santos et al., 2021). This is one of the theories that is widely used in literature to discuss the nature of non-financial information and how organisations go about deciding whether to disclose it (Machmuddah & Wardhani, 2020; Wang et al., 2024; Zarzycka & Krasodomska, 2022). This theory might enable blue accounting adoption to be fast-tracked in organisations if the stakeholders, especially the stakeholders considered to be powerful, perceive that the information currently being provided in the financial statements does not provide them with the valuable information they need for decision-making and that the manner in which the activities are reported does not comprehensively reflect whether the organisation is creating value for them or not, with the result that they might withdraw their financial contributions (Freeman, 2010; Freeman et al., 2021; Hörisch et al., 2020). Consequently, meeting the stakeholders' needs would strengthen the organisation's position with its stakeholders due to the positive correlation between voluntary environmental disclosure and the sustainable performance of the organisation, especially considering that, at times, voluntary disclosure might indicate that the organisation is being proactive in achieving environmental sustainability. This is evidence that organisations that perform the best are those that disclose more information concerning their performance regarding environmental sustainability (Drempetic et al., 2020b; Shah et al., 2021; Zaid et al., 2019). This is a means for an organisation to show that it is operating in an environmentally friendly manner, as organisations that show good environmental performance tend to appeal to investors, employees, customers, and the public (Safitri et al., 2020). However, some studies contradict the notion that there is a favourable relationship between disclosures and performance, as organisations with poor environmental performance or large organisations can use environmental disclosures and modify their reporting as a public relations strategy to signal sound environmental performance without actually altering performance or adopting sound environmental activities (Bui et al., 2020; Doan & Sassen, 2020; Rosa Portella & Borba, 2020; Sampong et al., 2018).

These environmental disclosures entail reporting on environmental matters such as waste, deforestation, various forms of pollution, climate change, carbon dioxide emissions, environmental policies, risks, costs, etc (Alsayegh et al., 2020; Bednárová et al., 2019; Bellamy et al., 2020). Hence, these disclosures describe the organisation's environmentally related activities and provide information for the users (Wang et al., 2020). These disclosures also involve the organisation's environmental strategies and liabilities. Such disclosures are not necessarily mandatory; they reflect aspects the organisation could improve on (Adriana & Dewi, 2019). Organisations that are in environmentally hazardous/harmful industries are the ones that tend to voluntarily disclose more of their environmental activities as a means of showing that their stakeholders can trust them (Bednárová et al., 2019; Carandang & Ferrer, 2020; Tadros et al., 2020; Wang et al., 2020). They also wish to demonstrate that they have nothing to hide and thus secure their place in society as legitimate members of the community, which they do by including positive information on their environmental activities (Maama & Mkhize, 2020; Manes-Rossi et al., 2018; Zarzycka & Krasodomska, 2022). Organisations that have a high level of environmental performance tend to be attractive to potential investors (Alshehhi et al., 2018; Brogi & Lagasio, 2019; Dragomir, 2018; Elshabasy, 2018; Safitri et al., 2020). Most entities use the annual integrated reports as a vehicle for these disclosures, which provide the information stakeholders need for their decision-making (Maama & Mkhize, 2020; Mgilane, 2023). Therefore, organisations must invest in the necessary environmental reporting systems to ensure that accurate and timely information is provided to stakeholders for purposes of informed decision-making (Mgilane et al., 2023; Ngorima, 2019).

Additionally, according to this theory, organisations could possibly venture into innovative strategies that would make them more environmentally friendly in their operations through green innovation, which entails using eco-friendly input materials and the employment of processes to curb water pollution, air pollution and the degrading of natural resources (Cai & Li, 2018; Mukhtar et al., 2023; Seman et al., 2019; Singh et al., 2020; Wang et al., 2024). The disclosure and implementation of green innovation might also enhance the organisation's profitability and financial performance (Alam et al., 2019; Albitar et al., 2020; Carandang & Ferrer, 2020; Elshabasy, 2018; Gull et al., 2022; Mukhtar et al., 2023; Seman et al., 2019; Shabbir & Wisdom, 2020; Shah et al., 2021; Svanberg et al., 2022).

For organisations with a marine footprint, disclosing marine-related information in the organisation's annual report could respond to stakeholders' needs, especially if the

stakeholders demand comprehensive information about how the organisation uses marine resources in order to assess its environmental sustainability. Blue accounting can result in value creation by an organisation due to stakeholder satisfaction (i.e. suppliers, lenders, investors, government, customers, etc.) and this could eventually lead to a direct impact being reflected in the capital, share value, and overall financial performance of the organisation (Brogi & Lagasio, 2019; Freeman, 2010; Khan, Zhang, Kumar, et al., 2020; Mata et al., 2018; Rahmayanti & Sari, 2023).

Stakeholder theory suggests that blue accounting can bridge gaps in environmental accountability by addressing the informational needs of diverse stakeholders, thus supporting sustainable marine practices. It is thus evident from the discussion that stakeholder and legitimacy theory work hand in hand with regard to an organisation's decision about blue accounting disclosures and the extent thereof. The last theoretical concept to be discussed is the signalling theory.

2.2.7 Signalling Theory

Signalling theory is anchored in the premise that organisations have a great deal of internal information which has not been published for public consumption; therefore, through the disclosures the organisation makes, the stakeholders can assess the information to signal a particular positive, neutral or negative effect (Braam & Peeters, 2018; Datt et al., 2019; Karaman et al., 2020; Yasar et al., 2020). This assumption was upheld in a study that explained the motives behind the disclosures organisations make (Khanifah et al., 2020; Kheireddine et al., 2023; Ngole & Mabonesho, 2023). This theory speaks to the manner stakeholders of an organisation respond to information asymmetry initiatives applied by the organisation (Karaman et al., 2020; Maama & Mkhize, 2020; Wang et al., 2020; Zuraida et al., 2018). This throws light on the reason why organisations disclose non-financial information (Jámbor & Zanócz, 2023; Papoutsis & Sodhi, 2020). Disclosing information that is not financial is premised on the assumption that asymmetry in information between an organisation and its stakeholders can negatively affect how these parties relate with each other parties, and corporate disclosure is the best way to mitigate such an effect (Ngole & Mabonesho, 2023). Therefore, the stakeholders will use the disclosed information in combination with the information they already have to understand what the disclosed information is seeking to communicate about the company's operations, especially considering that the organisation has a wealth of insight and information at its disposal (Karaman et al., 2020; Khanifah et al., 2020; Machmuddah &

Wardhani, 2020; Yasar et al., 2020). The theory purports that organisations with higher sustainability performance are more likely to provide extensive disclosures about their sustainability performance compared to companies that are not performing so well (Benjamin et al., 2023; Datt et al., 2019; Hassan et al., 2020; Kheireddine et al., 2023; Machmuddah & Wardhani, 2020). This was also articulated in the literature by other authors (Papoutsis & Sodhi, 2020).

The absence of good-quality voluntary environmental disclosure may be viewed as a negative signal by an organisation's stakeholders (Chiu et al., 2020; Kheireddine et al., 2023). Therefore, the disclosure of environmental information may be seen to signal particular information to stakeholders, thus persuading them to invest in the organisation, creating a positive outlook/perception about the organisation, increasing the competitiveness of the organisation, and yielding increased profitability (Alam et al., 2019; Albitar et al., 2020; Baalouch et al., 2019). Hence, an organisation's absence of proper environmental disclosure may be viewed as a negative signal by stakeholders concerning its exposure to future environmental challenges (Bui et al., 2020; Chiu et al., 2020; Doan & Sassen, 2020; Wang et al., 2020). This is because greater disclosure of information, which includes environmental disclosures, provides more information to investors, who then can use that information in deciding whether to invest in the organisation. In this way, the organisation is signalling how sustainable it is through the voluntary disclosure it is making, which in turn tends to enhance its environmental performance (Alsayegh et al., 2020; Doan & Sassen, 2020; Hassan et al., 2020). This theory helps to explain the decisions management takes and the timing thereof; however, the quality of the disclosed information and the reputation of the sender do affect the effectiveness of the signal sent through the disclosure (Benjamin et al., 2023; Ifada & Saleh, 2022; Yasar et al., 2020).

Organisations, therefore, signal their environmental performance by publishing their environmental reports to enhance their credibility with investors and correct any information asymmetry (Doan & Sassen, 2020; Kheireddine et al., 2023). Organisations could also withhold information that reflects noncompliance as that would signal poor performance and disclose a lot of proprietary information, rendering environmental disclosures unreliable and useless (Doan & Sassen, 2020). This would mean that organisations identified as not performing well will probably avoid disclosing their negative environmental activities to protect their environmental performance. Also the theory assumes that older and larger organisations tend to disclose more information so as to signal their good image and reputation

than their counterparts, because larger organisations have a significant amount of resources at their disposal (Aluchna et al., 2022; Ngole & Mabonesho, 2023).

However, this theory also highlights the fact that an organisation is under no obligation to make a complete environmental disclosure as environmental disclosure tends to be voluntary, and where the organisation perceives information asymmetry, it can opt to disclose environmental information provided it considers the benefits of doing so to exceed the reporting costs (Doan & Sassen, 2020; Hassan et al., 2020). For organisations with good environmental performance, the benefits of being perceived as a good corporate citizen outweigh the costs (Doan & Sassen, 2020; Hassan et al., 2020). As a result, the better-performing organisations tend to present more accurate, detailed, verifiable information and tend to benchmark themselves against industry averages to distinguish themselves from poor performers (Doan & Sassen, 2020; Hassan et al., 2020; Hassan et al., 2021). By leveraging signalling theory, blue accounting practices can improve the entity's image, portraying it as a responsible and environmentally aware entity, which can positively influence stakeholder perception and support.

These three theories go hand in hand in that the authority exercised by the stakeholders tends to be what legitimises an organisation's standing in society and communicates to stakeholders, especially investors, how they are to respond to the organisation in terms of investment. This illustrates the interplay or collaboration between these theories and shows how these theories explain the relationship between disclosures and performance (Kheireddine et al., 2023; Maama & Mkhize, 2020; Syah et al., 2020). The empirical literature for the study will be discussed after a discussion of the underlying theories.

2.3 Blue Accounting, Sustainable Reporting and Firm's Performance: A Review of The Literature

Following the discussion of the underlying theoretical framework, this section will review the empirical literature on blue accounting practices and explain how blue accounting enhances an organisation's environmental performance. Lastly, this section will allude to the findings from prior literature on the relationship between blue accounting and an organisation's environmental performance.

2.3.1 The Blue Accounting Concept

Before addressing the literature used in the study in detail, it may be necessary to define the terms “accounting” and “blue”, thus providing context for the term “blue accounting”, a critical aspect of the study. Accounting is the way financial and non-financial information is measured, processed, and communicated to all the relevant users to enhance transparency and accountability to its users (de Villiers et al., 2022; Elshabasy, 2018; Perkiss et al., 2022; Wilson et al., 2020). In the context of this study, accounting is about aligning water-related matters with the preferred outcomes (Syah et al., 2020). In this context, “blue” refers to the use of groundwater and surface water resources, which includes the ocean's resources and the water quality thereof; these water sources are primarily water-based (blue), stored in natural aquifers found in coastal, marine, and aquatic ecosystems (Failler et al., 2023; Syah et al., 2020).

An in-depth understanding of the ocean is necessary since it offers excellent value in continents such as Africa, especially considering that the ocean economy could be used to address ills such as poverty, low economic growth, food security, and unemployment and even enable low-income societies to access and participate in the economic sector (Failler et al., 2023; Struwig et al., 2024; D. Wang et al., 2021). This is of importance as in various countries, and even globally, the ocean sector is seen as a leading sector capable of activating and enabling the operations of the other sectors that drive the economy. Therefore, increased yield from the ocean could be maximised through organisations establishing and implementing sustainable operational practices. However, this sustainability can best be measured when there is a developed framework that can be applied consistently across the board by the various ocean-based organisations to assess sustainability (Büyüközkan & Karabulut, 2018; Wilson et al., 2020; Winarsih et al., 2020).

Despite the high value the oceans add to the economy, as previously emphasised, there are challenges, such as exploitation and the depreciation of marine assets. Consequently, this leads to the community paying the price instead of the organisations that tend to be the biggest beneficiaries of marine assets (Syah et al., 2020). Therefore, without the sustainable use and constant monitoring of and accounting for marine assets, which include renewable water sources such as aquifers, the excessive pressure currently being placed on the ocean may lead to the ultimate destruction of water, the natural resource (Fridman et al., 2021b; Rodrigues et al., 2014; D. Zhang et al., 2020). The failure of sustainable operations of organisations has led to climate change, which has further exacerbated the pressure the water sources are

experiencing, thereby demonstrating the importance of accounting for marine resources and potential blue accounting as a cornerstone for assessing the organisation's acts in relation to climate change (Alam et al., 2019; Failler et al., 2023; Fridman et al., 2021b; Sumaila et al., 2021). This is due to the fact that the ocean can absorb vast amounts of greenhouse gases in the atmosphere; therefore, the effective management of and accounting for the oceanic resources may assist in effectively preserving the ocean's significant role in reducing the adverse effects of climate change (Al-Qahtani & Elgharbawy, 2020; Remmert, 2019). But, for this effective management to materialise, it is critical for organisations to have ocean accounts that will enable effective tracking of the ever-changing marine ecosystem and develop timely mitigation measures to ensure the sustainable use of marine resources (Pattinaja et al., 2023; Perkiss et al., 2022). All things considered, it has become increasingly urgent to develop a framework that can assist organisations in designing and implementing sustainable measures that will ensure that through their operations, the current needs of the organisation's stakeholders are met while conserving and enhancing the natural assets for future use (Büyükožkan & Karabulut, 2018; Chiu et al., 2020).

This highlights the importance of the blue economy, also known as the ocean economy, which embraces not only the marine economy but also fisheries and is concerned with the sustainable use and preservation of the marine and freshwater ecosystem (Failler et al., 2023; Lubchenco & Haugan, 2023). The ocean economy is also defined as that part of the economy which fully relies on the ocean as its input into the production process or which, by geographic location, occurs on or under the ocean and uses these inputs for sustainable development (Pattinaja et al., 2023; Struwig et al., 2024; Walker, 2018). As crucial as the blue economy is, there is no concise and global definition for it; as this is a fairly new economic model, however, it entails a huge increase in and enhancement of the economic value from the ocean, sustainably, and this is also known as blue growth, i.e. growth which encompasses both the growth of the economy and the protection of the environment across the different organisational forms (Pattinaja et al., 2023; Remmert, 2019; Satizábal et al., 2020; Struwig et al., 2024; X. Zhang et al., 2020). This is considered a new concept although it has been around from as early as 2010 (Syah et al., 2020). The above definition, in principle, is in line with how the blue economy is defined by the World Bank, which describes it as the sustainable use of marine resources for growing the economy and developing it, improving the quality of life, creating jobs, and improving the quality and health of the marine ecosystem (Abreu et al., 2019). Consequently, the identified lack of a global definition of the blue economy has led to various narratives, one

being the natural capital one, where it is argued that the value of the ocean ecosystem is not sufficiently measured, thus giving rise to a pressing need to develop a framework to quantify it so as to enable all its relevant stakeholders to take the necessary steps to protect and rehabilitate the marine ecosystem (Remmert, 2019; Satizábal et al., 2020). The second narrative is the good business narrative, which alludes to the failure of all private and public corporations to effectively manage the complex marine ecosystem, which makes it necessary for both spheres to collaborate to ensure the effective engineering of the blue economy (Remmert, 2019). Therefore, a framework might help to co-ordinate collaboration between these two spheres, leading to effective coastal management policies that are depoliticised and to the achievement of more significant synergies for both organisations and community stakeholders, especially the potentially marginalised ones (Satizábal et al., 2020). The last narrative in the definition of the blue economy is the livelihood narrative, which is anchored in the international political and economic systems that use and develop the marine resources. These systems, however, employ means that disadvantage the poor communities and developing countries, which tend to be slowly squeezed from maximally participating in the marine economy (Remmert, 2019).

From the above discussion, it is important to delve into what the blue economy means in the African context. It encompasses economic activities involving the oceans, seas, coastlines, banks, lakes, rivers, and groundwater (Failler et al., 2023; Hoekstra, 2019; Rahmayanti & Sari, 2023). In short, the blue economy encompasses the processes undertaken to govern the coastal and marine environment, using discursive and material territorialisation, leading to enhanced extraction and development of the coast and marine spaces, which usually takes place without due consideration of the environmental sustainability of these activities (Satizábal et al., 2020). The lack of a framework might be the leading cause of the lack of accountability for the environmental sustainability of an organisation's practices and failure to protect the rights of other stakeholders who benefit from and use the marine resources (Satizábal et al., 2020).

Therefore, several activities, such as the utilisation of marine and aquatic resources by humans in the creation and trading of goods and services, marine transportation, and coastal tourism, would need to be explored in assessing how to account for the blue economy (Failler et al., 2023; Struwig et al., 2024). This is of great importance globally and in Africa as well, especially considering that the blue economy plays a crucial role in economic development by creating jobs in areas such as tourism, minerals, petroleum, and gas, and this is expected to progressively

increase over the years (Failler et al., 2023). Consequently, it is evident that the ocean's natural resources of the ocean and the conservation and safeguarding of the marine ecosystem are pivotal in the blue economy, especially considering its contribution to the gross domestic product (GDP) of various countries, the GDP globally, curbing climate change and the nutritional value it provides for both the human population and marine species (Gephart et al., 2021; Perkiss et al., 2022; Rahmayanti & Sari, 2023). Furthermore, the blue economy contributes significantly to national economies and mass job creation across different countries, which highlights the substantial natural capital the marine economy provides (Rahmayanti & Sari, 2023; Sumaila et al., 2021). Without question, effective conservation is necessary for this progressive blue economic growth to be realised, as this conservation could lead to other sectors, such as fisheries, ports, shipping, aquaculture, deep sea mining, and offshore exploration, growing progressively as well and making a sizeable contribution to the economy, especially considering that marine aquaculture, fish processing, offshore wind and shipbuilding have been evaluated as some of the sectors in the marine space with great growth potential (Sumaila et al., 2021). The ongoing progressive climate change hazard and increasing pollution might continue as long as there is no pre-determined consistent framework that can be used to assess whether the actions being taken against these environmental challenges are really effective or not, and this is where blue accounting could prove valuable in assessing the effectiveness of these measures (Failler et al., 2023; Failler & Seisay, 2021; Jámor & Zanócz, 2023). However, to develop the necessary framework to measure the sustainable use of marine resources, data must be collected to effectively measure and evaluate the sustainability of the organisation's activities that use natural marine resources (Büyüközkan & Karabulut, 2018). The continued deterioration of the ocean ecosystem points to the need for a national and international statistical and methodological base to assess the scale and performance of ocean-driven industries and the way these industries contribute to the economy (Failler et al., 2023). Such a framework could enable blue accounting to provide valuable information on the valuation of the ocean's assets, thus providing principles enabling the government to make correct and appropriate policies to regulate the blue economy (Failler et al., 2023). Therefore, embarking on blue accounting, nationally and internationally, might be of value as it would assist in the identification and quantification of how the economy and natural environment interact with each other, thus providing a systematic framework that could be used for analysing the economy and natural capital so as to enable informed decision-making (Failler et al., 2023; Perkiss et al., 2022). Furthermore, as blue accounting is a fairly new concept in comparison to the better-known concept of green accounting, further studies on it will reveal

aspects of accounting that have not been accounted for in green accounting (Rahmayanti & Sari, 2023; Syah et al., 2020).

Having looked at what blue accounting entails, it is evident that it is different from the well-known concept of green accounting in that green accounting is concerned with measuring how sustainable revenue is attained without decreasing natural assets and thus maintaining a suitable quality of life for both current and coming generations (Agyemang et al., 2021; Failler et al., 2023; Khan, Zhang, Kumar, et al., 2020). However, both of these concepts allude to the fact that sustainability necessitates cohesion between nature and the three operational aspects of an organisation, which are the environmental, economic, and human spheres, although they discuss these from different angles (Syah et al., 2020). The point of consensus between blue and green accounting attests to the fact that accountants are able not only to follow rules for recording transactions but also to create new rules/principles, thus supporting the ideal that accounting is evolving over time to be what it should be rather than simply conforming to what it is perceived to be (Syah et al., 2020). From the literature review, there is evidence that the marine ecosystem is complex and has socio-ecological factors that must be considered to enable a holistic approach to the sustainable use of the ocean (Castro-Cadenas et al., 2022; Remmert, 2019).

In the light of the marine activities of an organisation, sustainability performance is measured for the organisation by looking at the collective effect of the negative or positive financial, environmental, and social effects of its activities on its profit (Büyüközkan & Karabulut, 2018). Therefore, having a framework such as a blue accounting framework will give an organisation a comprehensive outlook on its operational activities or inactivity is affecting its shareholders, the environment, and the broader community and, consequently, enable the organisation to take the necessary measures to mitigate or improve on any adverse effects of its operations (Büyüközkan & Karabulut, 2018; Winarsih et al., 2020). After assessing the blue accounting concept, a possible blue accounting framework was investigated.

2.3.2 A Possible Blue Accounting Framework

Blue accounting, which is also known as ocean accounting in some literature, provides the financial reporting conceptual framework which would also have to embody the basic financial reporting framework principles such as the asset definition, liability, equity, income and expenses, recognition and measurement criteria, derecognition principles, presentation and

disclosure requirements, and principles that relate to capital and capital maintenance (Abreu et al., 2019; Probowulan & Sisouk, 2023; Rahmayanti & Sari, 2023). This sets out in detail the accounting treatment and disclosures for marine activity, which enable organisations to continuously reflect and control marine resources so as to attain maximum economic, social and ecological benefits and report on those to their stakeholders (Winarsih et al., 2020; X. Zhang et al., 2020). From the above deliberations, there is a need for effective blue asset management, identification of the amount of the revenue that is possibly being lost due to lack of effective blue asset management, and in the same breath, the amount of revenue that could be gained through effective management, and also the fiscal costs that might be saved due to the prevention of imminent natural disasters resulting from poor management of the marine ecosystem (Rahmayanti & Sari, 2023). Therefore, a blue accounting and sustainability performance framework might aid in providing useful information to blue economy users and help to guide the government in creating and administering marine-related policies (Rahmayanti & Sari, 2023; Winarsih et al., 2020). This shows the great need for further investigation into the blue accounting concept, seeing that to achieve the above financial reporting aspects, one would require the use of big data and in-depth business statistical data, which are necessary for the provision of a transparent and useful reporting framework to assist all the users in their decision-making. It should be remembered that the decisions taken will help to conserve, restore and enhance the ocean globally for the benefit of subsequent generations (Rahmayanti & Sari, 2023).

In light of the above principles of the conceptual framework, the asset in the context of blue accounting can be recognised as the ocean, which is a vital source of coastal protection, carbon sequestration, climate management, and recreational benefits. Revenue in this context is income attained from the productivity of the ocean; expenses are the expenditure incurred in research and development, education, protection, awareness, and maintenance for resource management (Rahmayanti & Sari, 2023; Winarsih et al., 2020). Blue accounting information needs to be assembled into understandable and useful information, which might pose a challenge for accountants, considering that this area of accounting is a new phenomenon for all accountants, globally. However, there is a vital need for accountants to identify and report on all calculations relating to the blue economy, especially considering that the marine environment undergoes significant changes, and the accountant needs to be able to quantify all the relevant data in the blue economy and provide financial reports in this regard (Rahmayanti & Sari, 2023). Therefore, the blue accounting framework does not differ greatly from the

current financial reporting framework. However, the current framework would need to be tailored for the marine ecosystem and its unique aspects. Based on this understanding of blue accounting, the concept of sustainability performance will now be assessed.

2.3.3 Sustainability Performance

Sustainability entails an economic, social, and environmental review of the organisation's operations, with a focus on long-term value creation (Christensen et al., 2021; Gunawan et al., 2020; Syah et al., 2020). With the increasing prominence of the concept of sustainability, a number of sustainability performance measure frameworks have become available, for example, Global Reporting Initiative (GRI), which focuses on the principles to be followed in corporate sustainability reports of organisations, with a specific focus on the environment and society (Arvidsson & Dumay, 2022; Büyüközkan & Karabulut, 2018; Chininga et al., 2023; Shahab et al., 2020). Using the GRI reinforces the signalling theory as the disclosures through the GRI are positively related to the actual performance of the organisation (Papoutsi & Sodhi, 2020). Applying this concept to blue accounting, a structured framework would enable organisations to evaluate and assess the sustainability of their marine operations considering their economic, social and environmental impact, not just their bottom line. This structured reporting would assist organisations in evaluating their performance and enhance their accountability as it would serve as a guide to what and how their impact on the marine ecosystems is measured (Satizábal et al., 2020). This would thus provide a means to assess the organisation's sustainable performance (Satizábal et al., 2020; Walker, 2018). Further, the ISO Standards issued by the International Organisation for Standardisation (ISO) are well known and have become more widely used by various organisations, especially considering their international acceptance globally in various sectors; they are regarded as progressive due to the continuous updating and development they undergo over time (Büyüközkan & Karabulut, 2018; Elshabasy, 2018; Raimo et al., 2021). The ISO standards are one of the voluntary guidelines that provide guidance on sustainability reporting (Papoutsi & Sodhi, 2020). Organisations are therefore expected to adopt ISO 14001, the Environmental Management Framework (EMF), or other relevant environmental management systems that will assist the organisation in reporting on its environmental performance (Johnstone & Hallberg, 2020). In light of this, ISO 14001, a standard that provides principles or requirements to help organisations structure their internal management processes, thus possibly legitimising organisations' operations to their stakeholders or yielding efficiencies and positive financial performance to organisations (Johnstone & Hallberg, 2020; Smeesters et al., 2018).

Furthermore, in the context of South Africa, the Environmental Management Framework (EMF) has been adopted as a South African environmental management tool that has been in force since 2006 to provide a tool for organisations to assess their environmental sensitivity and identify environmental risks emanating from their activities and take the necessary action to reduce the negative impact (Cilliers & Retief, 2017; Forest et al., 2013; Marais et al., 2015).

In addition to the above-mentioned sustainability frameworks or guidelines, there are the Stocks Exchange Sustainability Indices, which are public disclosures on sustainability performance and are relevant in all forms for listing by companies to enhance investor appetite (Büyüközkan & Karabulut, 2018; Raucci & Tarquinio, 2020). Additionally, there is the Carbon Disclosure Project (CDP), which emerged in 2001, focusing on disclosing the sustainability of a company's water usage practices, climate change mitigation strategies or initiatives, deforestation policy, and management of supply chain environmental risks (Büyüközkan & Karabulut, 2018; Pitrakkos & Maroun, 2020; Raucci & Tarquinio, 2020). However, none of these frameworks has been refined to focus specifically on the sustainable use of marine resources and the sustainability of the blue resources. This can reasonably be expected, especially considering the significant challenge of developing a framework covering various sustainability performance-related matters or adapting an existing framework to cater for such matters. Hence, developing a marine resource-oriented framework may provide value, even if such a framework might, in some instances, need to rely on principles already in place in some of the currently existing sustainability frameworks (Büyüközkan & Karabulut, 2018). Despite the numerous established and acknowledged frameworks for addressing different aspects of sustainability, these frameworks still reflect shortfalls such as a lack of standards, the absence of external assurance (external audit), and a lack of efficient monitoring and means of enforcement (Büyüközkan & Karabulut, 2018; Elmagrhi et al., 2019; Khatri & Kjærland, 2023). However, the lack of external assurance has not significantly affected environmental performance, which is determined on the basis of organisational sustainability reports (Boiral & Heras-Saizarbitoria, 2020; Khatri & Kjærland, 2023). This has been attributed to the absence of regulations that require external assurance of sustainability reports (Bramanti et al., 2021).

As alluded to above, there is an increasing need for disclosure and reporting on matters that are not financial, including disclosure on environmental aspects of the company's operations, and stakeholders are increasingly making use of this information in conjunction with the financial information to make decisions about the organisation (Amirrudin et al., 2021; Dinh et al., 2023;

Perkiss et al., 2022). This interest in non-financial information is growing amongst stakeholders, especially, in view of the escalating crises in relation to public health, and economic, environmental and social justice concerns (Akimbekova, 2021; Bergman et al., 2020; Manes-Rossi et al., 2018). In relation to blue accounting, these stakeholders may consist of the households (i.e. fishermen and consumers), corporations (i.e. investors, suppliers, and manufacturers/service providers), government (i.e. preparers of blue accounting reports, policymakers, and regulators) (Rahmayanti & Sari, 2023; Rodrigues et al., 2014).

This outcry against social and environmental ills has seen the development of several frameworks and guidelines, and the passing of directives in different parts of the world, e.g. the Global Reporting Initiative (GRI) guidelines, the Sustainability Accounting Standards Board (SASB) industry standards, the International Integrated Reporting Framework on non-financial information, which specifically provided principles and recommendations and outlined the various forms the non-financial information can take, specifically tailored to the organisation's operations and circumstances (Arvidsson & Dumay, 2022; Dinh et al., 2023; Perkiss et al., 2022). Other non-financial reporting guidelines or frameworks that have emerged are the Carbon Disclosure Project and the European Union (EU) Directive 2014/95/EU (Dragomir, 2018; Petruzzelli & Badia, 2024; Raucci & Tarquinio, 2020). All these are global, and country-wide means to encourage companies to begin deliberately reporting on their business management and operations to enable an assessment of their sustainability, thus providing the necessary socio-environmental information that would be lacking or limited in the financial records (Manes-Rossi et al., 2018; Raucci & Tarquinio, 2020; Udo, 2019). Consequently, all these initiatives have resulted in at least 80% of corporations globally reporting on sustainability, with over 90% sustainability reporting amongst the biggest organisations worldwide, despite the lack of clear, consistent, and uniform measures and guiding parameters in the form of directives or standards (Alsayegh et al., 2020; Baalouch et al., 2019; de Villiers et al., 2022; KPMG, 2020). It is evident from the above discussions that various frameworks or guidelines can be used to report sustainability information, in addition to the above-mentioned ones.

Sustainability reporting could not be more important in the current economic landscape as the growing dependence of an organisation's production or manufacturing processes (business operations) on natural resources necessitates an assessment of sustainable value creation processes, in line with the intergenerational equity theory (Gull et al., 2022; Maama & Mkhize,

2020; Raucci & Tarquinio, 2020). This theory requires the company to ensure that its current operations do not put future generations in jeopardy, and this can be assessed effectively through the company's comprehensive report on its environmental, social and governance matters (Rahmayanti & Sari, 2023; Raucci & Tarquinio, 2020). This intergenerational equity can be assured through the corporate reports organisations publish, as stakeholders can use these corporate reports to hold the organisations accountable for their actions and their effect on the future accessibility of natural resources (Maama & Mkhize, 2020). Although such disclosures may seem cumbersome for companies, the non-disclosure of such information may warrant the delegitimisation of a company's operations, as the stakeholders may perceive the company to lack transparency, and its reports may be deemed to be of a lower quality than of those of its peers who opted to disclose the information in line with signal theory (Machmuddah & Wardhani, 2020; Raucci & Tarquinio, 2020). Therefore, this type of accounting will enhance sustainability performance, resulting in holistic and comprehensive accounting for all the relevant social, financial, and environmental considerations related to the ocean (Perkiss et al., 2022). The next discussion will explore the possible relationship between blue accounting disclosure and sustainability.

2.3.4 The Connection Between Blue Accounting Disclosures and Sustainability

As has been alluded to, corporate reporting has evolved over time because the financial information has been deemed inadequate or insufficient by the investors, as investors perceive that financial information alone does not significantly influence their decision-making, hence the need for non-financial information over and above the financial one (Raimo et al., 2021; Syah et al., 2020). As accounting seeks to be reflective of an organisation's economic activities, these activities should not be construed merely in terms of numerical values but also considering the internal and external elements that affect the organisation's economic activities (Syah et al., 2020). The accounting evolution, therefore, needs to be all-inclusive, which entails the numbers slowly integrating with the social and environmental considerations that affect the organisation's operation, as evidenced by sustainability reporting and triple-bottom-line reporting (Alsayegh et al., 2020; Cho et al., 2019; Syah et al., 2020).

Blue accounting information for marine-sensitive organisations should be extracted from organisations' sustainability reports to close the current gap in accounting, where accounting mainly covers the financial aspects of a business (Syah et al., 2020; Wasara & Ganda, 2019). Blue accounting could also play a role in promoting the accounting and reporting of the

environmental and social factors relating to the organisation's operations, thus providing much-needed information about marine assets, i.e. marine resources (Pattinaja et al., 2023; Syah et al., 2020; Winarsih et al., 2020). This is important, especially in Africa, where blue accounting has not been undertaken on a large scale due to the challenges of collecting data on the necessary social, economic, and environmental aspects (Failler et al., 2023). Blue accounting should highlight an organisation's sustainability, assessing whether the organisation is able to meet its current needs using the marine assets without compromising the benefit that future generations will be able to derive from the marine assets (Rahmayanti & Sari, 2023; Syah et al., 2020; Wendling et al., 2022). In this context, blue accounting extends even to the water footprint beyond the seawater, i.e. including runoff water, brackish water, and reused water, to enable the organisation to assess comprehensively and more accurately its sustainability performance regarding water usage (Fridman et al., 2021b). This enables blue accounting to provide holistic information concerning how to account for various environmental and health effects of using water (Fridman et al., 2021b). Consequently, failure to include sustainability considerations in corporate reporting might be detrimental to an organisation's survival as the organisation might continue using an economic model that seems to yield the desirable profits without realising that these come at a high future cost (Sumaila et al., 2021; Syah et al., 2020). This compels organisations to consider aligning their activities with the environmental economic theory, a commonly used theory for corporate evidence, which premises that economic returns should be derived with due consideration for natural capital preservation, thus requiring management to have a deep awareness of environmental protection, which will enable an appropriate balance between an organisation's development and protecting the environment (Agyemang et al., 2020; Chiu et al., 2020; Rosa Portella & Borba, 2020). This suggests that blue accounting is the very essence of accounting, considering that accounting seeks to define the information to be collected for a defined purpose by identifying the relevant indicators and measuring them accordingly (Büyüközkan & Karabulut, 2018).

Furthermore, blue accounting seeks to ensure a balance between the needs of the human population for marine natural resources and nature's ability to meet these needs, a necessary balance, especially considering that 72% of the earth comprises marine life. Blue accounting can assist with the analysis of this marine ecosystem (Struwig et al., 2024; Syah et al., 2020). Furthermore, the economic value of the worldwide ecosystem is established along the coastlines, making the aquatic, marine, and coastal systems pivotal in providing products and services (Failler et al., 2023). Despite the indisputable value of the ocean, the lack of a system

that can be used to measure the usage of marine resources makes it difficult to assess the costly threat of degrading, destroying, and polluting the ocean ecosystem (Abreu et al., 2017; Failler et al., 2023; Halpern, 2020; Wu et al., 2021). The significance and extent of pollution and exploitation by the human population and economy cannot be quantified, especially considering the progressive warming of the ocean and acidification, which is likely to result in rising sea levels, increased floods, storms, marine heatwaves, El Niño, La Niña, other climate change effects, and all other effects that endanger marine life (Abbass et al., 2022; Khan, Zhang, Kumar, et al., 2020; Sumaila et al., 2021). One cannot help but imagine the disaster that might emanate from the above-mentioned effects; think of declining stocks of seafood like tuna, cod, and oysters due to the condition of the ocean, the ripple effect this would have on the blue economy, and on the supply of this seafood. It is impossible to estimate the long-term effects of this unless it is curtailed timeously (Fayiga et al., 2018; Remmert, 2019). Therefore effective management practices for marine resources are key to avoiding crises in the ocean due to the inadequate protection of the marine resources because the marine's economic potential is maximised without much consideration of the sustainability of such practices (Satizábal et al., 2020).

Blue accounting forces organisations to think in an integrated and holistic manner about the marine ecosystem and the marine assets which are at the core of the blue economy, thus reducing the negative effects commonly experienced when organisations use marine assets while ignoring any adverse effects resulting from their usage (Pattinaja et al., 2023; Syah et al., 2020). Organisations that practise blue accounting have to consider the economic and social aspects that are at play in terms of how they use marine resources to generate economic benefits from their varied activities (Büyükožkan & Karabulut, 2018). Blue accounting would also enable organisations to accurately measure their contribution to the United Nations Sustainable Development Goal (SDG): 14 Conserve and sustainably use the oceans, seas, and marine resources (Castro-Cadenas et al., 2022; Failler et al., 2023; Raucci & Tarquinio, 2020). Furthermore, blue accounting could be of great assistance to African companies in formulating and establishing practical blue economy objectives that could help to bolster the economy, especially considering that not much blue accounting has been embarked on at a national level in Africa due to the current lack of a consistent blue accounting framework that could be used across the various organisations nationally (Failler et al., 2023). The current strides being made in South Africa towards developing a pilot framework for natural accounting could provide valuable insights for blue accounting, although these insights would be limited considering that

the pilot was not programmed to account for all marine and freshwater life (Failler et al., 2023). Effective blue accounting, therefore, can enhance an organisation's performance and productivity (Syah et al., 2020). It can also provide the necessary guidance to assist the government in developing marine-related policies that could generate sustainable marine decisions (Büyüközkan & Karabulut, 2018). However, there is a lack of traction and appeal by blue accounting at both international and national levels, probably due to the lack of understanding by organisations and stakeholders that sustainable medium-term and long-term economic growth is impossible without adequate comprehensive environmental and social considerations (Failler et al., 2023). This is true even in Africa, where the blue economy is being considered without evaluating its social and environmental elements (Failler et al., 2023). Consequently, the lack of literature investigating sustainability accounting and assessment points to the need for the insights a framework of accounting for marine resources would provide (Raucci & Tarquinio, 2020; Sumaila et al., 2021). Another consideration is that blue accounting would compel the government and organisations to embark on gaining more information about the deep oceans, which have excellent potential to create wealth for economic growth; however, that potential is untapped because of insufficient understanding and research in this sphere compared to other marine ecosystems (Failler et al., 2023). Therefore, a marine-encompassing framework would necessitate a broad understanding of the oceanic resources that make up the blue economy. These renewable and non-renewable resources involve the harvesting of living resources, such as seafood, and the products of aquacultures, marine biotechnology, etc, as well as the extraction and use of non-living resources, such as mineral resources, energy, and water (Abreu et al., 2017, 2019; Remmert, 2019). The marine economy also entails a third aspect, namely commerce and trade in and around the ocean, e.g. transport and trade, coastal development, tourism and recreation etc, and lastly, matters like coastal protection, waste disposal, and carbon sequestration (Abreu et al., 2017, 2019; Remmert, 2019; Sumaila et al., 2021). This points to the extensive or broad range of factors an effective blue accounting framework must encompass to provide an effective and appropriate measure for marine resources. The limited literature on the combined effects of accounting and performance underlines the importance of this study in providing insights in this regard (Büyüközkan & Karabulut, 2018).

From the above discussion, it can be highlighted that sustainability is a challenge that cannot be easily mitigated or addressed if an organisation is not willing to evolve in its corporate reporting but instead wants to continue using the traditional forms of corporate reporting

(Manes-Rossi et al., 2018; Ngole & Mabonesho, 2023; Syah et al., 2020). Marine system sustainability continues to be a challenge due to irresponsible human activities such as excessive use of marine resources and pollution (Syah et al., 2020; D. Wang et al., 2021). Therefore, without a framework for accounting for environmental sustainability, even for the blue economy, it is inevitable that organisations will continue exploiting the aquatic resources in the name of generating profits, as there is no comprehensive measuring and monitoring tool that can be used to provide information about the long-term cost being incurred to generate those short-run profits and ultimately destroy value rather than create it (Cai & Li, 2018; Chiu et al., 2020; Failler et al., 2023). Blue accounting can assist in providing a statistical framework that could be used to measure and monitor the impact of the profit/output that organisations derive from the ocean. Monitoring could help generate data that is currently lacking and that is required to analyse the sustainability of the usage of the marine and ocean economy (Failler et al., 2023). The sustainability of an organisation is related to the internal management of the organisation and the sustainability performance shared with the external stakeholders (Silva, 2021).

Developing an assessment tool for blue accounting and environmental performance would equip companies to assess the sustainability of their marine-related activities, determine the relevant information that the internal controls and systems of the organisation need to collect and for what objective, and also the necessary information to be presented and disclosed to the users to enhance and assist in their decision-making process (Büyüközkan & Karabulut, 2018). A blue accounting and sustainability performance correlation assessment is important considering that, with environmental and accounting frameworks being continuously updated, these frameworks are beginning to expand to aspects such as technical, political, technological, recreational, institutional, and communal considerations, thus slowly leading to sustainability losing its foothold in some of these frameworks (Büyüközkan & Karabulut, 2018). Such deficiencies in some of the existing frameworks might result in the current frameworks yielding unsatisfactory results, which would be to the disadvantage of users, especially considering that currently environmental performance is increasingly being used by stakeholders making decisions (Baalouch et al., 2019; Büyüközkan & Karabulut, 2018; Struwig et al., 2024). This is largely due to the environmental challenges that are threatening the availability of the natural resources for current use and for future generations (Safitri et al., 2020). Furthermore, an assessment that can evaluate the effect of blue accounting practices on the sustainable performance of a corporation might curb the current practices being followed by organisations

of pursuing their bottom line without taking cognisance of human rights of use, access, and tenure to the marine resources, thereby ultimately indirectly removing aspect of the social justice from the organisation's operations (Alshehhi et al., 2018; Satizábal et al., 2020; Walker, 2018). This would imply that even for governmental institutions there is a need for a balance between meeting food security and nutritional needs and protecting the rights of the communities, who are also stakeholders in marine resources. Consequently, such an assessment would present a win in that it would enable tripartite marine activities, i.e. activities that would secure economic, social, and environmental benefits without potentially disadvantaging future generations and the marginalised communities who also benefit from the natural resources of the ocean, especially considering that, currently, stakeholders seem to lack assurance from organisations regarding the measures they have put in place as social and environmental safeguards (Alshehhi et al., 2018; de Villiers et al., 2022; Satizábal et al., 2020). This ideal balance between the use of marine resources and social considerations might prove to be a challenge due to the current gap that has been noted in relation to the failure of companies to integrate social considerations into the blue accounting system and the related governance systems, which then results in the neglect of the social aspect in decision-making by management. The result is trade-off decisions due to the absence of social information supplied by blue accounting (Failler et al., 2023; Perkiss et al., 2022). The gap in integration might be due to the complex issues raised by the intangible and non-marketable nature of social capital (Perkiss et al., 2022). This can be reasonably expected, although, considering that without adequate risk assessment of the extent of their marine activities, it is unlikely that an organisation would know which safeguards to implement and monitor. Unless the above predicament is addressed, there is a huge risk of increased investment in marine operational activities, increased marine usage, and increased infrastructure development in the marine and coastal areas while simultaneously increasing the displacement of coastal dwellers, their access to the resources, and bringing about increased degradation of the ecosystem of the oceans (Satizábal et al., 2020). Recent literature on the oceans and the marine sphere has indicated that there is a need for an assessment/framework that can comprehensively assess the use of marine resources. Such a framework should be all-encompassing, in that it should encompass sustainability, i.e. the environmental, financial, social and governance spheres of the ocean, thus providing a means of reconciling all human activities involving the oceans and the environmental, social, governance and financial effects of such usage (Perkiss et al., 2022). Ultimately, to a certain extent, such an encompassing blue accounting framework would be useful to organisations considering that the information it would require would be in line with

the required integrated reporting-related information, i.e. social capital, natural capital, and manufacturing capital (Maama & Mkhize, 2020; Perkiss et al., 2022). Following this discussion of sustainability, a further discussion will focus on one of the facets of sustainability, namely environmental performance.

2.3.5 The Concept of Environmental Performance

As the study focuses on blue accounting and environmental performance, it is necessary to review the literature on environmental performance to identify the connection between these two concepts. Environmental performance is the measurable outcome of an organisation's management of its environmental aspects, evidenced by how the organisation manages to minimise the environmental impact of its economic activities on the environment through activities such as the introduction of measures to prevent, reduce or avoid pollution (Agyemang et al., 2021; Gull et al., 2022; Shahab et al., 2020). It is also defined as investing in the environment, and having environmentally friendly processes in place (Singh et al., 2019; Singh et al., 2020). This would encompass how the organisation behaves concerning the natural environment in which it is conducting its operations, how it is managing nature, and how it controls any pollution emissions (Alam et al., 2019; Dragomir, 2018; Wendling et al., 2022). The escalation of environmental damage, the growing effects of global warming, and the possible extinction of various ecosystems highlight the pressing need for organisations to measure their interaction with the environment (Bramanti et al., 2021; Deswanto & Siregar, 2018; Machmuddah & Wardhani, 2020).

Furthermore, in terms of stakeholder theory, environmental performance is required by the organisation's various stakeholders, including shareholders, creditors, customers, and the general public (Jiang & Fu, 2019). Ultimately, environmental performance is a reflection of how the organisation has engineered its processes to produce environmentally friendly quality products, invested in green processes and green innovation, and follows ecologically sustainable practices as part of its business operations and the products it provides (Dragomir, 2018; Lončar et al., 2019; Singh et al., 2020). Furthermore, environmental performance benefits the organisation in that over time, as the organisation improves its environmental disclosure and protection of the environment in its operations, this is likely to attract more of the stakeholders' favour and possibly capital as well (Agyemang et al., 2021; Elshabasy, 2018; Jiang & Fu, 2019; Tadros et al., 2020). This therefore highlights the importance of laws and regulations that encourage organisations to implement innovative measures to enhance

environmental performance, especially considering that being innovative yields a competitive advantage over time (Cai & Li, 2018; Jiang & Fu, 2019; Smeesters et al., 2018; Velte, 2022).

Evidently, the increased need for environmental performance is due to recognising that organisations need to be intentional about operating in an environmentally sustainable manner, especially considering the increased deterioration in areas such as climate change, pollution, natural resource depletion, etc, to which the operations of organisations tend to contribute (Alsayegh et al., 2020; Gerged, 2021; Q.-J. Wang et al., 2021). Accordingly, environmental performance broadly encompasses various indicators as indicated in the literature, GRI and ISO standards, such as the recycling and clean-up operations of the organisation, environmental aspects of the production cycle, supply and logistics of the organisation, penalties due to the organisation's environmental activities, and environmental management systems (Baalouch et al., 2019; Benjamin et al., 2023; Cai & Li, 2018; Dragomir, 2018). Other indicators according to the literature include the organisation's impacts on aspects such as air and water quality, fines, incidents, and biodiversity (Dragomir, 2018; Hora & Subramanian, 2019; Tadros & Magnan, 2019).

Hence, ultimately, environmental performance represents the content included in the environmental disclosures for these indicators (Agyemang et al., 2021; Tadros & Magnan, 2019; Tadros et al., 2020). The organisation's application of standards, such as the ISO standards, enhances the organisation's legitimacy in the eyes of stakeholders (Bramanti et al., 2021; Jiang & Fu, 2019). Therefore, matters such as reducing wastewater and solid waste, consumption of harmful materials, and environmental accidents would enhance the organisation's environmental performance (Antara et al., 2020; Cai & Li, 2018; Dragomir, 2018). However, the study pinpointed only the factors/indicators that were regarded as relevant or applicable to ocean-based companies, as these are the ones that best reflect the characteristics of the targeted sectors (Dragomir, 2018). Notably, environmental performance is positively aligned with environmental information disclosure, as the quality of environmental information disclosed by the organisation tends to move in the same direction as environmental performance (Drempetic et al., 2020b; Tadros & Magnan, 2019; Younis & Sundarakani, 2019).

Expanding on the definition of environmental performance, an organisation would need to consider how it could include biodegradable ingredients in its production process, reduce wastage, reduce environmentally harmful materials, and enhance the way it uses resources such

as water, thus providing the organisation with enhanced profitability and competitive advantage, especially considering the highly competitive space organisations operate in (Khan, Zhang, Kumar, et al., 2020; Singh et al., 2019; Singh et al., 2020). The organisation would also need to enhance the way it uses resources such as energy efficiently and improve its competitive advantage by implementing green practices and applying strict environmental policies (Alam et al., 2019; Alsayegh et al., 2020; Khan, Zhang, Kumar, et al., 2020). This approach would reflect two facets of environmental performance: the organisation's ability to reduce or eliminate the negative impact or increase its positive effect on the environment (Babič et al., 2023; Fianko et al., 2021). The environmental performance of the organisation can be evaluated through the disclosures it makes. In such disclosures, the organisation should voluntarily use principles or guidelines from credible standards such as those produced by the Global Reporting Initiative (GRI) or International Organisation for Standardization (ISO), the GRI being the most recognised and commonly utilised (Deswanto & Siregar, 2018; Dremptetic et al., 2020b; Elshabasy, 2018; Sampong et al., 2018). The literature suggests various measures for measuring environmental performance, accounting for the various facets that reflect how the organisation is performing in terms of its environmental activities and sustainability (Dremptetic et al., 2020b; Maama & Mkhize, 2020; D. Wang et al., 2021; Wendling et al., 2022).

This study will use ESG scores to measure environmental performance. This is supported by literature where it's highlighted that various institutions usually produce ESG scores, and some of the important institutions are Bloomberg Sustainability, ASSET4 by Thomson Reuters, the Ethical Investment Research Service (EIRIS), and Kinder Lydenberg Domini & Co. (KLD) at MSCI (Cordazzo et al., 2020; Gibson Brandon et al., 2021; Machmuddah & Wardhani, 2020; Smeesters et al., 2018). In this study, Bloomberg's proprietary ESG scores were used; these scores are widely used globally by a wide range of users, including investors, analysts, researchers and companies. These scores range from 0.1 for companies that have disclosed at least a minimum of the ESG data to 100 for companies that have disclosed all the data points being collected by Bloomberg but are not applicable where no disclosures are made (Alareeni & Hamdan, 2020; Billio et al., 2021; Mans-Kemp & Van der Lugt, 2020). Other environmental studies have used the Bloomberg ESG scores (Gibson Brandon et al., 2021; Smeesters et al., 2018; Yu & Van Luu, 2021). The data from Bloomberg contain the ESG disclosure score and the individual scores for each element, i.e. the environmental disclosure score, governance disclosure score and social disclosure score where available (Benjamin et al., 2023; Buallay,

2019; Lopez-de-Silanes et al., 2020; McBrayer, 2018; Muzanya, 2022). The other studies confirm that the use of the Bloomberg environmental score allows the conversion of environmental disclosures in text form to numerical values that can be replicated and are regarded as more valid and meaningful for statistical analysis (Doan & Sassen, 2020).

The disclosed data are based on the data Bloomberg collects from an organisation's publicly accessible information such as sustainability reports, corporate social responsibility reports, annual integrated reports, organisational websites, carbon disclosure project (CDP) data, third-party research and any other publicly available information that the organisation has shared with the public (Drempetic et al., 2020b; Gregory, 2024; Muzanya, 2022; Phaswana, 2018). To produce the scores, Bloomberg assesses the information in the light of their methodology and then produces the related scores (Bellamy et al., 2020; Muzanya, 2022; Phaswana, 2018). Furthermore, to close any gaps in the publicly available data, Bloomberg uses the Bloomberg Sustainability Survey, based on the GRI standards, to obtain further ESG information from the organisations (Bellamy et al., 2020). Greater emphasis was placed on the environmental score for relevance to the study.

The environmental score is derived from major sustainability reporting frameworks in use by various internationally listed companies to highlight significant sustainability issues; these scores reflect a company's performance in terms of its environmental activities, and this performance is measured and updated on Bloomberg on an annual basis (Bellamy et al., 2020; Billio et al., 2021; Gibson Brandon et al., 2021; Muzanya, 2022). The environmental performance of organisations has been linked to the environmental disclosures organisations make, and the environmental disclosures are measured in Bloomberg using the environmental disclosure score in prior studies (Deswanto & Siregar, 2018; Doan & Sassen, 2020; Giannarakis et al., 2020; Tadros et al., 2020). This was corroborated in other studies as well (Bellamy et al., 2020; Tadros & Magnan, 2019). Therefore, the higher the environmental score, the higher the organisation's environmental performance (Muzanya, 2022). The Bloomberg environmental score has been noted as appropriate considering that it accounts for the environmental disclosure of the organisation, thus reflecting the organisation's environmental suitability, and it is also one of the most elaborate environmental disclosure scores (Bellamy et al., 2020; Giannarakis et al., 2020; Machmuddah & Wardhani, 2020). Lastly, the scores use a wide variety of about 120 environmental impact indicators, which include water-related disclosures, waste generation and effluents (Bellamy et al., 2020).

There are studies where the environmental scores were used as proxies for environmental performance (EP), including studies where the KLD environmental ratings were used. Other studies used the environmental score from ASSET4 (Thomson Reuters database) as a proxy for environmental performance, hence using the environmental score from the Bloomberg database was also considered appropriate as all these ratings are regarded as relevant proxies (Baalouch et al., 2019; Elmagrhi et al., 2019; Mans-Kemp & Van der Lugt, 2020; Omran et al., 2021; Orazalin, 2020; Tadros & Magnan, 2019). In addition to the above, there are certain other environmental performance-related studies that also used the scores as a proxy measure for environmental performance (Azeem et al., 2024; Bednárová et al., 2019; Kordsachia et al., 2022). This measure of the dependent variable (environmental performance) is discussed in more detail in the next chapter.

2.3.6 The Relationship between Blue Accounting and Environmental Performance

From the above deliberations, it is clear that blue accounting can enable an organisation to determine and assess the related environmental costs incurred by that organisation through its operations, thus enabling the organisation to take better accountability and responsibility for the extent to which its activities are affecting the environment and thus enabling it to be more deliberate in the way its operating activities are engineered (Drempetic et al., 2020a; Failler et al., 2023; Rahmayanti & Sari, 2023). This might improve the relationship the organisation has with its stakeholders due to the reduced imbalance of information between the organisation and its different stakeholders, thus possibly improving the social contract between the organisation and its various stakeholders and improving the legitimacy of the organisation in the eyes of the stakeholders (Bramanti et al., 2021; Rossi & Candio, 2023; Wang et al., 2020). In fact, the recognition of blue accounting voluntary disclosure can be a legitimising tool for the organisation's operations and enhance its accountability and transparency to its stakeholders (Rahmayanti & Sari, 2023; Raucci & Tarquinio, 2020; Syah et al., 2020). The organisation might; therefore, endeavour to be more deliberate in ensuring that its activities reflect more environmental friendliness, which could possibly also enhance the organisation's profitability and financial performance over time (Albitar et al., 2020; Elshabasy, 2018; Shah et al., 2021). Therefore, embarking on blue accounting practices might help organisations improve or enhance their environmental performance through enhanced decision-making and environmental awareness, which are brought about by recognising the extent of the effect their activities are having on the environment for both present and future generations.

2.3.7 Gaps in the Literature

From the literature review, it is evident that accounting focuses on numbers to depict the financial substance of the organisation, often overlooking the social and environmental factors that influence an organisation's reported economic/financial substance. Over time, corporate reporting has evolved to include environmental, social, and governance (ESG) aspects through ESG reporting. However, the ESG reporting remains broad and lacks a specific focus on the marine ecosystem. To the author's knowledge, no study has considered blue accounting practices within the context of the ocean-based JSE-listed companies in South Africa. Therefore, this study aims to fill this gap by examining what influences these companies to adopt blue accounting. It also examines how these companies disclose information related to blue accounting and assesses its impact on their environmental performance. The study applies qualitative scoping review, quantitative content analysis, correlational analysis, and pooled regression analysis to explore these gaps. Having discussed the various concepts in the literature, the chapter concludes.

2.4 Chapter Reflections and Conclusion

This chapter started by discussing the theories that support this study, that is legitimacy, stakeholder, and signalling theory. From the theoretical review, it became evident that organisations disclose non-financial information, including environmental information, in line with their stakeholders' demands that they should demonstrate legitimacy, maintain the social contract, and signal a particular sustainability performance. Subsequently, the relevant empirical literature, both international and national, was reviewed across the different facets of corporate reporting, the blue economy, blue accounting, sustainable performance, and environmental performance. From the empirical literature reviewed, it was noted that stakeholders are increasingly requiring more than financial information presented in the financial statements; they are demanding reporting on sustainability which encompasses the organisation's environmental, social, and governance spheres. However, there seems to be a reduced demand where marine-sensitive organisations are concerned, as reflected by the lack of research on blue accounting, which provides information on marine-sensitive organisations' interaction with the marine ecosystem. The lack of blue accounting disclosure has been ascribed to various factors, including the lack of enforcement of marine-related laws and the lack of a uniform, consistent, acceptable framework for use. However, the accounting and management of marine resources can contribute positively to organisations' sustainability and environmental performance. Through this literature review, the study identifies gaps in the

application of blue accounting for marine-sensitive organisations, setting the stage for an empirical investigation into its effects on environmental performance in the South African context. Following an examination of the various concepts represented in the study, the research methods and design chosen to investigate these gaps were addressed.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the research methodology adopted to answer the research questions, including the research design, methods of data collection, sampling procedures, data elimination criteria, and the use of annual integrated reports as a secondary data source. The chapter also discusses the philosophical assumptions. The study reviewed the literature on quantitative, qualitative, and mixed methods approaches to determine the most appropriate methodology to adopt for this study. The literature was discussed in the context of the qualitative scoping review, and quantitative content analysis of the integrated annual reports was also carried out; the econometric model was employed for the research objective. This chapter further explains the steps taken to ensure the validity and reliability of the data utilised in the study and provides a detailed overview of the research process. It concludes with an examination of the ethical considerations involved in the study.

3.2 Research Paradigm

The philosophical assumptions inform how each study adopts the approach or approaches that best address the research questions properly and within the proper guidelines (Bell et al., 2022; Dawadi et al., 2021; Hennink et al., 2020). Research is grounded on four distinct paradigms/philosophical stances: constructivism, criticalism, positivism and interpretivism (Dawadi et al., 2021; Mohajan, 2020; Yadav, 2022). Positivism claims that knowledge is derived from sensory experience, is objective, is obtained by quantitative means and is verifiable (Bell et al., 2022; Hennink et al., 2020; Phaswana, 2018; Walliman, 2021). In contrast, interpretivism is based on multiple realities and is thus considered subjective, employing qualitative methods such as interviews, participant observations, and focus groups (Bell et al., 2022; Busetto et al., 2020; Dawadi et al., 2021; Hennink et al., 2020).

Another paradigm is constructivism or constructionism, which argues that reality results from human interaction with the real world and knowledge is built up through socialising, contrary to the notion that there is a single methodology that generates knowledge (Bell et al., 2022; Dawadi et al., 2021; Kaushik & Walsh, 2019; Mohajan, 2020). The criticalism paradigm, on the other hand, is premised on the principle that knowledge is generated from a critical perspective and seeks to focus on the power of imbalance within society (Dawadi et al., 2021; Walliman, 2021). A relevant paradigm for this study is pragmatism, which integrates

positivism and interpretivism, as it views reality as being both singular and multiple, objective and subjective, and therefore usually employing the mixed methods research design (Dawadi et al., 2021; Mazandarani, 2022; Walliman, 2021). This study adopts pragmatism, which integrates both the positivist and interpretivism elements, providing the methodological flexibility that allows the use of qualitative and quantitative research methods to explore blue accounting and its impact on environmental performance comprehensively (Bell et al., 2022; Mazandarani, 2022). The main paradigms identified from the prior studies are positivism and interpretivism, which are the quantitative and qualitative methodologies, respectively (Dawadi et al., 2021; Mazandarani, 2022). The pragmatism approach applied is further discussed in the section below.

3.3 Research Philosophical Assumptions

A paradigm is defined as a worldview that guides the researchers on the area of research, how it should be researched, and how the results and findings should be interpreted (Bell et al., 2022; Mazandarani, 2022). A research paradigm is a philosophical position about the world or nature of reality and how these should be approached and interpreted (Dawadi et al., 2021; Hennink et al., 2020; Kaushik & Walsh, 2019). These assumptions influence the choice of research strategies, data collection and data analysis methods (Jones, 2022; Mazandarani, 2022; Phaswana, 2018). This comprises the assumptions made about ontology and epistemology, which guide the research process (Bell et al., 2022; Dawadi et al., 2021; Hennink et al., 2020). Ontology is the nature of the truth, and epistemology is the nature and forms of human knowledge (Bell et al., 2022; Dawadi et al., 2021; Hennink et al., 2020; Walliman, 2021). Given that blue accounting is an emerging area, this study allows for an exploratory design mixed methods approach to be applied to provide a holistic and in-depth investigation into blue accounting adoption and environmental performance. The following section will provide a detailed discussion of the different research philosophies in literature and the reasoning behind the research philosophy adopted.

3.4 Philosophical Assumptions Underpinning this Study

The applied pragmatism approach incorporates inductive and deductive methods (Bibi et al., 2022; Busetto et al., 2020; Kaushik & Walsh, 2019). This research philosophy was appropriate as the study sought to identify factors influencing blue accounting disclosures to understand what is responsible for the lack of literature and visibility of blue accounting and offer recommendations to expedite blue accounting adoption. It also permitted the investigation of

the significant effect blue accounting disclosures have on the marine organisation's environmental performance. Pragmatism made it possible to maximise the complementary merger between the two methods and their philosophies, thus enhancing the understanding of the researched phenomenon (Muzata, 2018; Strijker et al., 2020). The exploratory design method was applied, where the qualitative data was collected first to identify key factors influencing blue accounting adoption, followed by a quantitative analysis with econometric modelling to assess the blue accounting impact on environmental performance (Akotia et al., 2023; Bibi et al., 2022; Kaushik & Walsh, 2019). The approach chosen for this study was to integrate the results at the interpretation stage, where qualitative findings are presented, followed by quantitative results, providing a holistic understanding of blue accounting's impact on environmental performance. Therefore, applying this approach promoted an understanding of the blue accounting concept and how organisations can adopt it to improve their environmental performance (Muzata, 2018). Lastly, the pragmatic view aligned with the mixed methods research approach was considered the most appropriate for researching relatively new fields or research areas where not much research has been done (Muzata, 2018). The above approach was adopted since blue accounting is a relatively new field.

The results of the two methods can be interpreted either during the method stage or the interpretation stage. At the method stage, qualitative findings can guide the data collection and analysis of the quantitative method (Akotia et al., 2023; Busetto et al., 2020; Mahmood et al., 2018). Alternatively, integration can occur during the interpretation stage, where the results and interpretations of the first method applied (qualitative in this study) are presented, followed by the results of the second method (quantitative in this study) (Akotia et al., 2023; Busetto et al., 2020; Mahmood et al., 2018). In answering the research questions and achieving the research objectives, a pragmatic worldview was adopted, and a mixed research method was applied, supported by the above explanations. The following section offers a detailed discussion of the research methodologies applied to this study.

3.5 Methodologies for Studying Blue Accounting and Environmental Performance

Research methodology refers to frameworks fundamentally related to the research process (Sejake, 2021). The research strategy outlined below was adopted to ensure alignment with the research objectives, study aim, and methodology (Melnikovas, 2018; Saunders & Tosey, 2012; Saunders et al., 2015). This meant a qualitative scoping review was applied to identify factors that influence blue accounting adoption and quantitative content analysis for assessing the

impact blue accounting disclosures have on environmental performance using an econometric model. The research onion adopted is presented below in Figure 1. Figure 1 is structured in layers, with the outside layer reflecting the philosophy, then the approach to theory development, then methodological choice, strategies, time horizon, and techniques and procedures at the core.

Research onion proposed (Saunders et al., 2015)

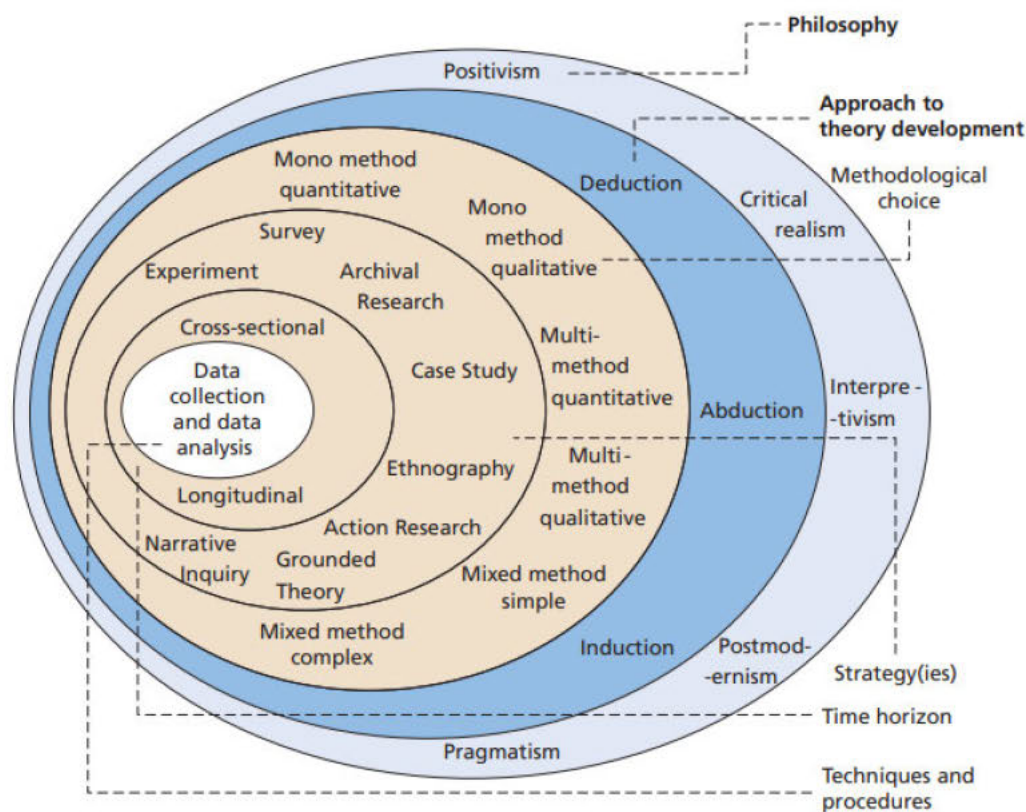


Figure 1: Research Onion

Source: Adapted from Saunders et al., 2015

3.6 Research Strategies and Approaches

As alluded to above, the study must adopt the appropriate research methodologies and techniques to address the research questions appropriately. The criticality of decisions also highlights the difficulty such decisions present as researchers are required to have the correct understanding of the research topics and the various research approaches available.

Previous studies investigating blue accounting disclosures have mainly applied the qualitative approach to decipher the blue accounting phenomenon (Abreu et al., 2019; Karani et al., 2023; Perkiss et al., 2022; Rahmayanti & Sari, 2023). However, one of the studies argued that richer

results would be attained using the quantitative method, considering that, at times, qualitative results are not as objective and appropriate for complex phenomena; thus, a qualitative method was employed (Pattinaja et al., 2023). For investigating environmental performance, various studies employ qualitative methods (Dragomir, 2018; Harris et al., 2021; Tjoa & Widianingsih, 2022), while other studies apply quantitative methods to evaluate environmental performance (Antara et al., 2020; Dremptetic et al., 2020b; IFADA et al., 2021). To the author's knowledge, no studies have investigated the relationship between blue accounting and environmental performance. Some of the studies that applied either qualitative or quantitative methods noted that using a single method is a limitation. Therefore, to counteract the limitation imposed by using a single method and allow different methods to complement each other, a mixed method was employed in this study. The qualitative, quantitative, and mixed methods approach, with their related advantages and disadvantages, are discussed below.

3.6.1 Quantitative Method

The quantitative method is a deductive research method focusing on quantifying data collection and analysing the data by measuring variables using statistical analysis and systematic measurement programs such as Excel, Stata, Access, etc (Basias & Pollalis, 2018; Bhangu et al., 2023; Busetto et al., 2020; Mohajan, 2020; Rahman, 2020; Strijker et al., 2020). This method necessitates obtaining accurate and reliable measurements that can be used for statistical analysis (Bhangu et al., 2023; Busetto et al., 2020; Mohajan, 2020). This method applies ontological assumptions (Hennink et al., 2020; Kaushik & Walsh, 2019; Yasseen, 2019). It also underpins the positivist perspective, where the singularity of reality is based on the statistical results (Basias & Pollalis, 2018; Bloomfield & Fisher, 2019; Busetto et al., 2020; Phesa & Sibanda, 2022).

Moreover, the positivism premise highlights that the world is considered to be made up of a single, firm reality, a reality which can be objectively quantified through the use of standardised sets, systematic observations, experiments, survey data, simulation, correlation studies, and statistical analysis, thus emphasising the wide range of results that can be obtained by applying this research method (Basias & Pollalis, 2018; Mohajan, 2020; Walliman, 2021). The quantitative method may be experimental and non-experimental. With the experimental method, the study seeks to understand the relationship between the dependent and independent variables, and the results are not known in advance (Ahmad et al., 2019; Hennink et al., 2020; Kavar et al., 2024). With the non-experimental method, the independent variable is not

manipulated and may be either descriptive, causal-comparative or consist in evaluation, existing data meta-analysis, etc. (Kawar et al., 2024; Mohajan, 2020). Therefore, the method allows for the replication of the results, emphasising the objectivity and reliability of the results obtained (Collingridge & Gantt, 2019; Mohajan, 2020).

There are several advantages to using quantitative methods, such as the ability to generate predictions through the use of deductive reasoning that can be examined in real-life situations (Bibi et al., 2022; Dawadi et al., 2021; Kawar et al., 2024). This method also makes it relatively easy to analyse the results and allows large quantities of data to be collected for testing (Hennink et al., 2020; Kawar et al., 2024; Lenger, 2019; Mohajan, 2020). These large datasets are not a hindrance as the statistical methods are well equipped to handle them in a time- and resource-efficient manner, using computerised software such as Excel, Stata, etc., for the statistical analysis (Bell et al., 2022; Bibi et al., 2022; Ragab & Arisha, 2018). This makes it possible to work with large samples and use the results to provide an overview of patterns, trends, deviations or anomalies in the tested area and generalisation over the larger population (Ahmad et al., 2019; Hennink et al., 2020; Mohajan, 2020; Strijker et al., 2020). The results attained can also be aggregated and compared across the various population groups if the dataset is structured to allow that (Ahmad et al., 2019; Lenger, 2019; Mohajan, 2020; Ragab & Arisha, 2018). However, these results can only be generalised if the selection process is well-designed and the samples are representative of the population (Hennink et al., 2020; Mohajan, 2020; Ragab & Arisha, 2018).

Another consideration is that, with proper experimental design, the data and results can be replicated, which enables the transfer of the data to other analysts, further controlling control bias and thus leading to objective results (Bell et al., 2022; Creswell, 2021; Mohajan, 2020). The method allows for a deeper examination of the relationship between the dependent and independent variables, thereby increasing the researcher's objectivity (Borgstede & Scholz, 2021; Lenger, 2019; Mohajan, 2020). However, this might not be achieved if the statistical measure used to measure these variables is invalid (Borgstede & Scholz, 2021). Additionally, this method is considered more accurate than the qualitative method, which focuses on non-numerical data, as fewer errors are likely to occur with the appropriate use of statistical tests (Bell et al., 2022; Kawar et al., 2024; Mohajan, 2020). Furthermore, the method allows for precision and standardisation, and due to its scientific nature, it produces more reliable findings and allows the researcher to measure and appropriately analyse the data (Ahmad et al., 2019;

Bell et al., 2022; Mohajan, 2020; Ragab & Arisha, 2018). This is also appropriate for systematic and standardised statistical comparisons across various factors where necessary and allows for testing hypotheses in experiments (Bell et al., 2022; Mohajan, 2020).

These benefits of the quantitative methods come with certain deficiencies. For one thing, the aggregation process involves sacrificing potentially useful information and commonly under-reports on difficult matters (Mohajan, 2020; Mwita, 2022). Also, it rarely involves large quantities of data if the study is expensive, and at times, it gives a false impression of homogeneity in a sample (Kawar et al., 2024; Mohajan, 2020; Ragab & Arisha, 2018). Moreover, statistical methods can be a limitation, as the results must be calculated using methods such as Excel, Stata, SPSS, etc., when these programs may be unavailable in a particular country (Mohajan, 2020). The pursuit of concrete statistical relationships can also be limited in some studies (Creswell, 2021; Mohajan, 2020). Additionally, the method does not provide much room for the context of the study and thus does not aid in understanding the context of a phenomenon, especially considering that the method ignores the human element (Bell et al., 2022; Bibi et al., 2022; Kawar et al., 2024; Mohajan, 2020). Although the method allows for control over the biases of the results, the biases can be introduced earlier in the research process, which might influence the output of the research (Kawar et al., 2024; Mohajan, 2020). Further, although quantitative methods allow the collection of large data quantities, the analysis of the data and results can be time-consuming in such instances (Mohajan, 2020; Mwita, 2022). Another consideration is that, at times, the data may not be robust enough to explain complex matters (Bibi et al., 2022; Mohajan, 2020; Ragab & Arisha, 2018).

After considering the above considerations, the study adopted the quantitative method to obtain findings that can shed comprehensive light on the whole population of marine-sensitive JSE-listed companies (Queirós et al., 2017). Consequently, this method is considered relevant for the study of blue accounting and its effect on the environmental performance of an organisation, as the relationship analysis can be viewed as an accounting problem that should be investigated using a deductive method, which is a mainstream accounting research method that is based on the perspective that there is single reality and that the researcher is unbiased (Ahmad et al., 2019; Dawadi et al., 2021; Mohajan, 2020; Yasseen, 2019). Therefore, over and above being the commonly used research method, it was also used because of its ability to answer the research questions best and enable the effective realisation of the research objectives

(Dawadi et al., 2021; Mohajan, 2020; Queirós et al., 2017). The positivist element of the method makes it possible to perceive the reality and the researcher as mutually exclusive, thus enhancing the objectivity of the results from the study using methods such as statistical analysis and content analysis (Ahmad et al., 2019; Busetto et al., 2020; Mohajan, 2020; Rahman, 2020). This was possible for this study because the study sought to evaluate the relationship between variables, and the results from the study are objective in that they are solely dependent on the analysis done without any manipulation of the variables (Busetto et al., 2020; Manes-Rossi et al., 2018; Mohajan, 2020; Pitrakkos & Maroun, 2020). With the diverse methods the quantitative methodology provided for this study, as discussed above, a correlation study was carried out, where the study sought to establish the extent of the relationship, if any, between the blue accounting practices and the environmental performance of JSE-listed companies in South Africa (Queirós et al., 2017). Mixed methods (quantitative and qualitative) are also discussed below to explain their relevance to the study.

3.6.2 Qualitative Method

The quantitative method was discussed above; the qualitative method will now be discussed to provide a basis for understanding how this method was factored into the study. This a common research method, which examines the nature, quality, and manifestations of phenomena in various contexts, focusing on text or words rather than numbers (Ahmad et al., 2019; Basias & Pollalis, 2018; Busetto et al., 2020; Hennink et al., 2020). Thus, the qualitative research method is better able to identify the cause and effect of complex relationships and reveal fine descriptive distinctions (Ahmad et al., 2019; Aspers & Corte, 2019; Hennink et al., 2020; Kavar et al., 2024). The collected data were interpreted and enhanced through descriptive statistics to establish general patterns from the results (Aspers & Corte, 2019; Busetto et al., 2020; Nassaji, 2020). The method is considered appropriate for exploring new research areas, exploring uncertainty about concepts, and understanding complex phenomena due to its ability to examine matters in great detail (Aspers & Corte, 2019; Collingridge & Gantt, 2019; L. Haven & Van Grootel, 2019). Therefore, it can provide new insights and a great deal of information and resolve uncertainties or areas for deeper clarification as it investigates the “why”, “where”, “when”, “who”, and “what” aspects of the research matter (Kavar et al., 2024; Lenger, 2019; Mwita, 2022). Although non-statistical, the results are reliable so long as the statistical/scientific principles inferred in applying the quantitative method are applied (Aspers & Corte, 2019; L. Haven & Van Grootel, 2019).

The method offers great flexibility because it is less structured, which can enhance the quality of the results; however, it could also produce lower-quality results due to its excessive flexibility (Ahmad et al., 2019; Lenger, 2019; Yadav, 2022). The complexity of a phenomenon could be inadequately captured and represented, as the researchers may be dissuaded from collecting large amounts of data (L. Haven & Van Grootel, 2019; Mwita, 2022). Also, the sample used in the method is chosen to gain insight and explain the phenomenon; however, this makes it challenging to generalise the results to the whole population, as doing so may lead to validity and reliability issues (Bibi et al., 2022; Jones, 2022; Kwar et al., 2024; Mwita, 2022).

However, the qualitative method is considered to be less standardised and scientific than the quantitative method and prone to subjectivity, which may increase biases in the results as it applies the interpretivism paradigm (Ahmad et al., 2019; Aspers & Corte, 2019; Mwita, 2022). However, there is value in this paradigm in that it enables the researchers to understand the social context of the phenomenon (Ahmad et al., 2019; Kwar et al., 2024; L. Haven & Van Grootel, 2019; Mwita, 2022). Furthermore, the evaluation phase can be demanding in terms of time and expensive as the researcher has to sift through large amounts of data and extract the relevant data (Kwar et al., 2024; Lenger, 2019; Mwita, 2022; Ragab & Arisha, 2018). Another limitation is that universally applicable statements cannot be extrapolated from the qualitative data as such data only allows representational patterns, and duplication tends to be a challenge (Creswell, 2021; Lenger, 2019; Mwita, 2022; Ragab & Arisha, 2018). Although the method has limitations, these do not inhibit high-quality research as the characteristics of research such as rigour, credibility, resonance, ethics, sincerity, and significant coherence also serve an essential function in the quality of results attained from the study (Muzata, 2018).

The qualitative method is suitable for the study, considering that the research question will be effectively addressed through the use of this method, as it helps in uncovering and providing an in-depth understanding of the patterns and relationships the study is seeking to establish (Basias & Pollalis, 2018; Busetto et al., 2020; Hennink et al., 2020). The interpretivism research paradigm anchors this method (Busetto et al., 2020; Hennink et al., 2020). This method was employed by applying the document study analysis, where a review of the research material, i.e. publications/articles, was conducted (Busetto et al., 2020; Hennink et al., 2020). Therefore, considering that blue accounting is a fairly new research area seeking to understand a complex marine ecosystem, employing the qualitative method was an appropriate means of

providing information concerning the research objectives under observation. Following the above discussion of both methods and their merits, the mixed method will be further discussed to highlight what it entails and why it was considered appropriate for the study.

3.6.3 Mixed Methods (Quantitative and Qualitative)

Other aspects of the mixed methods approach will be discussed next based on the prior discussions of qualitative and quantitative methods. This is necessary as the study employed the hybrid/mixed method approach to utilise the benefits provided by this approach and enhance the research output. Therefore, the mixed methods approach adopted will enable an effective synthesis of the research problem, providing breadth and depth of information on the research problem (Busetto et al., 2020; Dawadi et al., 2021; Kaushik & Walsh, 2019).

This method integrates postpositivist and interpretivism philosophical frameworks (Bibi et al., 2022; Dawadi et al., 2021; Timans et al., 2019). Enabling an enhanced and deeper understanding of the blue accounting phenomenon, which the qualitative or quantitative method could do independently, thus complementing the strengths of the two methods while compensating for the weaknesses embedded in each method and providing deeper knowledge as a result (Akotia et al., 2023; Dawadi et al., 2021; Strijker et al., 2020). There are various types of mixed method approaches, such as the convergent parallel mixed methods design, where the two types of datasets are collected concurrently and analysed independently using the qualitative and quantitative methods, respectively, and triangulated results are produced (Bell et al., 2022; Busetto et al., 2020; Dawadi et al., 2021; Mazandarani, 2022). The alternative design is the explanatory sequential design, where the data are collected and analysed using the quantitative phase and then expanded using the qualitative phase based on the quantitative results (Ahmad et al., 2019; Busetto et al., 2020; Dawadi et al., 2021). This design is applied when the quantitative phase is more dominant than the qualitative phase (Akotia et al., 2023; Bell et al., 2022; Busetto et al., 2020; Dawadi et al., 2021). The other design is the exploratory research design, where a research issue is explored in depth using qualitative data, after which the qualitative findings are identified and measured using variable statistical means (quantitative method), and the findings are used to provide insights to inform quantitative data collection and analysis (Ahmad et al., 2019; Bell et al., 2022; Busetto et al., 2020; Ragab & Arisha, 2018). This is applied when the study tends to be qualitative-oriented (Akotia et al., 2023; Bell et al., 2022; Dawadi et al., 2021; Kwar et al., 2024). The last design is the embedded or nested design, where data from both the qualitative and quantitative methods are collected

concurrently with the aim of each method supporting the other to respond to a complementary research question effectively, and either of the methods is dominant (Akotia et al., 2023; Bibi et al., 2022; Kwarar et al., 2024; Timans et al., 2019).

However, the mixed research method has been noted to pose several challenges, such as the nature of the method, which is lengthy and time-consuming (Bell et al., 2022; Creswell, 2021; Dawadi et al., 2021; Kwarar et al., 2024). Additionally, integrating qualitative and quantitative methods may lead to challenges in integrating the datasets and producing congruent results for the research (Akotia et al., 2023; Bell et al., 2022; Dawadi et al., 2021; Kwarar et al., 2024). The different epistemological and philosophical frameworks guiding the two methods might pose incompatibility issues, and it might not be possible for both methods to be afforded the same attention, thus possibly leading to distorted results (Ahmad et al., 2019; Bell et al., 2022; Borgstede & Scholz, 2021; Strijker et al., 2020; Yadav, 2022). Moreover, the methods might influence each other's results and interpretation, especially if they were not properly designed and the data quality was compromised during data integration (Creswell, 2021; Dawadi et al., 2021). Lastly, and most importantly, the researcher might struggle to justify the appropriate design applied in light of the different dynamics of each design (Akotia et al., 2023; Bell et al., 2022; Dawadi et al., 2021; Kwarar et al., 2024). Consequently, this study adopted pragmatism as the guiding philosophical framework for its mixed methods approach. The next section explores the research design and the rationale behind its selection.

3.7 Research Design

Research encompasses a planned investigation aimed at providing solutions to an identified problem (Sejake, 2021). For the research to be appropriate, it should be supported by the relevant theories and concepts, the data collection needs to be suitable and organised, and the appropriate analysis techniques should be applied (Sejake, 2021). Lastly, the research should provide findings consistent with the research question, followed by an informed interpretation of the results (Sejake, 2021). Research design entails a systematic process with comprehensive steps in the research process, from the starting point to the finalisation, i.e., the implementation of the selected research method (Bell et al., 2022; Dannels, 2018; Dawadi et al., 2021; Sovacool et al., 2018; Walwyn & Chan, 2019). For effective implementation of research, the researcher needs to employ one of the following methods: a quantitative, qualitative, or mixed or hybrid method based on what is best for achieving the research objectives (Basias & Pollalis, 2018; Bibi et al., 2022; Busetto et al., 2020; Mohajan, 2020). These discussed methods align with the

research paradigm, which serves as a framework for selecting the most appropriate research methods (Kaushik & Walsh, 2019; Mohajan, 2020; Walwyn & Chan, 2019). The applied research design is presented in Table 1 below. Table 1 displays Column 1, which shows the research objective, and Column 2 displays the research method used for the research objective.

Table 1: Summary of the Research Methods to be Used for the Study's Research Objectives

Research Objective	Method
1. Identifying factors that influence the organisation's adoption of blue accounting disclosure.	Scoping review (qualitative)
2. Testing whether blue accounting has a significant effect on the environmental performance of South African maritime companies listed in the Johannesburg Stock Exchange.	Quantitative content analysis

Source: Own Compilation

Using the exploratory sequential design, qualitative data were collected and analysed to build qualitative datasets such as the reporting guidelines used for blue accounting disclosures, blue accounting information/disclosures such as marine policies, environmental reporting costs, marine governance, marine risks and opportunities, sustainability, including the sustainability development goals and the regulatory framework (qualitative scoping review). Having identified these various factors, some of which are linked to blue accounting disclosures or broaden our understanding of blue accounting disclosure explanatory variables, the integrated annual reports and sustainability reports were used to score the marine organisations regarding their disclosure of these blue accounting disclosure variables. The blue accounting score was derived using a Likert scale scoring framework of 1-5, as described below in 3.14.2.2 (content analysis and its validity), assessing the extent and quality of each blue accounting disclosure in the organisation's integrated annual and sustainability reports. Environmental performance was measured using Bloomberg's environmental score, as explained above in 2.3.5 (the concept of environmental performance). This permitted correlation and regression analysis of blue accounting disclosures and organisational environmental performance (quantitative datasets) for the marine-sensitive JSE-listed companies.

The mixed methods approach was beneficial for this study as it allowed the use of qualitative research methodology (not necessarily with greater weighting) in exploring and gaining

insights into what influences organisations to adopt or fail to adopt blue accounting. The insights gained from the qualitative research also allowed a greater comprehensive understanding and interpretation of the quantitative findings.

A qualitative scoping review was used to identify the factors that influence organisations to adopt blue accounting. With the understanding obtained from the review, a quantitative content analysis was performed for Objective 2. Figure 2 displays the research methodology process for the study. Figure 2 shows the process followed for the exploratory mixed method design from the literature review to conducting the qualitative scoping review for identifying blue accounting factors and using quantitative content analysis to determine the blue accounting impact on environmental performance.

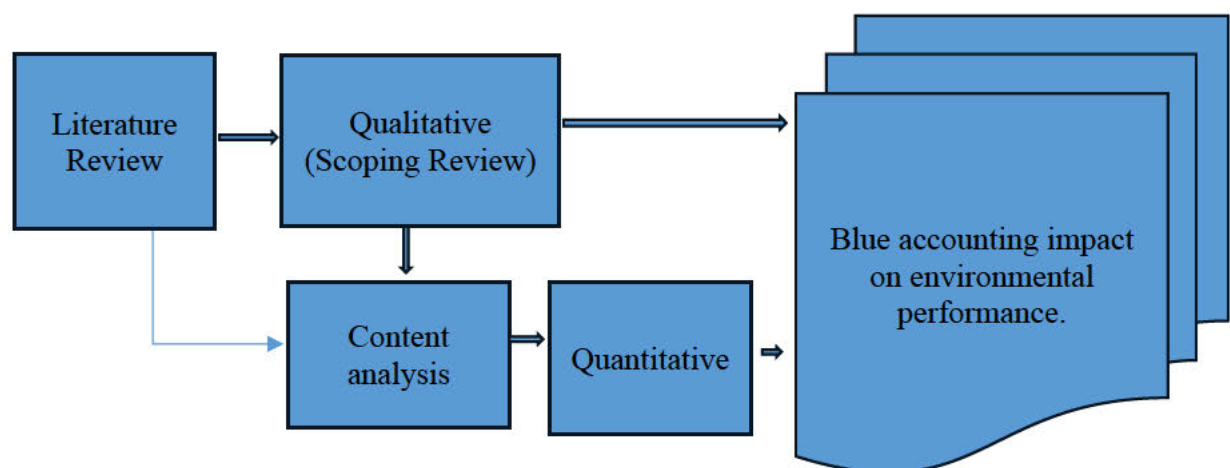


Figure 2: Exploratory Mixed Methods Research Design

Source: Adapted from (Busetto et al., 2020; Wright et al., 2015; Wright, 2014).

This hybrid method was chosen due to the benefits it offers for the study. These are articulated below.

3.8 Justification for the Choice of the Hybrid Approach

Mixed methodology entails using multiple research strategies and interpreting the results to enhance a study's reliability and comprehensiveness. The data can be collected using a sequential or a parallel approach and analysed accordingly to enable a better understanding of the research problem and to provide a more comprehensive assessment of the research area by ensuring that adequate information was collected to answer the research questions (Busetto et

al., 2020; Creswell, 2021; Dawadi et al., 2021). The mixed methods approach offers great potential within the accounting field, hence the growth of this method in accounting research (Lamprecht & Guetterman, 2019; Otieno, 2023; Saha, 2022). To the author's knowledge, no study has employed mixed methods to investigate blue accounting factors and how blue accounting disclosure influences the organisation's environmental performance. This study is thus the first to employ mixed methods to address the factors that influence the organisation's adoption of blue accounting and investigate how blue accounting disclosure has a significant effect on JSE-listed marine organisations' environmental performance. The results of the two methods and interpretations of the qualitative results in this study were presented, followed by interpretations of the quantitative method (Akotia et al., 2023; Busetto et al., 2020; Mahmood et al., 2018). The following section focuses on the research population.

3.9 Research Population

In research, a population refers to a collection of items, units, or subjects that are being analysed, and this group may consist of either a limited or an unlimited number of units (Nakeng, 2019; Pandiangan et al., 2021; Shukla, 2020). The population usually encompasses items, subjects or units with corresponding attributes that are of interest to the researcher conducting the study (Mgilane, 2023; Pandey & Pandey, 2021). The population is divided into a target population and a study population (Chininga, 2022). The target population is the actual population over which the findings will be generalised (Chininga, 2022; Jingura, 2019). In contrast, the study population further narrows the target population by removing elements that are not readily available for the study (Chininga, 2022). The study population becomes the actual population used in generalising the findings (Chininga, 2022).

To effectively assess the impact of blue accounting, marine-sensitive organisations need to be evaluated as these companies provide the appropriate population for this study, considering a relationship between blue accounting and the sustainability of the organisations' ocean-related activities. Thus, it can reasonably be expected that these organisations are highly likely to provide annual integrated and sustainability reports on their interaction with the marine ecosystem. These organisations are listed on the JSE and participate in fisheries, shipping, logistics, oil, and energy operations.

The total number of all the listed companies over this period was 302 as of the 2023 financial year. The total number (302) was obtained from a JSE listing schedule received on request

from the JSE communications personnel using the email address provided on the JSE website for information requests. The target population for this study was all the South African marine-sensitive organisations listed on the JSE for the period of 2019 to 2023. This period was elected as it is a period over which blue accounting disclosures can reliably be found in the annual integrated reports and sustainability reports, as most organisations would have prepared and published these reports over this period (Maroun, 2019; Rossi & Candio, 2023). To obtain the target population for the study from the JSE listing schedule, a filter was applied to the sector field, and the full sector name was used to select the organisations per the above sectors. Thus, the total population of 68 companies was made up as follows: shipping and logistics companies numbered 10, fishing companies 14, companies in the oil sector numbered 10, and companies in the energy sector 34.

The study focused only on JSE marine-sensitive organisations, so the results probably carry a risk of survivorship bias. Survivorship bias is a risk of obtaining skewed results by including only certain organisations and using data related to those organisations while excluding those organisations that fall outside the inclusion criteria (Aslan et al., 2021; Phakisi, 2022). This study is exposed to survivorship bias based on the selection bias and data availability of marine as we only considered marine-sensitive organisations listed on the JSE from 2019 to 2023. This ultimately means that organisations delisted during this period or listed after 2019 were not analysed for the study. When selecting the population and the sample, the annual integrated reports of organisations not listed in the JSE during the period 2019 to 2023 period and not marine sensitive were not evaluated for the study. However, this does not discount the study's validity or integrity but should be considered when reaching conclusions on the regression results (Danso et al., 2019; Steen et al., 2020).

These companies' annual integrated and sustainability reports are easily accessible from their websites. Furthermore, the JSE is a reliable source of financial and non-financial data due to its status; thus, it was used to select the population for the study (Nakeng, 2019).

To the author's knowledge, no study has been done on the JSE-listed companies encompassing the above marine-sensitive sectors. Having discussed the population, the inclusion and exclusion criteria will now be discussed to provide further guidelines on the organisations analysed for research Objective 2.

3.10 Inclusion and Exclusion Criteria

3.10.1 Inclusion Criteria

The study focuses on marine-sensitive organisations in fishing, shipping and logistics, energy, and oil operations. To qualify for inclusion in the study, the organisations in the above sectors would need to have been listed on the JSE for at least five years. Over this period, there has been progressive growth in the need for blue accounting due to the growing need to sustainably address the growing marine deterioration caused by the growing blue economy and reliance on marine resources for food purposes (Failler et al., 2023; Rahmayanti & Sari, 2023). Furthermore, the negative effects of increasing water pollution on the quality of the marine ecosystem and the apparent obliviousness of organisations to their contribution to such has seen a growth in advocacy for organisations to measure how their activities affect the sustainability of the marine ecosystem (Failler et al., 2023; Syah et al., 2020). The above issues are aggravated by the lack of regulatory framework enforcement, which has led to the failure of some organisations to adhere to marine regulations aimed at enhancing marine sustainability (Failler et al., 2023).

All the above issues are exacerbated by the lack of blue accounting disclosures, which could assist marine organisations in measuring the impact of their operations on the ocean; as such, they continue with business as usual as they are oblivious to some of the dire effects of their operations. Therefore, the period from 2019 to 2023 is ideal as it captures both the improvements in environmental disclosures and the potential lag in blue accounting disclosures by marine-sensitive organisations, enabling an effective assessment of how these deficiencies may lead to observable environmental impacts. This enables an effective assessment of how deficiencies in blue accounting may obscure the organisation's actual environmental footprint making it therefore difficult to assess its contribution to water pollution, inefficient resource use and non-compliance with marine regulations (Chiu et al., 2020; Failler et al., 2023; Fridman et al., 2021a). Thus, making it difficult for organisations to track their impact over the years. This also weakens the organisation's environmental accountability to its stakeholders and across the marine organisations in the sector (Winarsih et al., 2020).

This period of five years has also been chosen to enable an effective longitudinal analysis for evaluating blue accounting and environmental performance for at least five years. Furthermore, the organisation must have been listed at least a year before 2019; this will assist in the

normalisation of the data points for the statistical analysis over the 5-year period. The organisations to be included must be listed on the JSE throughout the period under consideration, and the environmental disclosure information must be available on Bloomberg for all five years. The period under consideration was 2019–2023, as over this period, the companies would have been required to comply with the mandatory requirement of integrated reporting for JSE-listed companies, and this would, therefore, be a period in which the environmental performance can be evaluated from the secondary data. Furthermore, this period was used because the data was available. Therefore, the organisation must actively report on its environmental sustainability, at least for the years under consideration.

The 2019–2023 period was selected as it is reasonably expected that the implementation of environmental reporting is likely to have improved over the years with more companies adhering to the updated integrated reporting principles so that this period will provide enough data for the quantitative study (Agyemang et al., 2021; Maroun, 2019; Rossi & Candio, 2023; Sukhari & De Villiers, 2019). Other authors support this as well (Amirrudin et al., 2021; Arvidsson & Dumay, 2022). It has also been noted that the ESG information presented in the integrated reports of South African listed companies shows improved accuracy, especially in the environment-related disclosures (Phaswana, 2018; Rossi & Candio, 2023). Also, over the five-year period, marine organisations would not see any value or benefit from ESG as it is believed that ESG benefits are realised mainly in the long term (Chininga, 2022). This period may, therefore, provide some assurance with limited distortion due to the short period under consideration. This is in view of the fact that over this period, the global reporting initiative (GRI) principles would have been available for the adoption and implementation by all the companies intending to disclose the sustainability of their environmental practices transparently. This may reasonably be expected, considering that these GRI principles would have been available as early as 2000 and were continuously updated as the need arose (de Villiers et al., 2022; Initiative, 2021; Khakimovna & Oktyamovna, 2022). Hence, the reasonable expectation that the listed companies, which are likely to have been operating for years, would have adopted the GRI principles, considering that these principles come from one of the most acclaimed standard-setting bodies in the field of sustainability reporting and the GRI standards are noted to be dominant as a global reporting standard with more and more organisations using them for their sustainability reporting (Bramanti et al., 2021; Mahmood et al., 2018; Nkundabanyanga et al., 2021).

Improved environmental reporting from 2019 onwards is also expected to be reflected in the ESG scores in Bloomberg due to the measures taken by Bloomberg to provide scores that are aligned with the global sustainability frameworks, resulting in more comprehensive and reliable scores (Arvidsson & Dumay, 2022; Cort & Esty, 2020; Egginton & McBrayer, 2019). This enables a detailed analysis of trends in the organisation's blue accounting practices, particularly in assessing the extent to which they align with marine-related disclosure requirements under existing sustainability frameworks. Since blue accounting is not yet an established framework, organisations have relied on these sustainability frameworks to disclose the environmental impact of their marine activities. These disclosures are reflected in the organisation's Bloomberg environmental scores, providing insight into its performance, especially as it is evaluated over a five-year period. This, in turn, allows for a more effective analysis of the organisation's environmental performance using Bloomberg environmental scores.

However, if the companies had not adopted GRI standards, they would have been expected to adopt other relevant non-financial data reporting standards or principles, as alluded to in the literature review. Lastly, over this period, it is reasonably expected that the quality of integrated reports has been on a rising trajectory, and even more so in South Africa, where the integrated reporting concept was mandatorily applied for JSE-listed companies earlier than in other countries (Eccles et al., 2019; Mahmood et al., 2018; Manes-Rossi et al., 2018; Phaswana, 2018). But, as blue accounting is a new concept, marine-sensitive organisations are probably still learning how to effectively integrate and implement it in their environmental reporting, which may create an expectation gap between stakeholders and what is being reported on by the organisation (Failler et al., 2023). This expectation gap might make it difficult for the organisation to determine whether it has met its stakeholders' needs (Haque & Ntim, 2018).

3.10.2 Exclusion Criteria

Following a discussion of the organisations to be included, the organisations to be excluded will be dealt with. These are the newly listed companies belonging to the above-identified sectors as they would not have been in operation throughout the period under consideration, i.e. these companies would have been listed for less than five years. Furthermore, such organisations might not have had all the necessary data for the study, thus jeopardising or distorting the interpretation of the study's final results. Hence, organisations that had not prepared integrated annual reports for any of the periods under consideration were excluded

(Sukhari & De Villiers, 2019; Tingbani et al., 2020). Consequently, this may have resulted in fewer organisations being observed than the 68 organisations identified above. After discussing the above guidelines on what makes up the organisations that were evaluated, it is necessary to ascertain the methods and instruments used to collect the data.

After the above inclusion and exclusion criteria had been applied, 14 organisations were available for assessment in terms of Objective 2. From the evaluation of the 14 companies regarding blue accounting disclosure requirements, it appeared that one company did not include disclosures in their report for 2019; however, it had the information for the remaining years. Therefore, given the study's limited observations, removing additional observations could further reduce the available dataset, potentially introducing bias, overlooking valuable insights, and possible inadequate analysis (Khan & Hoque, 2020; Lin & Tsai, 2020; Matenda & Sibanda, 2022; Zhang, 2016). Hence, the study imputed the missing data values for the one company's 2019 financial year to mitigate this. This was done to enhance the precision of the models created and mitigate forms of bias related to the use of non-representative samples (Emmanuel et al., 2021; Lin & Tsai, 2020; Matenda & Sibanda, 2022; Zhang, 2016). Various techniques were available for imputation; however, for this study, mean imputation was applied, where the average value was established for the missing data, and then the calculated average was substituted for every missing value (Austin et al., 2021; Enders, 2022; Lin & Tsai, 2020; Matenda & Sibanda, 2022; Matenda et al., 2023). This method was chosen due to its simplicity to apply and understand, its ability to maintain the sample size and because it is one of the top ten most frequently used methods (Emmanuel et al., 2021; Lin & Tsai, 2020; Matenda & Sibanda, 2022; Matenda et al., 2023). After discussing the two criteria, the sample will be discussed next.

3.11 Research Sample

A sample is a limited group of individual items which are selected from the population (Abutabenjeh & Jaradat, 2018; Bell et al., 2022; Majid, 2018; Shukla, 2020; Walliman, 2021). There are two sampling strategies normally applied in research: probability and non-probability sampling (Makgoba, 2019; Mashele, 2021). Probability sampling involves using statistical inferences about a population to answer the research question and meet the research objectives, whereas non-probability sampling is targeted; non-randomised sampling provides a range of techniques to select the sample, allowing for the researcher's objectivity (Makgoba, 2019; Mashele, 2021). The sampling technique is a way of selecting random samples categorised

according to what the research population is based on (Mgilane, 2023; Nakeng, 2019). Various types of sampling are random, judgemental, stratified and purposive sampling (Nakeng, 2019). This study used purposive sampling to select shipping, logistics, fishing, oil, and energy organisations. This is similar to a case where JSE-listed construction, mining, or retail mixed (specific sector) companies were investigated, and therefore, all the listed construction companies were selected (Nakeng, 2019; Sejake, 2021).

A sample was selected based on the companies with marine footprints. From the JSE-listed companies, the following were identified: shipping and logistics companies are 10, fishing companies are 14, companies in the oil sector are 10, and companies in the energy sector are 34, totalling 68 listed companies. Although 68 companies are mentioned, the companies that were studied were chosen on the basis of their listing years and the availability of the integrated annual reports, sustainability reports, Bloomberg ESG scores, and other relevant data for the five years under consideration (2019-2023). The names of these companies are accessible from a schedule requested from the JSE. The integrated annual reports are accessible on the respective organisations' websites. The schedule comprises all the listed companies, and the sector fields were used to filter for the above-mentioned sectors. These listed companies report on environmental matters in their sustainability reports, which are published on their websites and in integrated reports; therefore, these data are readily available and accessible (Agyemang et al., 2021; Baalouch et al., 2019; Bramanti et al., 2021; Dragomir, 2018). This resulted in the target population being the same as the research sample. This aligned with prior studies where the research population equalled the sample (Nakeng, 2019; Phaswana, 2018). Table 2 displays an overview of the selection process used to determine the final sample of organisations available for analysis. Column 1 of Table 2 displays the stage of the selection process, Column 2 of Table 2 displays the total number of companies for each stage of the selection process and Column 3 of Table 2 displays the description of what each number represents at each stage.

Table 2: Summary of the Sample Analysed

	No.	Description
Total listed companies	302	Schedule requested and received from the JSE listing as of 2023
Population and sample	68	Selected companies with a marine footprint (per the inclusion criteria)

Applied inclusion criteria	52	Excluded as having failed the inclusion criteria and met the exclusion criteria (discussed above)
The final sample for analysis	16	
Further exclusion	2	Excluded due to missing data (Environmental scores for the 5 years) in Bloomberg
Final sample of evaluated companies	14	

Source: Own compilation

The unavailability of the Bloomberg environmental score (a proxy for environmental performance) for two organisations led to their exclusion from the sample to be reviewed for Objective 2. Although there are alternative databases for environmental scores other than Bloomberg, it was considered prudent to use environmental scores from one database only. This was done to mitigate the risk of inconsistencies, which could possibly have influenced the results of the environmental scores coming from different databases, as different methodologies, different source documents and processes would have informed the scores (Billio et al., 2021; Gregory, 2024; Jámor & Zanócz, 2023; Marchini et al., 2022). Thus, using one data source (Bloomberg) for the environmental scores was considered to be prudent. The research sample and the means of collecting the data are discussed below. This resulted in the evaluation of 14 ocean-based organisations over five years, yielding 70 data observations. This dataset is considered adequate for meaningful statistical analysis, as the panel data enables robust exploration of trends and relationships over the five years. This is in line with a prior study, which used a small sample size of 12 organisations (Jingura, 2019).

3.12 Data Collection Methods and Instruments

Data collection entails the process undertaken to gather and extract information identified in the research objectives and answer the research question (Nakeng, 2019). For this study, as mentioned above in the research sample, the websites of the sampled listed companies were used to access the integrated annual reports, sustainability reports and audited annual financial statements in PDF format, as these published integrated reports are digitised. The extracted reports were analysed to assess the blue accounting practices of the organisations and the effect thereof on the organisations' environmental performance. The disclosure of the organisations' blue accounting practices was found in the section disclosing sustainability; however, the

position where the information is placed in the reports is likely to differ from organisation to organisation as the corporate reports are not necessarily written in the same format. As mentioned, quantitative content analysis collected blue accounting information from the published reports. These reports were analysed page by page for blue accounting disclosures, over and above the sustainability section, to ensure completeness of the coding that was applied. Coding was applied to the reports for each marine-sensitive listed company. The content analysis method used has been explained above.

The period under consideration was 2019–2023, as over this period, companies would have been required to comply with the mandatory requirement of integrated reporting for JSE-listed companies, and this would, therefore, be a period in which performance could be evaluated. Furthermore, this period was selected due to the availability of data (Agyemang et al., 2021; Shabbir & Wisdom, 2020). The method applied was quantitative content analysis, as explained in detail above, a deductive technique that was developed around the early 1940s and applied to secondary data to identify particular trends, attitudes, or content categories which can be used to analyse text or information in any other form (Gaur & Kumar, 2018; Manes-Rossi et al., 2018; Qian & Sun, 2021; Walliman, 2021; Wasara & Ganda, 2019). This method has been used in accounting literature studies where firm performance, corporate social responsibility disclosures, and voluntary disclosures are analysed using documents such as annual reports and sustainability reports, where the factors were evaluated using the information presented in the report while taking into account the context of the organisation's operations (Dragomir, 2018; Gaur & Kumar, 2018; Manes-Rossi et al., 2018; Tingbani et al., 2020). Therefore, from the description of content analysis and the usual studies where it is used, the method fits the current study and was deemed appropriate for research Objective 2.

Content analysis is being increasingly used for assessing an organisation's performance through the evaluation of narrations contained in the reports, as it helps in grouping disclosures into the various required categories for investigation (Gnanaweera & Kunori, 2018; Qian & Sun, 2021; Rahim, 2021; Raucci & Tarquinio, 2020). Therefore, the data collection process used quantitative content analysis, which involved reviewing and coding the integrated reports, sustainability reports, and financial statements of JSE-listed marine-sensitive companies for five years, thus providing data about organisations' blue accounting disclosures. These blue accounting disclosure results were analysed using the econometric model discussed below to ascertain whether these disclosures have a significant effect on the organisations'

environmental performance. The details of how the data collected for each of the two objectives were analysed are discussed below.

3.13 Data Analysis Strategies

As described earlier, this study applied both qualitative and quantitative data, gathered through a scoping review and content analysis, respectively, requiring distinct analytical approaches. Qualitative data were analysed using descriptive statistics in Excel, while quantitative data extracted from the content analysis of integrated annual reports were analysed using EViews version 14 to estimate the statistical models.

3.14 Data Analysis in Line with the Research Objectives

Data analysis involves examining the information obtained during the data collection process and utilising relevant data to draw conclusions or make informed decisions based on the findings (Nakeng, 2019; Sejake, 2021).

Research Objective 1: To identify factors that influence the organisation's adoption of blue accounting disclosure.

To achieve this objective, a qualitative scoping review was conducted using the research question outlined in the scoping review model. The analysis was done by means of a thorough reading of the available publications between 2017 and 2024. The results were analysed and described using Excel's descriptive statistics (charts).

3.14.1 Objective 1: Qualitative Scoping Review

3.14.1.1 Justification for the Choice of the Scoping Review Approach

Having discussed the qualitative research method and highlighted its value in exploring new and complex research areas, a scoping review was considered the appropriate qualitative approach. Objective 1 was identifying factors that influence the organisation's adoption of blue accounting disclosure, and a scoping review was used. A scoping review, also known as a scoping exercise or scoping study, is a research method which evaluates the literature review on a particular discipline, and identifies research gaps and forms and sources of evidence to appraise policy-making, research and practice (Lockwood et al., 2019; Matenda et al., 2021; Yuriev et al., 2020). This method is also useful for providing a comprehensive overview to

address a broad review question than a systematic review thus offering an opportunity to identify the main areas of a research topic (Munn et al., 2018; Peters et al., 2020; Rasoolimanesh et al., 2023).

This qualitative method was considered appropriate as it would allow the examination of literature and other information sources and incorporate findings from various study methods and research designs (Arksey & O'malley, 2005; Matenda et al., 2021; Peters et al., 2020; Pollock et al., 2021). This method is especially recommended for sophisticated and diverse research areas or areas that have not been extensively covered or researched before (Munn et al., 2018; Peters et al., 2020; Rasoolimanesh et al., 2023). Furthermore, this method is also appropriate for responding to extensive questions and summarising findings in a particular area (Arksey & O'malley, 2005; Lockwood et al., 2019; Matenda et al., 2021). Since investigating blue accounting is a fairly new research area without extensive literature, a literature review would not have yielded maximum results as there is no wealth of knowledge in this area. The scoping review was more appropriate for this objective, providing sound and dependable knowledge with minimal bias (Matenda et al., 2021). Also, this method, although not widely used, has been noted to be appropriate in sustainability studies (Yuriev et al., 2020). The scoping review was conducted using the model below:

The model

- i. Phase 1: Research question identification
- ii. Phase 2: Relevant articles identification
- iii. Phase 3: Study selection
- iv. Phase 4: Data charting
- v. Phase 5: Compiling, summarising and writing the research results (Arksey & O'malley, 2005; Matenda et al., 2021; Matz et al., 2019; Munn et al., 2018; Yuriev et al., 2020)

The consultation exercise was not required for this model and will not be explored for the study (Arksey & O'malley, 2005; Matenda et al., 2021). After explaining the different phases of the model, a more detailed explanation and application of the phases were discussed.

Phase 1: Research question identification

As alluded to above, phase 1 identifies the research question. This phase involved the generation of the research question the study sought to respond to and provided a structure of how the search should be conducted as a means to respond to the research question (Arksey &

O'malley, 2005; Matenda et al., 2021; Munn et al., 2018; Yuriev et al., 2020). The question dealt with in this objective is: what are the factors that influence the organisation's adoption of blue accounting disclosure? Having discussed the question of identification, the next phase in the process of identifying the relevant studies to be covered for the review is discussed below.

Phase 2: Relevant studies identification

As discussed above, phase 2 entails identifying the relevant studies necessary to address the identified research question. This entailed covering as much ground as possible and accessing a wide range of primary sources of published articles that could be valuable in seeking to respond to the research question (Matenda et al., 2021; Munn et al., 2018). The articles were sourced from ScienceDirect, Google Scholar, Research Gate, Google, and Wiley, and a snowball approach was also applied (Matenda et al., 2021; Munn et al., 2018; Pollock et al., 2018). These sources, namely ScienceDirect, Google Scholar, Research Gate, Google, and Wiley, were included as they contain several articles that are noted on the Web of Science, and these databases were considered likely to provide the articles relevant to the study (Matenda et al., 2021; Pollock et al., 2018; Rasoolimanesh et al., 2023). Furthermore, this would help to ensure that the information extracted possessed high degrees of replicability, consistency, reliability and quality, and that the author's subjectivity had been avoided as any relevant article in these sources is available for selection (Arksey & O'malley, 2005; Matenda et al., 2021; Munn et al., 2018). As the articles from the sources came from authors from different parts of the world, geographical biases were eliminated as any relevant articles were available for selection and review (Matenda et al., 2021). However, this wide range of sources was considered within the stipulated time frame or period of 2017–2024, and only articles within this period were included in the database search. The year 2017 was chosen as the period, as indicated in the literature review, when the blue accounting concept started to become evident in the literature space or be a concept under investigation. As the time frame had to be restricted, April 2024 was chosen as the end period for performing the search for articles evaluated for the scoping review, and any articles post-April 2024 were not considered. All the articles used were written in English. Any articles in other languages were excluded from the search, which may pose a limitation in that those non-English articles may have been relevant but have been excluded. While there are translation applications available, to the author's knowledge no information has been provided by the developers on the suitability of the applications for academic use, and the time and financial resources required for translation might be significant (Maramba et al., 2019; Matenda et al., 2021). Furthermore, incorrect

translations or interpretations might have distorted the study results. To perform a preliminary search, the following sentence was used: “Factors influencing blue accounting”, and a few articles were populated. The research established that the final search enquiry would be “Blue accounting factors”, which yielded several articles that were read to provide input for the question. These search enquiries were applied in August 2023 to the Google Scholar database, ScienceDirect, Google, Wiley, and Research Gate. In performing the search, the abovementioned period limitations were used.

From the above search, nine articles were identified as relevant to the study. The snowball process was applied, and the citations within the set period found in the identified articles were also evaluated until no further information was identified as relevant to the research question. Ten publications were evaluated as relevant for the study from the snowball process. From the above, a total of nineteen (19) publications relevant to the research question at hand were identified for the scoping review. Using these 19 publications, the next phase was applied, and the relevant articles for answering the research question were selected.

Phase 3: Study selection

As the 19 articles were selected using a high-level overview, phase 3 was applied to analyse the articles in depth to ensure that only the relevant articles were selected and articles that, when reviewed, were concluded not to be relevant to the study or duplicated other articles were eliminated from the study (Arksey & O'malley, 2005; Maramba et al., 2019; Matenda et al., 2021; Matz et al., 2019).

The selection of the studies was based on the inclusion and exclusion criteria, the chosen period and the research question to ensure that the comparisons drawn and the reviews were impartial and of the appropriate quality (Matenda et al., 2021; Matz et al., 2019; Peters et al., 2020). To avoid biases and publication discrimination, all publications were considered provided they were in English and appropriate to the search query to provide as comprehensive a picture as possible, thus providing a better map of the whole range of literature in this area (Maramba et al., 2019; Pollock et al., 2018; Xiao & Watson, 2019). Articles falling outside the above parameters were excluded from the study (Matenda et al., 2021; Yuriev et al., 2020). After defining the inclusion and exclusion parameters, the articles were assessed for suitability.

Article Suitability Assessment

For this assessment, an initial assessment of suitability was made based on the titles and abstracts of the publications. Where that initial assessment was not adequate to determine the suitability of an article for the review, an additional assessment was made where the title, abstract, introduction, and conclusion were reviewed to assess suitability so as to enhance the efficiency with which articles were evaluated for further review (Matenda et al., 2021; Matz et al., 2019; Munn et al., 2018; Pollock et al., 2018). However, if the above assessment was not satisfactory, then the entire article was reviewed to assess its eligibility for the scoping review (Matenda et al., 2021). Once the article suitability assessment had been completed, the data collection followed.

Data Collection

Following the article suitability assessment, all the articles identified as relevant in terms of the above process had their full contents reviewed, and details such as author(s), year of publication, title of the study, objective of the study, variable(s), population, composition of the sample, data source(s), technique(s)/method(s) applied, and the results thereof were populated (Matenda et al., 2021; Peters et al., 2020; Xiao & Watson, 2019). In this phase, all the articles were reviewed in detail to identify the relevant information for the research question effectively, and any unsuitable articles were then scoped out of the study (Matenda et al., 2021). As alluded to in earlier discussions, blue accounting is a fairly new concept, and limited studies are available. Figure 3 displays the approach followed for assessing the suitability of the publications. It contains an assessment of whether the study investigates blue accounting disclosures, whether it is English, and whether it should be evaluated further or not.

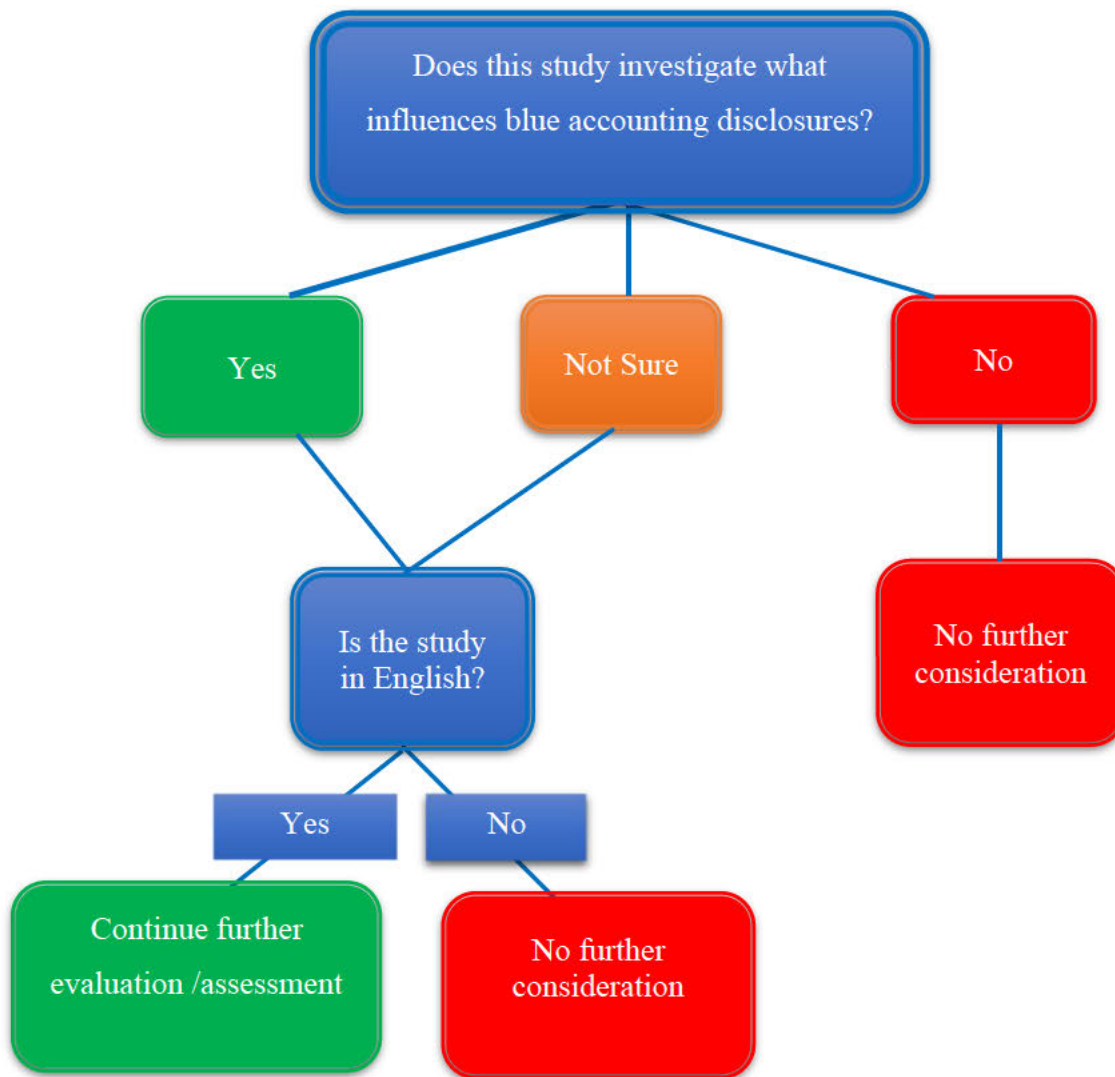


Figure 3: Data collection process flowchart

Source: Own compilation

Overall, 19 articles were identified and included in the study by applying the above process. After relevance and duplication exercises, 10 articles remained, which were included based on the title, abstract, introduction, and full text evaluation, thus resulting in a total of 9 articles being scoped in. Following the data collection process, the collected data were charted.

Phase 4: Data Charting

For data charting, the collected data from the various articles were evaluated and examined in line with the main themes and factors that were identified in relation to the research question (Arksey & O'malley, 2005; Matenda et al., 2021; Rasoolimanesh et al., 2023).

The data gathered were then presented in the form of data charting where the following information was articulated: author(s), year of publication, title of the study, objective of the study, variable(s), population, sample, data source(s), technique(s)/method(s) applied, and the results thereof were populated (Arksey & O'malley, 2005; Dinh et al., 2023; Matenda et al., 2021; Yuriev et al., 2020). After discussing the four phases of the model, the study selection process was summarised diagrammatically, as shown below, before phase 5 was addressed. Figure 4 shows the process of selecting articles for the qualitative scoping review. Figure 4 shows all the articles identified from the various sources, articles that were eliminated and the final articles that were scoped in for the review.

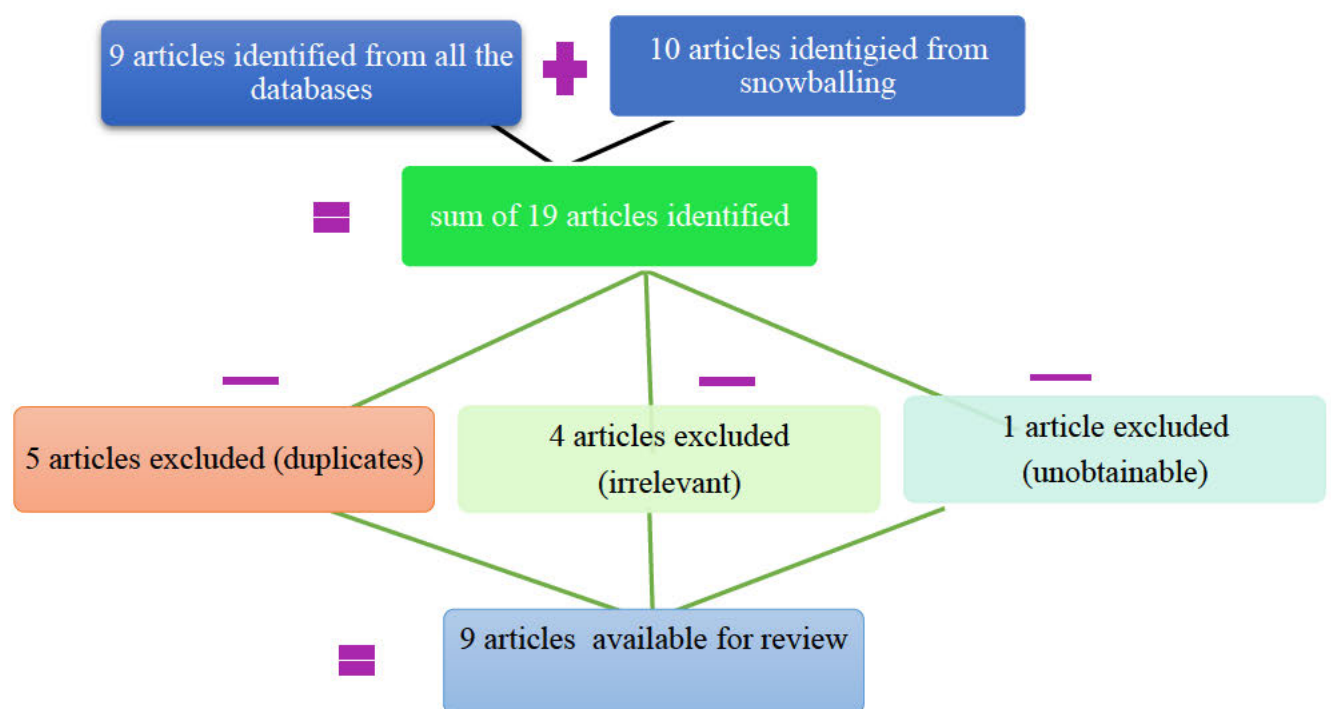


Figure 4: Study Selection Process Flowchart

Source: Own compilation

Phase 5: Collating, Summarising, and Reporting Results

After concluding all the phases, the information from the nine reviewed articles was collated, summarised, and reported on. The results from the scoping review were limited to the amount of information that was examined from the scoped sources that were relevant to the research question at hand (Arksey & O'malley, 2005; Matenda et al., 2021; Peters et al., 2020). At this

stage, all the scoped articles were reviewed, the information from the articles was charted, and the findings and discussion from the review were presented based on the literature that had been presented from the articles (Matenda et al., 2021).

A number of publications or papers were reviewed, as highlighted above, and these were analysed to identify the factors that influence companies to adopt blue accounting disclosures. The studies reviewed were not confined to any geographical location and were conducted from 2017 to 2024. Of all the various articles that came through the database search, only nine were ultimately scoped in for the detailed review. This section provides a narrative description of the key information on the studies that were reviewed, namely the author(s), year of publication, title, objective of the study, its variable (s), sample, data source(s), technique(s) applied and the results of the study. This information is provided in Table 3 below, where the author(s), year of publication, title, objective of the study, variables or factors influencing blue accounting disclosures, sample/scope and technique(s) are articulated.

In all the reviewed articles, “blue accounting” was a term commonly used, and “ocean accounting” was used occasionally to describe information relating to blue accounting principles, disclosures, and adoption. Several factors that influenced blue accounting were identified from the articles. Five out of the nine articles cited the lack of a uniform blue accounting framework as a deterrent in the adoption of blue accounting (Abreu et al., 2017, 2019; Failler et al., 2023; Failler & Seisay, 2021; Rahmayanti & Sari, 2023). Another deterrent noted in five out of the nine articles was the lack of systems in place in marine-sensitive organisations for compiling the necessary blue accounting information, which contributed to the unavailability or lack of complete and accurate blue accounting disclosure information (Failler et al., 2023; Failler & Seisay, 2021; Rahmayanti & Sari, 2023; Syah et al., 2020; Winarsih et al., 2020). The above deficiencies point to a need for a blue accounting framework, as alluded to in the empirical literature review, and for that to work effectively, an environmental management system that enables the accounting of blue ecosystems would also need to be implemented by the organisation (Abreu et al., 2017, 2019; Perkiss et al., 2022; Syah et al., 2020; Winarsih et al., 2020). Without the one, the other may fail, as these requirements go together. That said, however, several factors were noted that serve as an encouragement/incentive to organisations to adopt blue accounting disclosures, one of which is that stakeholders require blue accounting information /disclosures as a means to assess the impact an organisation's operations have on the marine ecosystem, as underpinned by

legitimacy and stakeholder theory (Failler et al., 2023; Failler & Seisay, 2021; Rahmayanti & Sari, 2023; Syah et al., 2020; Winarsih et al., 2020).

Furthermore, the requirements of the laws and regulations governing the marine space encourage blue accounting disclosures; however, such regulations need to be accompanied by consequence management, i.e. enforcement through penalties, fines, and imprisonment where possible, (Failler et al., 2023; Rahmayanti & Sari, 2023; Syah et al., 2020). An organisation's drive for sustainable marine operations, enhanced by the stakeholder's needs, is another driver for blue accounting adoption (Failler et al., 2023; Rahmayanti & Sari, 2023; Syah et al., 2020). This is coupled with the realisation that blue accounting might also assist in tracking the organisation's achievement of the SDGs, especially SDG 14 (Life Below Water), (Perkiss et al., 2022; Rahmayanti & Sari, 2023). All these factors reflect the diverse factors that influence an organisation's adoption of blue accounting disclosures, which seek to cover the various environmental factors of the marine ecosystem. Table 3 below displays the scoping review of the literature on blue accounting. Column 1 of Table 3 displays the author(s) and (year) of publication, and Column 2 of Table 3 displays the findings. Column 3 of Table 3 displays the journal/book/series/chapter; Column 4 of Table 3 displays the title of the paper/article and Column 5 of Table 3 displays the location.

Table 3:Presentation of the Scoping Review

Author(s) and (year) of publication	Findings	Journal/Book/Series/ Chapter	Title of the paper/article	Location
1. Failler et al. (2023)	<p>Blue accounting provides an assessment of actions against climate change.</p> <p>There is a lack of a uniform accounting framework for blue accounting.</p> <p>The data necessary for blue accounting are scattered.</p> <p>Blue accounting can enhance the sustainability of the operations (conservation and sustainable consumption).</p> <p>Blue accounting reflects value for measuring the cost of degradation and destruction.</p> <p>There are difficulties in producing accurate data for blue accounting.</p>	<i>Journal of Sustainability Research</i>	Blue accounting approaches in the emerging African blue economy context.	Africa

Table 3: Presentation of the Scoping Review

Author(s) and (year) of publication	Findings	Journal/Book/Series/ Chapter	Title of the paper/article	Location
	The legal framework/laws and regulations governing the marine space affect the adoption /non-adoption of blue accounting.			
2. Rahmayanti & Sari (2023)	<p>The availability/adequacy of data for blue accounting disclosures determines the adoption /non-adoption of blue accounting disclosures.</p> <p>The urgent need for the ocean's sustainability (to meet the current and future generation's needs) could accelerate the adoption of blue accounting disclosure.</p> <p>The achievement of SDG Goal 14 (Life Below Water) could encourage the adoption of blue accounting disclosure.</p> <p>The lack of a clear framework for blue accounting may hinder the adoption of blue accounting disclosure.</p>	Conference Proceedings (The 5th International Conference on Vocational Education, Applied Science and Technology: 2022).	Blue accounting to enhance the quality of sustainability report.	Indonesia

Table 3: Presentation of the Scoping Review

Author(s) and (year) of publication	Findings	Journal/Book/Series/ Chapter	Title of the paper/article	Location
3. Syah et al. (2020)	<p>Blue accounting adoption enhances the considerations of the sustainable use of marine resources in the present and future generations.</p> <p>Stakeholders interested in marine ecosystems put pressure on information relating to the organisation's marine practices and their sustainability.</p> <p>Blue accounting adoption improves the organisation's environmental accounting.</p>	Conference Proceedings: 23rd Asian Forum of Business Education	Blue accounting and sustainability	Indonesia

Table 3: Presentation of the Scoping Review

Author(s) and (year) of publication	Findings	Journal/Book/Series/Chapter	Title of the paper/article	Location
4. Failler & Seisay (2021)	<p>Blue accounting can serve as a tool to assess the effectiveness of climate change actions.</p> <p>Incentives from the government, such as grant funds or ocean-based financing, such as blue bonds, could encourage marine sustainability.</p> <p>There is no uniform international/national framework for blue accounting, with the result that the necessary information for disclosure may be unavailable or incomplete.</p>	African Union Inter-African Bureau for Animal Resources (AU-IBAR) Information note	Information Note on Blue Accounting in the Context of African Union Blue Economy Strategy	Africa
5. Abreu et al. (2017)	<p>Blue accounting may assist in meeting the information needs of the stakeholders concerning the marine ecosystem and the effect of the organisation's operations.</p> <p>There is a lack of accounting and marine knowledge.</p>	Proceedings of the 16th International Conference on Corporate Social Responsibility and 7th Organisational Governance Conference	Blue accounting: First insights	Broad, including Europe

Table 3: Presentation of the Scoping Review

Author(s) and (year) of publication	Findings	Journal/Book/Series/ Chapter	Title of the paper/article	Location
	A regulatory framework that enforces blue accounting might accelerate blue accounting disclosure adoption.			
6. Abreu et al. (2019)	<p>Blue accounting disclosures could satisfy the information needs of the stakeholders concerning the marine ecosystem and the effect of the organisation's operations.</p> <p>The adoption might provide more knowledge about the marine ecosystem and how it interfaces with the entity's operations.</p> <p>A regulatory framework that enforces blue accounting might accelerate blue accounting disclosure adoption.</p>	Responsibility and Governance: The Twin Pillars of Sustainability	Blue accounting: Looking for a new standard.	Europe
7. Winarsih et al. (2020)	The stakeholders' information needs on the marine ecosystem and how it is affected by the organisation's operations might influence the organisation's adoption of blue accounting.	Complex, Intelligent, and Software Intensive Systems: Proceedings of the 13th International	Blue accounting of the marine knowledge and	The research was not conducted in a specific marine region.

Table 3: Presentation of the Scoping Review

Author(s) and (year) of publication	Findings	Journal/Book/Series/ Chapter	Title of the paper/article	Location
	<p>The organisation might legitimise its operations through blue accounting disclosures.</p> <p>Blue accounting adoption might be of value to stakeholders and organisations seeking more understanding and knowledge of the marine ecosystem.</p>	Conference on Complex, Intelligent, and Software Intensive Systems (CISIS-2019).	sustainable seas: A conceptual model.	
8. Pattinaja et al. (2023)	The organisation's desire to identify the negative and positive environmental effects of its operations in the marine space might influence the organisation's adoption of blue accounting disclosure.	Aquaculture, Aquarium, Conservation & Legislation	Blue economy accounting model for tuna fisher groups in Maluku Province, Indonesia	Indonesia
9. Perkiss et al. (2022).	<p>Perceiving ocean accounting as a means to measure the organisation's progress towards attaining the SDGs might influence the adoption of blue accounting disclosure.</p> <p>Initiatives towards developing an accounting system with accounting principles and</p>	Marine Policy	Can critical accounting perspectives contribute to the development of ocean accounting	The research was not conducted in a specific marine region.

Table 3: Presentation of the Scoping Review

Author(s) and (year) of publication	Findings	Journal/Book/Series/ Chapter	Title of the paper/article	Location
	<p>processes focused on measuring the marine facets might influence blue accounting disclosure adoption.</p> <p>Pursuing effective ocean governance based on the results/information from ocean accounting might influence the adoption of blue accounting disclosure.</p>		<p>and ocean governance?</p>	

Source: Own compilation

The above review was discussed in detail in Chapter 4 with respect to what the findings communicate about the research objective. After discussing the model applied to research Objective 1 (qualitative), the quantitative content analysis considerations were discussed to provide further information on how they will be applied to research Objective 2.

3.14.2 Research Objective 2: To test whether blue accounting has a significant effect on the environmental performance of South African maritime companies listed on the Johannesburg Stock Exchange.

To achieve this objective, a quantitative content analysis was performed where the blue accounting disclosures in the annual integrated reports were measured using a 5-point Likert scale (Score 1: Very inadequate information or the information was not provided at all in the report; Score 2: Inadequate or limited information was provided; Score 3: Average information was provided to some extent; Score 4: Strong information was provided to a large extent; and Score 5: Extremely adequate and detailed information was provided). The analysis was conducted using EViews version 14 for descriptive statistics analysis (means, standard deviations, percentages, and frequencies). Furthermore, a regression analysis and a correlation analysis were performed using EViews 14 to evaluate the relationship between the dependent and independent variables.

3.14.2.1 Objective 2: Quantitative Content Analysis

The research method used for this objective was the quantitative research method, as explained prior to data collection. This, therefore, implies that the research design created a structure for consolidating all the elements of the study to provide credible, objective results that can be replicated (Dannels, 2018). An indication was given of any data that had been eliminated, and the results from the study were discussed. A correlation study was used to collect data, analyse them, derive results, and refine and interpret those results to provide insights into the identified research problem. The correlational study sought to establish a relationship between two or more variables and, ultimately therefore, describe the degree to which the variables relate to each other without any form of manipulation (Bloomfield & Fisher, 2019; Lillykuty & Samson, 2018; Mohajan, 2020; Seeram, 2019). Applying a correlation study does not, however, provide information on variables that are irrelevant to the variables being studied (Devi et al., 2022; Obilor & Amadi, 2018). The correlation can be found to be positive,

negative, or neutral, and it determines the strength of the relationship (Bloomfield & Fisher, 2019; Fonseca et al., 2020; Seeram, 2019; Senthilnathan, 2019). In instances where the correlation coefficient is 0.00, this indicates that there is no relation between the variables being evaluated, whereas a positive amount (+) reflects the progressive extent/degree of the positive correlation and a negative amount (-) reflects the progressive degree of a negative correlation, with the values ranging between -1, 0 and +1 (Bloomfield & Fisher, 2019; Busetto et al., 2020; Obilor & Amadi, 2018; Senthilnathan, 2019). This study may take the form of a descriptive or explanatory study, a predictive study or a model, which is one of the common statistical methods in research (Bell et al., 2022; Bloomfield & Fisher, 2019; Mohajan, 2020; Pandiangan et al., 2021). A correlational study establishes the relationship but not necessarily that there is a causal effect between the variables, even if the correlation appears to be quite strong (Bloomfield & Fisher, 2019; Lillykutty & Samson, 2018; Mohajan, 2020).

Lastly, as the study was conducted over five years, and the results of the listed companies were analysed by performing panel regressions from 2019 to 2023. This is particularly relevant for this study, considering that blue accounting is a new field. Therefore, the correlation study assessed whether there is a relationship between blue accounting adoption and the number of factors identified as possibly influencing the adoption of blue accounting (Devi et al., 2022). It, therefore helped to obtain answers to the research question studied (Devi et al., 2022). As a synopsis of the research methods applied has been highlighted above, further details will be provided below on these methods and the benefits they provide to the study, starting with the quantitative method and then dealing with the qualitative method.

3.14.2.2 Content Analysis and its Validity

As discussed above under research design, content analysis is the most widely used and most important analytical method for studies on environmental information disclosures (Baalouch et al., 2019; Dragomir, 2018; Manes-Rossi et al., 2018; Petruzzelli & Badia, 2024). Other authors also emphasised the use of content analysis for disclosure studies, including voluntary disclosures using corporate reports such as sustainability reports (Gunawan et al., 2020; Papoutsis & Sodhi, 2020; Tingbani et al., 2020). Content analysis is therefore considered appropriate for investigating blue accounting disclosure. Content analysis was applied to the annual integrated reports and sustainability reports to determine the presence of identified blue accounting disclosures. The aim was to investigate Objective 2 of the study: To test whether

blue accounting has a significant effect on the environmental performance of South African maritime companies listed in the Johannesburg Stock Exchange.

The literature review, among other methods, indicated that some studies provide an avenue for measuring this effect using content analysis where the environmental accounting disclosures that have been identified from the integrated annual reports and the sustainability report are scored using quantitative scoring where zero (0) is awarded if the component is missing from the reports and one (1) where the component is present, and each company is rated based on how many factors are present over the total score of all the expected factors (Elshabasy, 2018; Manes-Rossi et al., 2018; Posadas & Tarquinio, 2021; Rahim, 2021; Tadros & Magnan, 2019). In some studies, this method is considered appropriate as it regards each factor as equally significant without any unfair advantage, bias or significance in favour of any particular factor and has been adopted by some studies (Carandang & Ferrer, 2020; Qian & Sun, 2021; Zaid et al., 2019). However, a limitation of this method of scoring yes – 1 (disclosure present) or no - 0 (disclosure absent) is that it only reflects whether the disclosure has been made or not without taking the detail or depth of the disclosure into account, thus limiting the nature of comparability that is possible across the various organisations and is therefore viewed as subjective (Marimuthu et al., 2023; Petruzzelli & Badia, 2024).

An alternative avenue for measurement would be the use of content analysis, where the factors identified as blue accounting disclosure in the integrated annual reports and the sustainability report are evaluated based on the detail or specificity of the disclosure, using quantitative scoring where the following method of scoring is applied:

Score 1: Very inadequate information or the information was not provided at all in the report.

Score 2: Inadequate or limited information was provided.

Score 3: Average information was provided to some extent.

Score 4: Strong information was provided to a large extent.

Score 5: Extremely adequate and detailed information was provided.

The above method of scoring was created using principles from the Likert scale and is an adaptation from the following corporate disclosure studies done where an assessment of the narrative disclosure was performed using quantitative content analysis by scoring the disclosure elements based on the nature and quality of the disclosure of the identified items (Dragomir, 2018; Marimuthu et al., 2023). Other prior studies on non-financial disclosures and

environmental disclosures applied the Likert scale scoring (Kraus et al., 2020; Marimuthu et al., 2023; Yip & Yu, 2023). In view of the above factors and the nature of the study, the above-mentioned avenue was considered comprehensive and appropriate for this study.

The blue accounting disclosure to be scored and rated is based on the literature review and what has been discovered to reflect the disclosures marine-sensitive companies make concerning blue accounting. Furthermore, to ensure that any chances of omission are reduced, the integrated and sustainability reports are read twice; also, the key search words and their respective synonyms were used to supplement the interrogation of the integrated annual reports to identify the blue accounting disclosures made by the marine organisations (Alshehhi et al., 2018; Dragomir, 2018; Mahmood et al., 2018; Tingbani et al., 2020). The final blue accounting disclosure scoring was based on analysing the reports by the author and an independent peer reviewer. The results from the two analyses were compared and discussed, and the final score was assigned as a further means of ensuring the accuracy and reliability of the content analysis (Busetto et al., 2020; Manes-Rossi et al., 2018; Nguyen et al., 2021). Therefore, the final score used for the blue accounting disclosures was based on the final score after undertaking the above process.

From the literature, the following explanatory variables, namely, regulatory framework, obligations, reporting guidelines, value add, environmental reporting costs, waste management, effluent management, and marine water quality, were identified as factors that reflected an organisation's blue accounting practices. These factors are reported in Table 4 and are expected to be evident from the integrated annual report disclosures the organisation makes, thus providing information on ocean-based organisations' blue accounting disclosures/practices. Therefore, the identified explanatory variables from literature which reflect blue accounting practice will be evaluated later to see whether they have any effect on the organisations' environmental performance (Arvidsson & Dumay, 2022; Giannarakis et al., 2020; Helfaya & Whittington, 2019).

The blue accounting disclosure variables enable an analysis to be performed to evaluate, measure, and keep track of the sustainability of the organisation's activities in relation to the marine ecosystem, and this would then assist in determining whether the organisation is creating value or destroying value for its stakeholders, thereby influencing its standing in the environment it operates in and the legitimisation of its activities by the stakeholders. This

evaluation was done in the context of JSE-listed marine-sensitive companies, i.e. shipping and logistics, fishing, oil, and the energy sector. These sectors have been selected as they are considered to be principal marine-related sectors that make considerable contributions to the ocean economy, even within the African context (Failler et al., 2023; Lubchenco & Haugan, 2023; Voyer et al., 2018).

The above Likert scoring scale was used to gather, analyse, and score the blue accounting data in the integrated annual reports to assess the organisations' blue accounting disclosures. The integrated annual reports for all the JSE-listed marine-sensitive organisations were studied over the period 2019–2023, i.e. a five-year period. After diligently scrutinising, peer scoring and reading these reports at least twice, differences and patterns were identified from the sampled organisations. After that, a score was attributed for each factor, considering the quality and quantity of the disclosed information as alluded to above. The blue accounting disclosures that were identified from the literature are displayed in Table 4. These disclosures are considered as the independent variables for the study. Column 1 of Table 4 displays the explanatory variable, Column 2 of Table 4 displays the key search words that were used for the variable and Column 3 of Table 4 displays the data source and measurement.

Table 4: Blue Accounting Explanatory Variables

Explanatory Variable	Key search words	Data Source and Measurement
<p>i) Regulatory framework (REG): The government's or public authorities' strategy for marine and maritime sustainability through regulations or directives to be adopted by ocean-based companies (Abreu et al., 2019; Failler et al., 2023; Failler & Seisay, 2021; Perkiss et al., 2022; Syah et al., 2020)</p>	<ul style="list-style-type: none"> • Regulations • Laws • Regulatory requirements • National Environmental Management Act (NEMA) • Marine Living Resources Act (MLRA), South African Maritime Safety Authority (SAMSA) 	<p>Data to be obtained from the integrated annual reports:</p> <ul style="list-style-type: none"> • Disclosure of marine laws and regulations the organisation complies with in its accounting/reporting, assigned a value according to the above scale as discussed in Section 3.14.2.2.
<p>ii) Obligations (OBLI): The significance and effect of existing legal, contractual, or constructive obligations to reduce or repair ocean and marine damage (Abreu et al., 2019; Failler et al., 2023).</p>	<ul style="list-style-type: none"> • Environmental liabilities/obligations • Non-compliance • Environmental restoration • Litigation • Fines • Penalties • Environmental responsibilities 	<p>Data to be obtained from the integrated annual reports:</p> <ul style="list-style-type: none"> • Disclosure of current or potential obligations and associated costs assigned a value according to the above scale as discussed in Section 3.14.2.2.

Explanatory Variable	Key search words	Data Source and Measurement
	<ul style="list-style-type: none"> • Damage • Sanctions 	
iii) Reporting guidelines (GUID): Availability of guidance or framework for blue accounting reporting (Failler et al., 2023; Failler & Seisay, 2021; Perkiss et al., 2022; Zuraida et al., 2018)	<ul style="list-style-type: none"> • Integrated Reporting Framework (IR Framework) • Global Reporting Initiative (GRI) • International Organisation for Standardization (ISO) • Sustainability Accounting Standards Board (SASB) • Guideline • Reporting Standards 	Data to be obtained from the integrated annual reports: <ul style="list-style-type: none"> • Disclosure of framework or guideline applied in disclosing marine-related information/disclosures, assigned a value according to scale as discussed in Section 3.14.2.2.
iv) Value-add (VA): The value blue accounting disclosure or information provides to the organisation regarding its marine-related risk, opportunities, and sustainability (Abreu et al., 2017; Failler et al., 2023; Perkiss et al., 2022; Syah et al., 2020).	<ul style="list-style-type: none"> • Opportunities • Ocean economy • Value • Benefit • Governance 	Data to be obtained from the integrated annual reports: <ul style="list-style-type: none"> • Disclosure of corporate governance or related benefits from marine disclosures is assigned a value according to the above scale as discussed in Section 3.14.2.2.

Explanatory Variable	Key search words	Data Source and Measurement
<p>v) Environmental reporting costs (ENVIR): The high costs associated with preparing and publishing environmental information (Abreu et al., 2019; Dremptic et al., 2020b; Failler et al., 2023; Failler & Seisay, 2021; Rahmayanti & Sari, 2023)</p>	<ul style="list-style-type: none"> • Reporting costs • Sustainability reporting expenses /expenditure • Cost management • Cost efficiency • Cost 	<p>Data to be obtained from the integrated annual reports:</p> <ul style="list-style-type: none"> • Disclosure of cost or expenditure relating to blue accounting disclosure, assigned a value according to the above scale as discussed in Section 3.14.2.2.
<p>vi) Environmental marine policy (EMP): The organisation's policy or culture regarding compliance with the applicable environmental laws, regulations, and rights concerning how its business activities affect the marine environment, e.g., patents and pollution rights (Abreu et al., 2019; Failler & Seisay, 2021; Fridman et al., 2021b; Remmert, 2019; Syah et al., 2020)</p>	<ul style="list-style-type: none"> • Policy • Management • Stewardship • Sustainable Development Goals (SDGs) 	<p>Data to be obtained from the integrated annual reports:</p> <ul style="list-style-type: none"> • Disclosure of a guideline or policy to ensure marine ecosystem sustainability, assigned a value according to the above scale as discussed in Section 3.14.2.2.
<p>vii) Waste management (WM): Waste generated, waste disposal, waste treatment, waste diverted from disposal, and management of significant</p>	<ul style="list-style-type: none"> • Waste • Wastewater • Water discharge • Reuse 	<p>Data to be obtained from the integrated annual reports:</p> <ul style="list-style-type: none"> • Disclosure of waste treatment and disposal to ensure marine ecosystem sustainability,

Explanatory Variable	Key search words	Data Source and Measurement
waste-related impacts (Abreu et al., 2017, 2019; Initiative, 2020; Wu et al., 2021)	<ul style="list-style-type: none"> • Recovery • Treatment • Mitigation 	assigned a value according to the above scale as discussed in Section 3.14.2.2.
viii) Effluents management (EM): Disclosed spills and treatment of chemicals, oils, and fuels, among other substances, can potentially affect water and marine biodiversity (Bellamy et al., 2020; Cai & Li, 2018; Initiative, 2016, 2020; Wu et al., 2021)	<ul style="list-style-type: none"> • Effluents • Oil • Spills • Chemicals • Reuse • Recovery • Treatment • Mitigation 	<p>Data to be obtained from the integrated annual reports:</p> <ul style="list-style-type: none"> • Disclosure of effluent treatment and disposal to ensure marine ecosystem sustainability, assigned a value according to the above scale as discussed in Section 3.14.2.2.
ix) Marine Water Quality (MWQ): Disclosed water-related impacts from the organisation's activities and how these impacts are managed (Initiative, 2018; Mahmood et al., 2018; Syah et al., 2020)	<ul style="list-style-type: none"> • Marine water • Sea water 	<p>Data to be obtained from the integrated annual reports:</p> <ul style="list-style-type: none"> • Disclosure of water-related impacts treatment to ensure marine ecosystem sustainability, assigned a value according to the above scale as discussed in Section 3.14.2.2.

Source: Own compilation

3.14.2.3 Measuring Environmental Performance Using ESG Scores

After establishing the blue accounting disclosure variables above, the next step is to discuss environmental performance measurement. As explained in section 2.3.5, the concept of environmental performance, the Bloomberg environmental score, is used as a proxy for this study, and this is the measure for environmental performance. The data for the environmental scores was accessed from Bloomberg from 2019 to 2023 for each organisation that was assessed for the study. Missing data observations were excluded from further analysis, resulting in two companies being excluded as their data was found not applicable to the Bloomberg database, thus resulting in 10 observations being excluded. The exclusion was in line with what has been applied in other studies (Agyemang et al., 2021; Azeem et al., 2024; Bashir et al., 2023; Bednářová et al., 2019; Benjamin et al., 2023; Smeesters et al., 2018). Environmental performance is the dependent variable.

From the above discussion, the blue accounting score is derived by scoring each organisation using the explanatory variables in Table 4 and the Likert scoring scale to measure the extent and quality of the disclosure for each blue accounting item. In contrast, the environmental score is obtained from Bloomberg and determined using sustainability reporting guidelines such as the GRI. Therefore, while sustainability reporting frameworks such as the Global Reporting Initiative (GRI) and Environmental, Social, and Governance (ESG) standards provide guidelines for environmental reporting, there is no standardised blue accounting disclosure framework. This results in inconsistencies in how marine-related activities and impacts are measured and reported across organisations. To address this gap, this study applied a quantitative approach to measure and analyse the impact of blue accounting disclosures on environmental performance. This allowed for a data-driven evaluation of whether organisations that provide comprehensive blue accounting disclosures also tend to exhibit better environmental performance. Having discussed both variables, the econometric model to be applied to measure the relationship between these variables is discussed below.

3.15 Econometric Model

This study employs a panel data approach to analyse the longitudinal and cross-sectional data from the sample. After evaluating fixed effects and random effects models, the pooled Ordinary Least Squares (OLS) model was deemed the most suitable for the study's objectives and data structure. The model's design reflects the study's multi-year analysis of several companies

across various variables. Panel data were chosen for their ability to provide richer insights, greater flexibility, and improved analytical efficiency (Li et al., 2023; Mohajan, 2020; Muzanya, 2022; Nakeng, 2019; Zulfikar & STp, 2018). Therefore, a panel regression model was employed to determine the relationship between the dependent, independent, and control variables (Chininga, 2022). Panel data were utilised because they account for the heterogeneity of observations, capturing variations across both the cross-sectional and time-series dimensions (Chininga, 2022). When generalising results, the panel data regression methods help minimise temporal errors, limit biases from omitted variables, and address potential heterogeneity (Ahmad et al., 2021; Chininga, 2022).

The panel regression is valuable for gaining insights into data variability and minimising collinearity between variables in longitudinal data (Chininga, 2022). Considering the consistent nature of the environmental variables disclosed in the annual integrated and sustainability reports, which are not likely to change as they are influenced by shareholder approval, this model is suitable as it investigates stable relationships (Chininga, 2022). In this study, panel data from 14 marine-sensitive organisations from 2019 to 2024 included the blue accounting information and environmental performance (Chininga, 2022). This methodology was also adopted in other similar studies (Chininga, 2022; Zhao et al., 2018).

For the panel data analysis, three analytical models were available to be used for the regression analysis of this study: pooled ordinary least squares (pooled OLS), fixed and random effects (Majeed & Mazhar, 2019; Muzanya, 2022; Wooldridge, 2023). However, for this study, in which an evaluation of the effect of blue accounting on an organisation's environmental performance was performed, the pooled ordinary least squares model was applied. To effectively analyse the relationship between blue accounting disclosures and environmental performance, it is essential to define the specific variables used in the study. The following section introduces these variables and explains how each was measured.

3.15.1 Defining the Variables of the Study

The study includes one dependent variable, environmental performance, and multiple independent variables representing blue accounting disclosures. Control variables, such as firm size and age, are included to capture additional factors that may influence environmental performance. A variable is defined as a characteristic that changes across different cases (Bell

et al., 2022). Variables can be defined as dependent variables and independent variables, dependent being the variable influenced by the independent variables, i.e. being the results or outcome the study is seeking to explain; as a result, these variables will change in response to the independent variable and the independent variable, namely the variable affecting or influencing the dependent variables (Drempetic et al., 2020b; Mohajan, 2020; Zhong et al., 2021). A dependent variable in this study is environmental performance (Alsayegh et al., 2020; Mohajan, 2020). The independent variable is the blue accounting disclosure, reflected by the various blue accounting disclosure requirements. Based on the discussion of the dependent and independent variables for research Objective 2, the control variables considered relevant for the study were the firm size and firm age.

3.15.2 Control Variables

Firm size was identified as a control variable for this study to address the notion that larger organisations tend to have better environmental, social, and governance performance; thus, such an effect needs to be modelled separately. Several measures can be used to measure firm size, but the main ones are total assets, sales, and the market value of equity (Agyemang et al., 2021; Dang et al., 2018; Drempetic et al., 2020b; Muzanya, 2022). Firm size is an indicator that reflects the organisation's size (Adriana & Dewi, 2019; Nakeng, 2019; Wirawan et al., 2020). For this study, total assets were used to measure the firm size and the data were drawn from Bloomberg and supported by audited annual financial statements of the companies (Benjamin et al., 2023; Wang et al., 2024; Yu et al., 2018). The firm size was accounted for in the study as prior studies have reflected a high correlation between ESG and firm size, probably due to the resources of firms which can be devoted to ESG data reporting; therefore, larger firms can invest more resources towards ESG data (Alareeni & Hamdan, 2020; Kordsachia et al., 2022; Muzanya, 2022). This was also highlighted in other studies by other researchers (Drempetic et al., 2020a; Lopez-de-Silanes et al., 2020; Smeesters et al., 2018).

Furthermore, some studies show that organisations that have large asset bases (large companies) disclose more environmentally related information than those with smaller asset bases (smaller organisations) in line with stakeholder and legitimacy theory, in that such disclosures are required to meet the needs of the stakeholders and further legitimise the organisation (Adriana & Dewi, 2019; Antara et al., 2020; Deswanto & Siregar, 2018). Total assets were therefore used because studies have shown that larger companies tend to have better

ESG performance (Gregory, 2024; Kordsachia et al., 2022; Muzanya, 2022). Consequently, variation in firm size was accommodated by using the natural logarithm of the total assets (Agyemang et al., 2020; Baalouch et al., 2019; Gull et al., 2022).

The other variable considered was firm years/age, which reflects the years or period for which the organisation has been in operation since its incorporation (Bashir et al., 2023; Nguyen et al., 2020). The age of the firm tends to influence its environmental performance, considering that age is related to the resources and innovativeness of the organisation (Bashir et al., 2023; Nguyen et al., 2020; Ullah et al., 2022). Table 5 summarises the variables used in the econometric model. Column 1 of Table 5 displays the variables, Column 2 of Table 5 displays the symbol for those variables, and Column 3 of Table 5 displays the measurement for the variables.

Table 5: Variables of the Econometric Model

Variable	Symbol	Measurement
Environmental performance (Dependent)	EP	Environmental disclosure score from the Bloomberg database.
The independent variables are as follows:		
Regulatory framework	REG	Measured using the content analysis method, the quantity and quality of the information provided were examined using the Likert scale. This was evidenced by all the information in the integrated reports that reflected the regulatory framework of the organisation.
Obligations	OBLI	Measured using the content analysis method, the quantity and quality of the information provided were examined using the Likert scale. Therefore, this was evidenced by all the information in the integrated reports reflecting the organisation's environmental obligations.

Variable	Symbol	Measurement
Reporting guidelines	GUID	Measured using the content analysis method, the quantity and quality of the information provided were examined using the Likert scale. Therefore, this was evidenced by all the information in the integrated reports, which showed that the environmental reporting guidelines were being complied with.
Value add	VA	Measured using the content analysis method, the quantity and quality of the information provided were examined using the Likert scale. Therefore, this was evidenced by all the information in the integrated reports reflecting the value add attained by the organisation.
Environmental reporting costs	ENVIR	Measured using the content analysis method, the quantity and quality of the information provided were examined using the Likert scale. Therefore, this was evidenced by all the information in the integrated reports showing the environmental reporting costs incurred by the organisation.
Environmental marine policy	EMP	Measured using the content analysis method, the quantity and quality of the information provided were examined using the Likert scale. Therefore, this was evidenced by all the information in the integrated reports reflecting the environmental marine policy the organisation complied with.

Variable	Symbol	Measurement
Waste management	WM	Measured using the content analysis method, the quantity and quality of the information provided were examined using the Likert scale. This was evidenced by all the information in the integrated reports, which reflected the organisation's waste management practices.
Effluent management	EM	Measured using the content analysis method, the quantity and quality of the information provided were examined using the Likert scale. Therefore, this was evidenced by all the information in the integrated reports reflecting the effluent management practices of the organisation.
Marine water quality	MWQ	Measured using the content analysis method, the quantity and quality of the information provided were examined using the Likert scale. Therefore, this was evidenced by all the information in the integrated reports reflecting the organisation's marine water quality practices.
Control variables:		
Firm size	FIRM SIZE	The natural log of total assets
Firm years	FIRM AGE	Age of the firm (from the date of incorporation until the date chosen for the study, namely 2023)

Source: Own compilation

3.15.3 Choice between the Pooled OLS, Fixed Effects and Random Effects Model

As discussed above, there are three available research methods for panel data, and each of these is discussed below with details on why the Pooled OLS method was chosen for this study.

3.15.3.1 Fixed Effects Model

This statistical model limits the sources of biases in the estimations to time-varying variables (Li et al., 2023; Nguyen et al., 2020). However, it is limited by unobserved heterogeneity, (Nguyen et al., 2020). Unfortunately, the model is unable to estimate the causal effect (Nguyen et al., 2020). In addition, the model is not suitable for estimating absolute group differences as it would not be able to do this, and the random measurement error could pose a bigger issue than in other models, such as the pooled OLS model, and furthermore, the model does not detect effects that exist (Adams & Balogun, 2020; Nguyen et al., 2020). It is also more prone to reverse causality and only identifies effects within individuals, whereas the pooled OLS model recognises differences between individuals (Nguyen et al., 2020).

Unlike the random effects model, the model is appropriate for fixed or non-random variables (Nguyen et al., 2020). It has less statistical power than pooled OLS, and it is not clear which information and biases are eliminated and which characteristics are captured with the fixed model (Nguyen et al., 2020).

3.15.3.2 Random Effects Model

This model allows random movement over the cross-sections to be captured as the random variations across the variations are considered to be there due to overlapping other than to arise from the given sample (Li et al., 2023; Mashele, 2021). This method also assumes that there is no relationship between constant and independent variables (Mashele, 2021).

The Hausman test is applied to test which of the two models is most appropriate as an application (Adams & Balogun, 2020; Li et al., 2023; Nakeng, 2019; Nguyen et al., 2020).

3.15.3.3 Pooled Ordinary Least Squares (Pooled OLS)

All these variables are coordinated into a pooled ordinary least squares model. This model allows the pooling of all the time series and cross-sectional data without assumptions on individual differences and then processes an OLS regression model (Majeed & Mazhar, 2019; Muzanya, 2022; Shabbir & Wisdom, 2020; Wooldridge, 2023). The model uses time-constant variation, which addresses measurement error concerns and also takes individual variations

into account, which is a limitation in the fixed effects model (Mashele, 2021; Nguyen et al., 2020). This supports prior studies that investigated the effect of different variables on the organisation's environmental performance, and the pooled OLS model was used in view of the above considerations (Alam et al., 2019; Ifada & Saleh, 2022; Khan, Zhang, & Nathaniel, 2020; Wang & Wang, 2019). The results were assessed; the effect was considered statistically significant where the probability was calculated at 0.001 or 1% (Bashir et al., 2023; Lončar et al., 2019). This was considered more straightforward than the fixed and random effects model (Adams & Balogun, 2020).

The usual significance level of 5% was adopted for the study (Phaswana, 2018). The significance of the relationship is determined by the probability levels, where the lower the probability level (p), the more significant the relationship. The levels applied for the study were $P < 0.01$ at 1%, $P < 0.05$ at 5% and $P < 0.1$ at 10% (Kwak, 2023; Mangere, 2022; Obilor & Amadi, 2018; Ullah et al., 2022). The regression model used to examine the effect of blue accounting on environmental performance is given in Equation (1).

$$EP_{it} = \beta_0 + \beta_1 REG_{it} + \beta_2 OBLI_{it} + \beta_3 GUID_{it} + \beta_4 VA_{it} + \beta_5 ENVIR + \beta_6 EMP_{it} + \beta_7 WM_{it} + \beta_8 EM_{it} + \beta_9 MWQ_{it} + \beta_{10} FIRMSIZE_{it} + \beta_{11} FIRMAGE_{it} + \varepsilon_{it} \text{ (Equation 1)}$$

Where:

EP_{it} = the dependent variable, environmental performance, depending on the specified company (i) at the time (t).

REG = Regulatory framework of ocean-based companies (i) at the time (t).

$OBLI$ = Obligations of ocean-based companies (i) at the time (t).

$GUID$ = Reporting guidelines of ocean-based companies (i) at the time (t).

VA = Value add of ocean-based companies (i) at the time (t).

EMP = Environmental marine policy of ocean-based companies (i) at the time (t).

WM = Waste management of ocean-based companies (i) at the time (t).

EM = Effluent management of ocean-based companies (i) at the time (t).

MWQ = Marine water quality of ocean-based companies (i) at the time (t).

$FIRMSIZE$ = Firm size (log of total assets)

$FIRMAGE$ = Firm age (years)

β_0 = Constant

β_n = The regression coefficient for the independent variables

$\chi_{1,it}$ = Explanatory independent variable of the company for i at a particular time t

ε_{it} = Error term to account for unobserved organisations and time effects

i = sample company

t = period (year)

This model assumed the following:

The regression coefficients are constant for the intercepts and the slopes. Secondly, the error terms are not correlated with the explanatory variables encompassed in the study, thus allowing certainty that the estimates being used are not biased and inconsistent. Lastly, the model assumed that errors are independent over time and have constant variance.

The above assumptions were applied to the study. Still, without ignoring the fact that the sampled organisations do not all have exactly the same attributes, there is a possibility that there are organisational attributes, such as location, management style, organisational culture, etc, that have not been accounted for and that this does have an impact (Muzanya, 2022). However, applying the pooled OLS means that the fixed effects will be camouflaged, and thus, the attributes that are specific to each organisation will be subsumed in the error term (ε_{it}) (Muzanya, 2022). The results are greatly influenced by the validity and reliability of the data used for the study. Ensuring that the data accurately represent the variables of interest is fundamental to meeting these assumptions. The following section addresses the validity and reliability of the data used in this study.

3.16 Data Validity and Reliability

Data validity and reliability are essential in achieving accurate results. This study relies on audited integrated reports, scoring measures, and a peer-reviewed content analysis process to ensure the consistency and validity of the data. The data's validity and reliability are both important; validity refers to the data being suitable for the predetermined use, i.e. the ability of the data to accurately measure the variables necessary for the study without ambiguity (Nakeng, 2019; Sürücü & Maslakci, 2020). Reliability assures that consistent outcomes will be attained as long as the variables are tested under consistent conditions (Lillykutty & Samson, 2018; Nakeng, 2019; Sürücü & Maslakci, 2020). This entails completeness, the ability to verify, measure objectively, report adequately, and present the information neutrally

(Dragomir, 2018; Sejake, 2021). Reliability is enhanced by the public accessibility of the annual integrated reports (Nakeng, 2019). The validity, as formulated in 1927 by Kelly, ensures that the research is such that it can fully address the research question and objectives set (Lillykuty & Samson, 2018; Surty et al., 2018; Sürücü & Maslakci, 2020). The integrated annual reports with the audited annual financial statements can assist in achieving validity, as the auditors are required to assess the consistency of the information that has been presented in the annual integrated reports by carrying out the necessary procedures to confirm that the financial and non-financial information is consistent, i.e. talk to each other (Nakeng, 2019; Surty et al., 2018; Sürücü & Maslakci, 2020).

The quantitative content analysis to be used in the study was selected due to the ability of the method to present reliable and comparable data, in that the study can be reproduced and verified through the investigation of corporate reports (Dragomir, 2018). Although no assurance is provided by auditors on some aspects of the integrated reports, this does not negate the reliability of the reports because an organisation needs to have in place an internal controls system and a financial reporting system, and engage with stakeholders and assurance providers such as internal auditors so as to provide holistic information that is a faithful representation of its operations (Braam & Peeters, 2018; De Villiers et al., 2020b; De Villiers & Middelberg, 2013). Furthermore, these annual sustainability reports (normally incorporated into or accompanying the integrated reports) have a high degree of credibility, considering that they are prepared using the Global Reporting Initiative Framework (Benjamin et al., 2023; Pittrakkos & Maroun, 2020; Wasara & Ganda, 2019). Therefore, considering the above facts and the fact that the study was conducted using secondary data from the companies' websites, the data are considered valid and reliable, with not much room for the author's bias (Qian & Sun, 2021; Shabbir & Wisdom, 2020).

Furthermore, to enhance the degree of validity, the study relied mainly on published and accredited studies on environmental reporting. The data from the integrated annual reports and sustainability reports were analysed using a Likert scale that aligned with previous studies. The author initially coded the reports using uniform coding guidelines to ensure validity and reliability (Sampong et al., 2018). In addition, the reports were analysed and scored by a peer to eliminate author bias and enhance the objectivity of the scoring process. The reports were also read again to finalise the ratings or scoring.

This method allowed the interpretations to be influenced by the reviewed literature and theories (Creswell, 2021; Muzata, 2018). This may raise unexpected questions from the data analysis and also assist in providing a basis for recommending future research areas in blue accounting and environmental performance. Therefore, the validity and reliability of the integrated annual reports and sustainability reports were ascertained on the assumption that these published reports are official and a true or fair representation of the organisation's environmental reporting (including blue accounting disclosures) at the time they were filed with the JSE and distributed to the various stakeholders in the public arena. Given the study's reliance on publicly available data and the use of corporate disclosures, ethical considerations play a role in ensuring that all data are used responsibly. The next section outlines the ethical principles adhered to in this research.

3.17 Ethical Considerations

In line with ethical research practices, the study has used only publicly accessible data and avoided any direct interaction with human subjects. Ethical clearance was obtained, ensuring adherence to all relevant ethical standards (Banks, 2018; Bell et al., 2022; Dawson et al., 2019; Mohajan, 2020; Walliman, 2021). This guarantees that the study adhered to ethical principles that ensured that no harm was caused to anyone, no information was used without due consent, no privacy was invaded, and no deception was involved in carrying out the study (Banks, 2018; Bell et al., 2022; Mohajan, 2020; Walliman, 2021). Ethical clearance was applied for and approved in line with the university's protocols, as the research could not possibly harm a third party, does not involve community participation or provision of community service, does not give rise to a potential conflict of interest and is not in the health field (Phaswana, 2018). The above provides assurance that the necessary ethical protocols were adhered to in connection with the study's data collection, analysis and outcomes, with no harmful effects on any human being. Secondly, the information collected for the study was extracted from published and publicly available annual integrated reports of JSE-listed marine-sensitive organisations' secondary data. Secondary data are existing data that are collected and used for a purpose other than the purpose for which they were originally created, either in a hard copy or soft copy format, e.g. financial statements, annual reports, publications, etc (Abbass et al., 2022; Mangere, 2022; Nakeng, 2019; Pederson et al., 2020; Qian & Sun, 2021; Walliman, 2021). These reports were extracted from the organisations' websites. As these are secondary data, there was no contact with the participants and no room for any manipulation of the data to be

used. After this discussion of all the methodological elements, the following section summarises the chapter and transitions to the results and analysis in the next chapter.

3.18 Chapter Reflections and Conclusion

This chapter detailed the methodological framework underpinning this study. It discussed the research design for the study, including the population, the sample, the data collection method and instruments, the variables, the econometric model, the data validity and reliability, and the ethical considerations that were accounted for in the study. A hybrid/mixed research method was employed for the study. From the discussion, a scoping review was found to be appropriate for identifying the factors that influence marine-sensitive organisations' adoption of blue accounting disclosures. The discussion also included the application of a quantitative approach to the study of the sample of over 68 identified ocean-based JSE-listed companies. In addition, details were provided on how content analysis was applied to code blue accounting data from the integrated annual reports extracted from the organisations' websites and how these data were used to evaluate the correlation between blue accounting disclosures and environmental performance. The application of a pooled ordinary least squares model to the blue accounting disclosures and environmental performance was also discussed.

The following chapter discusses the study's objectives and highlights the results from the scoping review, a qualitative method. The quantitative content analysis, correlation and pooled regression results are presented and discussed in relation to the effect of blue accounting disclosures on organisations' environmental performance

CHAPTER 4: DISCUSSION OF DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter presents, analyses and discusses the qualitative data gathered using a scoping review and the quantitative data gathered using quantitative content analysis scores on the integrated annual reports of sampled ocean-based companies using the 5-point Likert scales that align with the research objectives. First, the scoping review was applied to identify factors influencing the adoption of blue accounting disclosures (Objective 1). Then, the results of the factors that influence blue accounting disclosure were discussed using descriptive analysis. Content analysis was applied to the integrated annual report to determine the significance of the relationship between blue accounting disclosures and environmental performance (Objective 2), where the various factors were scored accordingly. These results were analysed using descriptive analysis, correlation, and pooled regression analysis in relation to environmental performance. Subsequently, the results of the effect of blue accounting on environmental performance for ocean-based JSE-listed companies were presented. The following section presents and discusses the findings from the quantitative scoping review on the factors that influence an organisation's adoption of blue accounting disclosures.

4.2 Descriptive Statistics of the Results of the Research Objectives

4.2.1 Objective 1: Factors that influence the organisation's adoption of blue accounting disclosure

The results of the scoping review have been analysed and coded into Excel to provide a high-level visual of the results extracted from the various articles highlighted in Chapter 3. This will help to illustrate the dynamics of the phenomenon in the literature presented below. Blue accounting seems to have gained traction in research over the years. Although the scoping review and database search was done from 2017 to April 2024 in accordance with the criteria applied in phase 2 (relevant studies identification) in Chapter 3, no results were identified for 2018 and 2024; hence, it is not represented in the chart below. Therefore, the frequency included only the years in which relevant studies were identified. Figure 5 displays the number of times publications were identified for each year between 2017 and 2023. Figure 5 shows the number of publications for each year and the proportion thereof as a percentage.

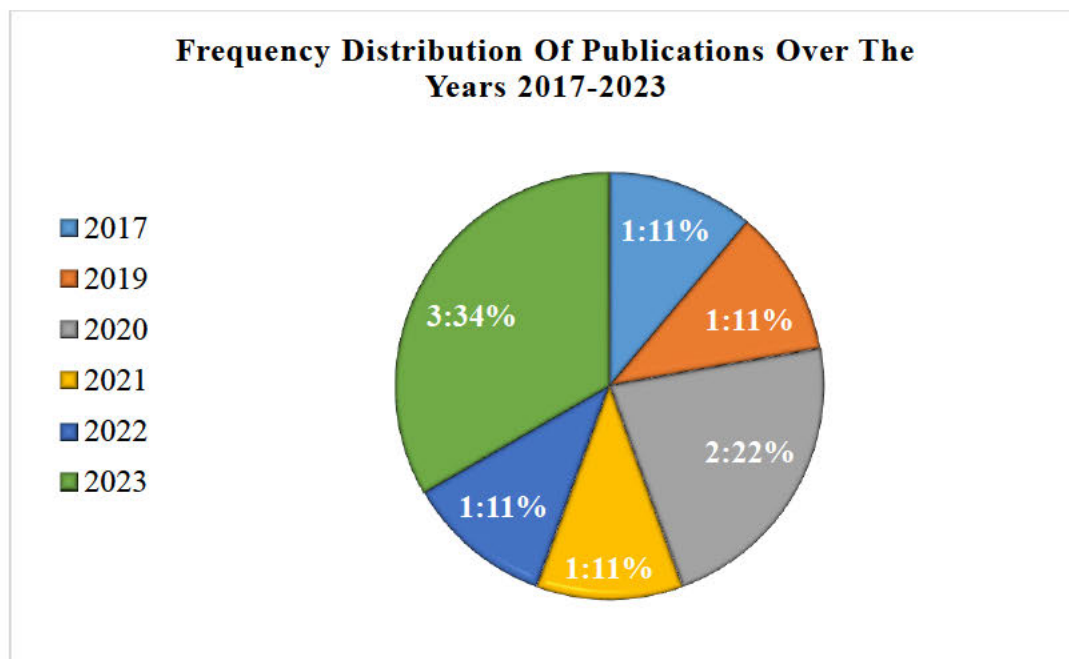


Figure 5: Representation of the Number and Percentage of Publications Over the Years

Source: Own compilation

Using the scoped articles, a review was carried out to identify the years in which the content scoped was published, starting from the earliest period, 2017 to 2024. From the above, 2023 (3 articles) and 2020 (2 articles) were the years when more articles appeared. The other years produced fewer articles (2017:1; 2019:1; 2021:1; 2022:1). 2018 and 2024 (subject to April 2024 as the end date for the search) had no articles. Having identified the period, an assessment was done of the locations where all the reviewed publications were found. Figure 6 shows the number of publications identified per geographical location. Figure 6 contains the geographical locations and the number of articles (quantity) in each location.

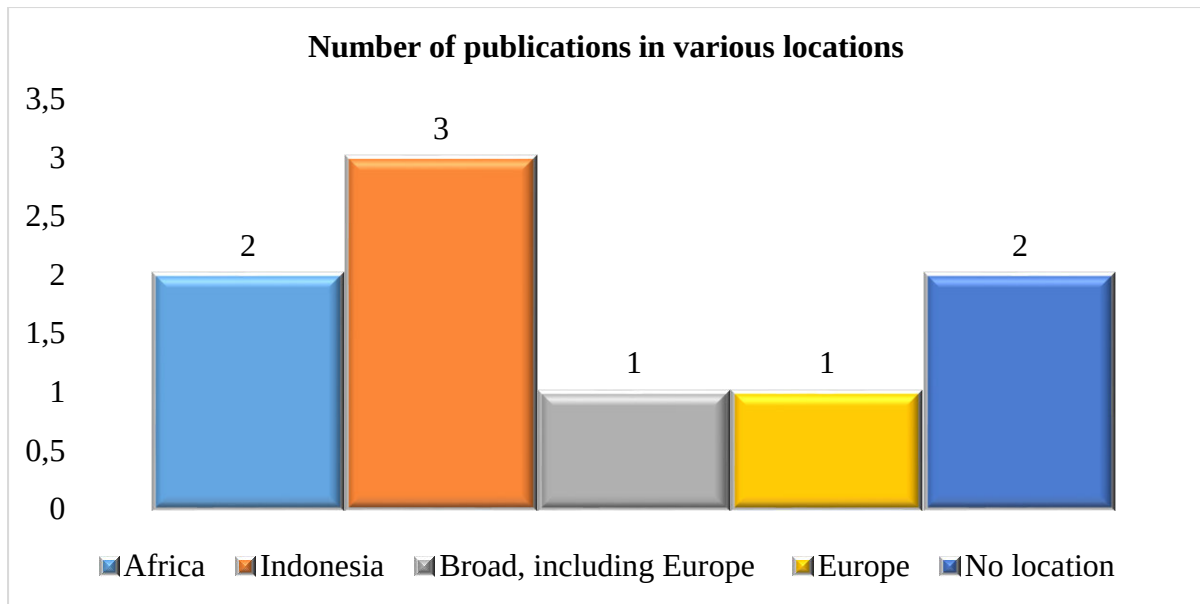


Figure 6: Geographical Distribution of Articles

Source: Own compilation

This represents the number of articles published in the context of specific locations. The objective was to assess the demographics of where studies on blue accounting were and conducted and thus identify gaps, i.e. where areas where there is limited or no research work done on the phenomenon of blue accounting. Indonesia is currently the location where the most work is done in this study area, followed by Africa. After identifying the years and regions covered by the articles, the findings were assessed to ascertain which of the findings recur in the various articles and which were introduced for the first time so as to identify the broad factors influencing blue accounting adoption. Figure 8 shows the blue accounting adoption factors identified from the scoping review. Figure 8 contains the individual blue accounting adoption factor and how many times each factor is identified in the various articles.

Broad Factors Influencing Blue Accounting Adoption

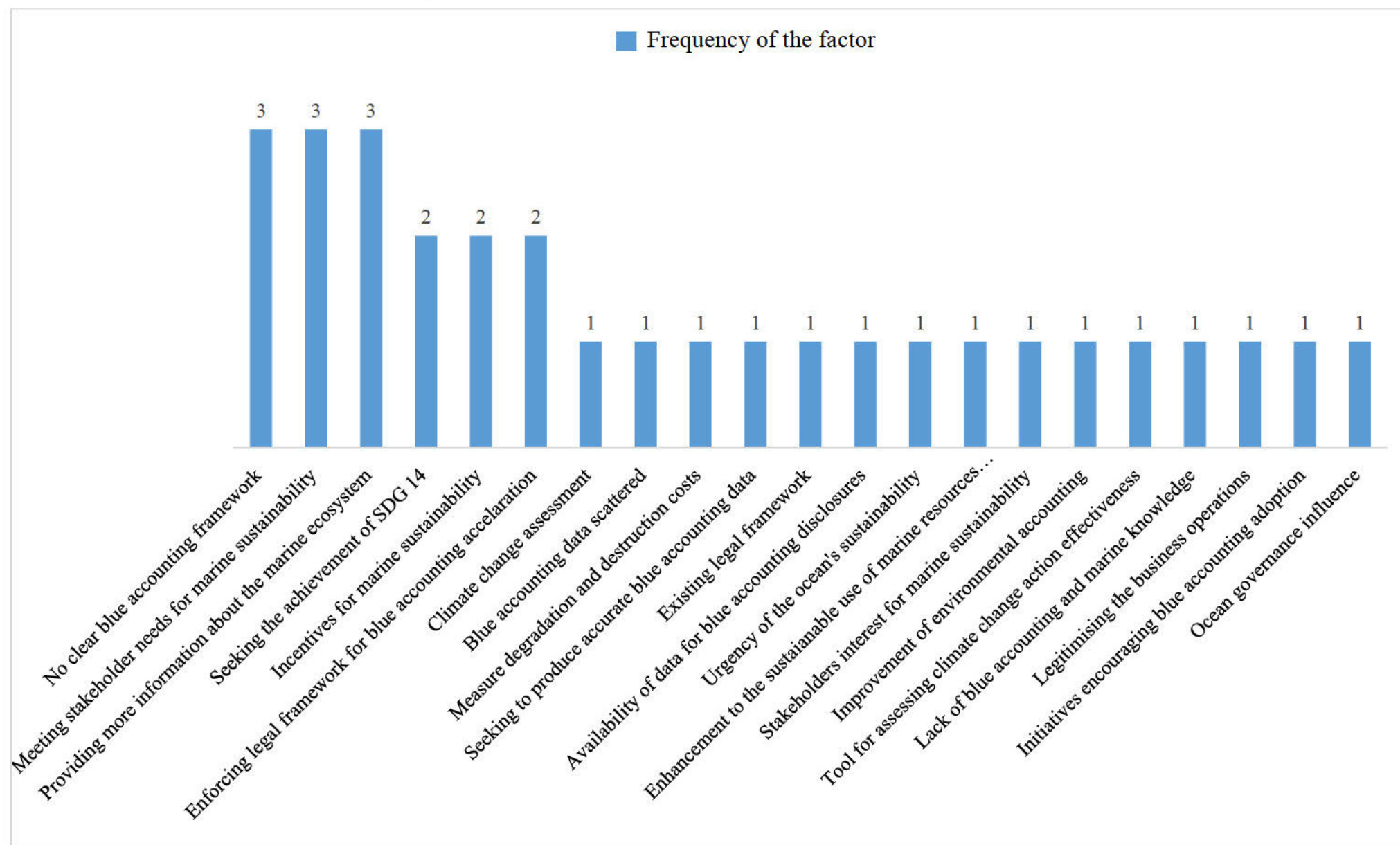


Figure 7: The Number of Times Findings Appear in the Various Publications

Source: Own compilation

Several findings were identified from the above; some recurred in various articles, but some did not. The various findings that were identified were categorised into the main themes/categories they reflect to see which factors appear prominent in the articles reviewed. Figure 8 shows the blue accounting factors grouped into main themes. Figure 8 shows the main themes each of the factors falls under and how many times blue accounting factors for those main themes were identified in the scoped articles.

Summary of the blue accounting factors classified into main themes

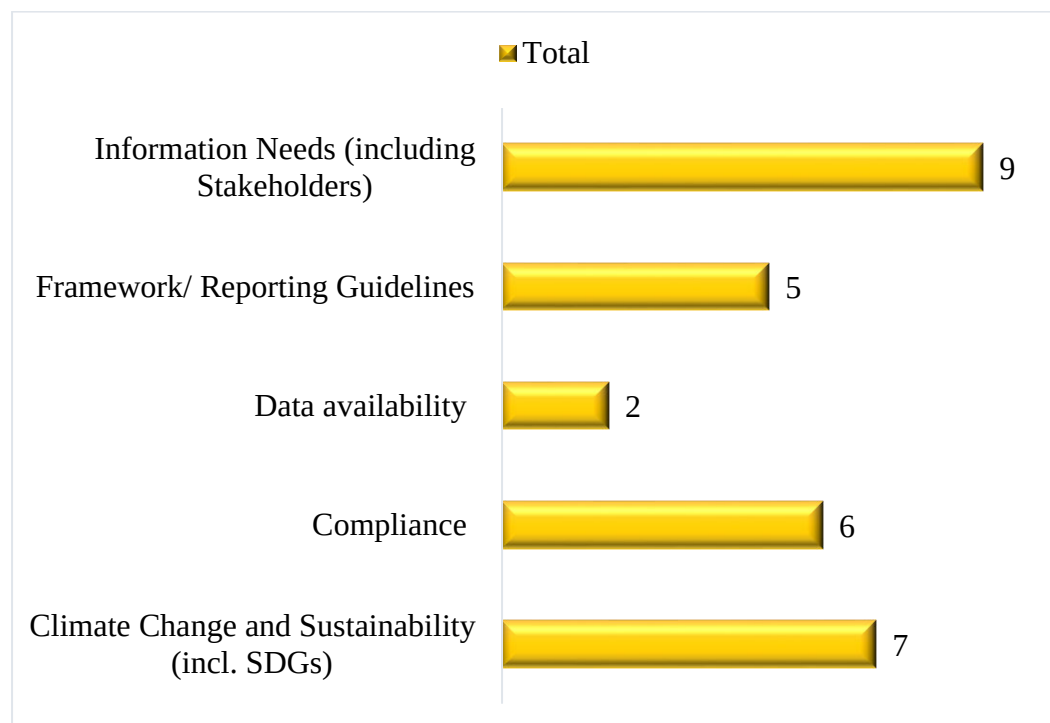


Figure 8: Classification of the Influences on Possible Categories or Main Themes

Source: Own compilation

The reviewed articles suggest that the needs of the stakeholders and the organisation, as well as climate change and sustainability, are the more prominent influences in relation to blue accounting disclosure. These results are diagrammatically presented above and explained in detail below.

4.3 Presentation and Discussion of Results

4.3.1 Objective 1: To identify factors that influence the organisation's adoption of blue accounting disclosure (scoping review)

This section presents the findings of the scoping review in the context of Objective 1. It categorises the factors from the scoping review into positive incentives (e.g. stakeholder demands and sustainability goals) and barriers (e.g. lack of standard frameworks) for blue accounting disclosure. Each theme is connected to relevant theories, such as stakeholder theory, signalling theory, etc, to explain its role in blue accounting adoption.

The reviewed studies were conducted in various locations, with three (3) in Indonesia, two (2) in Africa, one (1) in Europe and two (2) without specific articulated regional areas (Failler et al., 2023; Failler & Seisay, 2021; Pattinaja et al., 2023; Rahmayanti & Sari, 2023; Syah et al., 2020). This suggests a lack of blue accounting literature on a global, African, and South African scale. The period these articles cover began in 2017, with 2017 as the period when blue accounting disclosure literature emerged. There was one (1) publication in 2017, and one (1) or two (2) articles in the following years. With the final year of the review, 2023, having the highest number of annual publications, namely three (3). This field seems to be growing in popularity, judging by the number of articles published in the past year, 2023. The total number of publications (9) addressing the blue accounting concept over the 6-year period (2017-2024) emphasises how limited the literature on the blue accounting concept is (Failler et al., 2023; Perkiss et al., 2022; Rahmayanti & Sari, 2023).

These reviewed publications were all published in various sources and not in a single source, and the findings identified in the various articles differ; however, similar findings were identified as reflected in the above descriptive statistics. In nine (9) of the reviewed studies, three (3) authors highlighted those stakeholders, such as the investors/shareholders, society etc, that play a crucial role in pressuring/urging organisations to adopt blue accounting disclosures, especially considering the influence and power these stakeholders have on organisations' sustainability and reporting. This supports the stakeholder theory concept, highlighting that organisations disclose information at times as a means to address the powerful and strategic stakeholders' demands for information, especially non-financial information (Baalouch et al., 2019; Christensen et al., 2021; Freeman, 2010; Jiang & Fu, 2019). An organisation's disclosure of blue accounting information strengthens its endeavour to be seen as a legitimate citizen

within the communities in which it operates, as its blue accounting disclosure enables it to report on how it is meeting the terms and conditions of its social contract (Abreu et al., 2019; Failler et al., 2023; Pattinaja et al., 2023; Syah et al., 2020; Winarsih et al., 2020). Therefore, if an organisation does not meet these stakeholders' need for blue accounting disclosures, these stakeholders could regard the organisation as lacking transparency and accountability in its marine activities, which would then negatively affect its legitimacy in the eyes of shareholders. To avoid this, and the financial effect this would have, the organisation would be encouraged to adopt blue accounting disclosure and thereby meet its stakeholders' needs (Abreu et al., 2017, 2019; Failler et al., 2023; Pattinaja et al., 2023; Syah et al., 2020). The results uphold the assumptions of stakeholder theory (Beck & Storopoli, 2021; Freeman et al., 2021).

Furthermore, four (4) of the studies suggested that the dilatory adoption of blue accounting might be due to organisations' lack of understanding and failure to see the value blue accounting disclosure would contribute in terms of enhancing their operational, sustainability, and reporting functions. If organisations had this understanding, it would be an incentive for investment in blue accounting disclosure, and they would reap the rewards (Abreu et al., 2019; Failler et al., 2023; Perkiss et al., 2022; Rahmayanti & Sari, 2023). The value of blue accounting would take the form of the organisation identifying and continuing with operational activities that have been identified as conserving and preserving the marine system or abandoning or improving on operational activities that are eroding the marine ecosystem, thus enhancing the sustainability of its operations for present and future generations. These findings are in line with the assumptions of the intergenerational equity theory of John Rawls, which could enhance its standing with its various stakeholders and thus improve its legitimacy with the stakeholders in accordance with legitimacy theory (Abreu et al., 2019; Failler et al., 2023; Perkiss et al., 2022; Rahmayanti & Sari, 2023; Rawls, 1971).

Furthermore, four (4) studies emphasised that these disclosures would help organisations to assess how they are performing in terms of their organisation environmental performance goals/targets, which are aimed at reducing the effects of climate change, becoming more sustainable and contributing to the SDG (Life Below Water), as highlighted in the studies reviewed (Abreu et al., 2019; Failler et al., 2023; Perkiss et al., 2022; Rahmayanti & Sari, 2023). This would align with organisations playing their part in being responsible corporate citizens both nationally and globally. This would also support signalling theory, which states that providing stakeholders with more blue accounting information to enable them to make

informed decisions, reduces the information asymmetry that tends to exist between stakeholders and organisations concerning those organisations' marine operations (Ifada & Saleh, 2022; Karaman et al., 2020; Maama & Mkhize, 2020). Therefore, according to signalling theory, blue accounting disclosures could signal a positive effect and signal accountability and transparency by the organisations towards their stakeholders (Alsayegh et al., 2020; Bosi et al., 2022; Kheireddine et al., 2023).

One author emphasised that considering that the ocean provides great value, organisations (one of the primary users of marine resources) need to recognise the dire state of the ocean's sustainability and the urgency for organisations to play their part (Rahmayanti & Sari, 2023). Another author (one) alluded to the fact that organisations might be encouraged to adopt blue accounting disclosures if there were an initiative in place to develop the relevant accounting principles and processes that would measure and recognise the relevant aspects of the marine ecosystem. Such an initiative would, therefore enhance the availability, accuracy, and uniformity of blue accounting disclosures, as at the moment, these disclosures are still a fairly murky area for most organisations, with the result that there is much inconsistency (Perkiss et al., 2022). Lastly, much-needed regulation enforcement would be necessary to create an environment for effective marine governance and to expedite the adoption of blue accounting by organisations, as the accounting would be supported by the regulatory environment. It is possible that the present lack of continuous monitoring and enforcement of marine-related regulations is contributing to the state of degradation of the marine resources (Abreu et al., 2019; Failler et al., 2023; Perkiss et al., 2022). This supports stakeholder theory as these authors highlight the importance of the role stakeholders play in pressuring marine organisations to adopt blue accounting disclosure-enhancing initiatives. Such initiatives should be undertaken by the government, regulators or other policymakers (stakeholders), as should the enforcement of the regulatory framework (Freeman, 2010; Khan, Zhang, Kumar, et al., 2020; Mata et al., 2018; Udo, 2019; Ullah et al., 2022).

Although the factors mentioned above may encourage organisations to adopt blue accounting, it must be recognised that there are factors that act as stumbling blocks to this adoption, namely the lack of a uniform and recognised blue accounting framework or guidelines that organisations could adopt, as in the case of financial accounting disclosures where internationally recognised International Financial Reporting Standards (IFRS) provide guidelines for accounting (Failler et al., 2023; Failler & Seisay, 2021; Rahmayanti & Sari,

2023). Hence, three (3) authors have noted that the lack of such clear guidelines/framework has led to the lack of disclosed and thus available blue accounting and marine knowledge as organisations may not be aware of what constitutes such information and how it should be accounted for, resulting in the apparent lack or poor availability of such disclosures (Abreu et al., 2019; Failler et al., 2023; Rahmayanti & Sari, 2023). According to signalling and stakeholder theories, the lack of blue accounting disclosures (voluntary disclosure), although this is due to the lack of blue accounting reporting guidelines or a framework, might send a negative signal to stakeholders as it might be perceived as the organisation's withholding information about the negative impact of its operations to the marine ecosystem (Carandang & Ferrer, 2020; Chiu et al., 2020; Ullah et al., 2022). Other studies have corroborated this notion (Kheireddine et al., 2023; Maama & Mkhize, 2020). Another problem is that the lack of a blue accounting disclosure framework or guidelines has led to blue accounting disclosures being scattered across organisational reports instead of being collated in a specific area or section, as one would normally expect. This could lead to incorrectly produced and disclosed blue accounting data as there is no guidance or framework, thus leaving organisations to their own devices, which might result in unforeseen inaccuracies (Failler et al., 2023; Rahmayanti & Sari, 2023).

The above factors raise difficulties in adopting blue accounting disclosure and may have contributed to the current state of the literature on blue accounting, as it is still a new field. Therefore, the following research gaps can be noted from the scoping review and considered for future research. From the reviewed studies, it has been identified that studies are conducted mainly in the context of Indonesia, Africa and Europe (Abreu et al., 2017; Failler et al., 2023; Failler & Seisay, 2021; Pattinaja et al., 2023; Rahmayanti & Sari, 2023; Syah et al., 2020). As the studies have been conducted over limited areas, a study could be conducted in the South African context, as South Africa has rich marine resources and a large-scale marine economy. Furthermore, studies could be conducted in other marine-sensitive areas where there is large-scale blue economic activity, regions such as Pakistan and China. These regions could provide valuable new insights into blue accounting reporting.

The above-mentioned studies point to the need for a clear reporting framework or guidelines regarding how blue accounting should be reported on and what elements should be accounted for and measured (Failler et al., 2023; Failler & Seisay, 2021; Rahmayanti & Sari, 2023). The articles do not, however, provide information on what environmental management systems

would be appropriate to complement blue accounting disclosures in light of the blue accounting framework. An assessment could also be carried out to determine whether organisations have the necessary competence for such reporting and, if required, the capacitation necessary to enhance the accuracy of the blue accounting disclosures. Furthermore, seeing that blue accounting disclosures are non-financial environmental disclosures which may not necessarily be part of the information independent external auditors provide reasonable assurance over when conducting audits, it is necessary to explore the level of assurance auditors can provide and whether this level of assurance would affect the reliance stakeholders place on the credibility and usefulness of these disclosures. Lastly, in this regard, a study could be conducted on how these disclosures can effectively be incorporated into the sustainability, ESG, and integrated reports. This would provide useful insights as these are current reporting facets for non-financial information.

As the studies highlight the need for regulatory enforcement to expedite blue accounting disclosures (Abreu et al., 2019; Failler et al., 2023; Perkiss et al., 2022), it might be of value to explore how the current marine-related legislation can enhance blue accounting disclosure enforcement. It is also suggested that blue accounting disclosures could assist organisations in meeting their performance target for sustainability in terms of SDG 14: Life Below Water (Abreu et al., 2019; Failler et al., 2023; Perkiss et al., 2022; Rahmayanti & Sari, 2023). A study could explore how effective blue accounting disclosures would be in measuring the organisation's progress towards achieving SDG 14: Life Below Water. Having discussed the qualitative findings, we now move to an analysis of quantitative data. The following sections evaluate how blue accounting disclosures impact the environmental performance of ocean-based companies listed on the JSE in South Africa.

4.3.2 Objective 2: Test the significant effect of blue accounting on the environmental performance of South African maritime companies listed on the Johannesburg Stock Exchange

4.3.2.1 Descriptive Analysis

Descriptive analysis was used to explain the dependent and independent variables of the study, and the results were presented using tables, charts and diagrams (Adriana & Dewi, 2019; Machmuddah & Wardhani, 2020; Sampong et al., 2018). This was done for both Objective 1

and Objective 2. Furthermore, the content analysis results on Objective 2 were analysed by conducting a pooled regression analysis.

Seventy observations, as seen in Table 6 below, were analysed. Table 6 displays the descriptive statistics for the variables related to blue accounting disclosures, including the mean, median, maximum, and minimum standard deviation, etc. The descriptive statistics related to the dependent variable (environmental performance), independent variables (regulatory framework, obligations, reporting guidelines, value add, environmental reporting costs, environmental marine policy, waste management, effluent management, and marine water quality) and the control variables were run to determine the data spread, mean, minimum, maximum, and standard deviations.

4.3.2.1.1 Descriptive Analysis of the Blue Accounting Practices of South African Ocean-Based Companies

Table 6: Descriptive Statistics on Blue Accounting Disclosures

	EP	REG	OBLI	GUID	VA	ENVI R	EMP	WM	EM	MWQ	FIRM SIZE	FIRM AGE
Mean	53,33	2,83	3,66	4,44	2,59	2,49	2,50	3,01	2,61	2,87	4,85	62,50
Median	62,19	3,00	4,00	4,00	2,00	3,00	2,00	3,00	3,00	3,00	4,77	51,00
Maximum	82,80	4,00	5,00	5,00	4,00	4,00	4,00	4,00	4,00	4,00	6,42	138,00
Minimum	10,66	2,00	1,00	3,00	2,00	1,00	1,00	2,00	1,00	1,00	3,31	8,00
Std. Dev.	19,47	0,78	1,01	0,58	0,69	0,78	0,68	0,81	0,98	0,96	0,89	39,35
Skewness	-0,70	0,31	-1,00	-0,45	0,75	-0,14	0,43	-0,03	-0,09	-0,33	0,20	0,37
Kurtosis	2,30	1,72	3,52	2,27	2,39	2,61	2,78	1,56	2,00	2,07	2,06	1,94
Jarque-Bera	7,07	5,83	12,37	3,89	7,65	0,68	2,26	6,09	3,00	3,83	3,01	4,83
Probability	0,03	0,05	0,00	0,14	0,02	0,71	0,32	0,05	0,22	0,15	0,22	0,09
Sum	3732,97	198,0 0	256,00	311,00	181,0 0	174,00	175,0 0	211,0 0	183,0 0	201,0 0	339,31	4375,00
Sum Sq.	225238,0 0	602,0 0	1006,0 0	1405,0 0	501,0 0	474,00	469,0 0	681,0 0	545,0 0	641,0 0	1699,58	380295,00
Sum Sq. Dev.	26166,22	41,94	69,77	23,27	32,99	41,49	31,50	44,99	66,59	63,84	54,82	106857,50
Observations	70	70	70	70	70	70	70	70	70	70	70	70

Source: _eViews 14

Where: REG: Regulatory framework; OBLI: Obligations; GUID: Reporting Guidelines; VA: Value Add; ENVIR: Environmental reporting costs; EMP: Environmental Marine Policy; WM: Waste management; EM: Effluent management; MWQ: Marine Water Quality; FIRM SIZE: Firm Size (log of total assets); and FIRM AGE: age of the firm.

Table 6 above presents the results showing whether blue accounting has a significant effect on the environmental performance of South African maritime companies listed on the Johannesburg Stock Exchange. The aim was to analyse the 70 firm-year observations explored from 2019 to 2023 to determine the environmental performance of the maritime organisations, as well as the independent variables and control variables, to gauge the data spread, mean, and deviations.

Environmental performance (mean: 53.33 and standard deviation: 19.47) has an average mean value with a high standard deviation, highlighting significant variability in the organisations' environmental performance. Therefore, most of the evaluated marine organisations show good environmental performance, with some still underperforming and thus needing to improve their environmental performance. This is in line with the literature, which indicates that firms with better environmental performance tend to adopt voluntary non-financial disclosures (Baalouch et al., 2019; Drempetic et al., 2020b; Shah et al., 2021). Thus, it emphasises that organisations with better environmental performance adopt blue accounting disclosures, which improves their environmental performance. Meanwhile, marine organisations with lower environmental performance tend to fail to report on their blue accounting practices. This is aligned with the stakeholder theory notion that the lack of blue accounting and other environmental disclosure is usually evident in poorly performing organisations, and as a means to conceal such poor performance, they opt to disclose little to no information (Agyemang et al., 2021; Drempetic et al., 2020a; Tadros & Magnan, 2019; Younis & Sundarakani, 2019).

The regulatory framework (mean: 2.83 and standard deviation: 0.78) reflects a low mean and standard deviation, indicating that most of the marine organisations studied fail to comply with marine and environmental-related regulations, and there is low variability between these organisations. This high level of non-compliance has been noted by various authors in prior studies and has been ascribed partly to the lack of enforcement and consequences for non-compliance. Non-compliance is likely to affect an organisation's environmental performance adversely (Failler et al., 2023; Rahmayanti & Sari, 2023; Ullah et al., 2022).

Obligations (mean: 3.66 and standard deviation: 0.78) reflect a moderate mean and standard deviation and show variations across the marine organisations investigated. Several of the assessed firms have disclosed moderate to high environmental obligations, and these obligations mainly took the form of fines and penalties for non-compliance. Studies have noted

that this resulted in poor environmental performance as the disclosed environmental obligations, such as fines, penalties, incidents, etc, emanate from instances of non-compliance with the relevant environmental marine-related legislations reflecting poor blue accounting practices by the organisation (Gerged et al., 2024; Sun et al., 2024; Tadros & Magnan, 2019). No marine-related provisions, obligations, or decommissioning were identified from the integrated annual reports.

The reporting guidelines (mean: 4.44 and standard deviation: 0.58) reflect a high mean with a low standard deviation, highlighting that most marine organisations adopt and report according to the reporting guidelines for their blue accounting disclosures. Adopting and complying with the sustainability reporting guidelines enhances an organisation's blue accounting disclosures and, thus, environmental performance, as the guidelines provide measures that encourage the organisation to adopt sustainable environmental practices. This is in agreement with the findings from prior studies (Haque & Ntim, 2018; Sampong et al., 2018).

The value add (mean: 2.59 and standard deviation: 0.69) reflects a low mean and an average standard deviation, indicating that value add initiatives can enhance an organisation's environmental performance as the organisation can assess its environmental practices, the risks and opportunities they present, and devise means to improve and mitigate such risks. This could improve its environmental performance, which aligns with prior studies' findings (Agyemang et al., 2024; Jiang & Fu, 2019; Shahab et al., 2020).

The dimension environmental reporting costs (mean: 2.49 and standard deviation: 0.78) reflects a low mean and a standard deviation, highlighting the positive effect of incurring environmental reporting costs on comprehensive blue accounting disclosures that could improve the organisation's environmental performance as these environmental costs indicate the investment the organisation has incurred in respect of the means it has applied to ensure quality environmental reporting, including investing in an environmental management system which enables the organisation to evaluate the risks and opportunities its marine interactions presents. The same goes for organisations that do not invest in their blue accounting reporting and thus do not incur reporting costs, resulting in poor environmental performance. This aligns with findings from prior studies in which the reporting costs were found to affect organisations' environmental performance (Broadstock et al., 2021; Zhang & Wellalage, 2022).

The dimension of environmental policy (mean: 2.50 and standard deviation:0.68) reflects a low mean and a moderate standard deviation, showing that most of the organisations evaluated have internal marine policies in place without much variation in how these policies have been disclosed. These policies aid the environmental performance of the organisation, and the few organisations that have not adequately disclosed their marine policies have seen this reflected in their low environmental performance. This is to be expected as a marine environmental policy enables organisations to know what marine environmental practices to expect and thus to be consistent in their environmental interaction. This has been confirmed in prior studies (Haque & Ntim, 2018; Wendling et al., 2022).

Waste management (mean: 3.01 and standard deviation: 0.81) reflects a moderate mean and high variation across marine organisations. This indicates that an organisation's waste management practices are being fairly disclosed, and it should be remembered that the organisation's treatment and practices concerning waste impact the environmental performance of the organisation, as evidenced in prior studies (Baalouch et al., 2019; Liu et al., 2023). This is to be expected as the way the waste is managed and treated before disposal into the environment determines the effect on the marine ecosystem, reflecting the organisation's environmental performance.

Effluent management (mean: 2.61 and standard deviation: 0.98) reflects a moderate mean with significant variations across the different organisations. This indicates that the organisation's effluent management practices can improve the organisation's environmental performance as such practices enable environmentally friendly disposal of effluent into the marine environment, reflecting the organisation's blue accounting practices. This is supported by findings from prior studies on how effluent management reflects organisations' blue accounting practices and how these affect the organisations' environmental performance (Cheng et al., 2024; Rehman et al., 2022).

Marine water quality (mean: 2.87 and standard deviation: 0.96) has an average mean and high standard deviation, which indicates that marine quality practices differ significantly among the marine organisations investigated. Therefore, organisations with practices that seek to protect the quality of the seawater reflect the blue accounting practices of the organisations and tend to show improved environmental performance. Findings from prior studies support this (Agyemang et al., 2024).

Firm size (mean: 4.85 and standard deviation: 0.89) indicates that the firm size of marine organisations can influence their environmental performance. This is in line with prior studies, where firm size is associated with the organisation's resources, directly affecting the activities the organisation can invest in. The bigger the organisation, the more resources it has to invest in activities aimed at improving its blue accounting practices and, ultimately its environmental performance as opposed to smaller organisations (Agyemang et al., 2021; Nakeng, 2019; Younis & Sundarakani, 2019). These findings are in line with stakeholder theory, as the larger the organisation, the more stakeholders it has; those stakeholders can exert pressure on the organisation to improve the sustainability of its marine activities as a means to reduce marine pollution and deterioration resulting from the organisation's activities (Antara et al., 2020; Jiang & Fu, 2019). Therefore, the stakeholders' environmental interests would compel the organisation to be vested in providing the stakeholders with financial benefits and achieving environmental sustainability. Organisations are therefore responsible for meeting their stakeholders' needs through comprehensive and transparent disclosure of their marine environmental responsibility activities in their integrated annual reports to ensure they maintain long-term environmental sustainability and good social relations with the society they operate in (legitimacy) (Rahmayanti & Sari, 2023; Udo, 2019). This also supports stakeholder theory in that the more financial resources an organisation has, the more it can invest in environmental activities that will enhance the sustainability of its marine activities, which will improve its environmental performance (Alsayegh et al., 2020).

Lastly, the firm age (mean: 62.50 and standard deviation: 39.35) indicates that the organisations evaluated have varying years of existence. The organisation's age influences its initiatives on how it interacts with its marine ecosystem, which is influenced by its resources and the activities it can implement to enhance its blue accounting practices. Furthermore, old organisations are likely to have established environmental practices and stable environmental performance. However, young organisations can innovate and seek to improve their blue accounting practices and environmental performance. This supports prior findings (Ardito & Dangelico, 2018; Cheng et al., 2024) and also signalling theory, as older organisations showcase their consistent, stable, and environmentally sustainable practices through environmental disclosures (Chijoke-Mgbame & Mgbame, 2018; Rahim, 2021). Their commitment to environmental stewardship greatly appeals to stakeholders who value reliability. In contrast, younger organisations adopt innovative blue accounting practices to

demonstrate their good standing and attract stakeholders who prioritise forward-looking environmental responsibility (Andries & Stephan, 2019).

In summary, the results of the analysis reflected a mean of 2.83 for the regulatory framework, 3.66 for obligations, 4.44 for reporting guidelines, 2.59 for value-added, 2.49 for environmental reporting cost, 2.50 for environmental policy, 3.01 for waste, 2.61 for effluents, and 2.87 for marine quality. These results were interpreted considering the criteria used to measure the blue accounting disclosures organisations made; a score of 3 indicates that moderate information was provided to some extent, and a score of 4 signifies strong information was provided to a significant extent. Therefore, considering the above, a mean of 4.44 for reporting guidelines means sufficient disclosures were provided. A mean of 3.01 for waste disclosure and 3.66 for obligations means that average disclosure was made in the maritime organisations' integrated and sustainability reports. The rest of the disclosures are not far off the score of 3, so, to some extent, an average amount of disclosure was provided for the regulatory framework, value add, environmental reporting cost, environmental policy, effluents, and marine water quality.

Focusing on the variables with a mean of 3 and above, the minimum and maximum values for the reporting guidelines are 3 and 5, respectively, reflecting that of all the organisations evaluated, none was awarded a score of 2 or below. The minimum for obligations was 1, with a maximum of 5, indicating that some organisations failed to disclose information about environmental fines, penalties, or obligations. Lastly, waste, a minimum of 2 and a maximum of 4 indicates that all the evaluated companies at least provided some information disclosing their waste management.

Accordingly, the standard deviations for obligations are 1.01, 0.58 for reporting guidelines and 0.81 for waste. Furthermore, the mean for firm years is 62 years, indicating that the marine organisations have been in business for some time, which would imply that the organisations see a need to provide environmental disclosures as a means of winning the favour of the stakeholders and communities they are operating in, as alluded to by legitimacy theory, to increase their performance and economic value over time.

Overall, the standard deviation reflected that obligations (1.01), effluents (0.98), waste (0.81), marine water quality (0.96), and firm size (LogAssets) (0.89) have higher standard deviations than the other variables. This indicates much variability among the sampled companies for

these variables. However, for the lower standard deviation variables, i.e. regulatory framework (0.78), reporting guidelines (0.58), value add (0.69), environmental reporting costs (0.78), and the environmental policy (0.78), there is less variability, thus reflecting that most of the companies within the sample are disclosing these aspects in a moderately consistent manner.

Therefore, the standard deviation of the reporting guideline variable is closer to 0, indicating that the mean value is reliable with less volatility. Obligations have the highest standard deviation, followed by effluents and waste, reflecting a low contribution to the study, whereas the reporting guidelines, value add, environmental policy, regulations, and environmental reporting costs have low standard deviations, possibly indicating a significant contribution to the study.

The findings indicate that firm size, environmental reporting costs, and adherence to reporting guidelines positively influence environmental performance, but environmental obligations and firm age negatively affect it. The study's alignment with theories like signalling, stakeholder, and legitimacy theories highlights the motivations behind these effects.

4.3.2.2 Correlation Matrix

The correlation matrix shows relationships between variables, with VIF results confirming minimal multicollinearity. The analysis shows which blue accounting disclosures most significantly influence environmental performance. To verify the independence of each variable in the model, we conducted a correlation analysis and multicollinearity test. The correlation matrix reflects the correlation coefficients between variables, and this correlation is reflected by the absolute value of the coefficients and the direction of the relation (positive or negative) (Armstrong, 2019; Baalouch et al., 2019; Patil & Franken, 2022; Phaswana, 2018). Therefore, the correlation matrix was used to determine the multicollinearity between the independent variables (Nakeng, 2019). This will be assessed for all the blue accounting variables in relation to each other and the organisation's environmental performance.

4.3.2.3 Multicollinearity Test

The multicollinearity test is a helpful tool that can recognise the correlation between the variables in a model without affecting the reliability and predictability of the model (Senthilnathan, 2019; Shrestha, 2020; Singh & Kumar, 2021). In the context of regression analysis, this investigates line relationships between the independent variables (Kim, 2019;

Shrestha, 2020). This relationship between the variables was quantified using a regression model (Kalnins, 2018; Shrestha, 2020; Singh & Kumar, 2021).

In some studies, where the probability (p) values of independent variables were more than 0,005, which meant that the correlation coefficient (r) was equal to zero and had no effect, such variables were nevertheless considered (Obilor & Amadi, 2018; Singh & Kumar, 2021). In most instances, a high coefficient of determination (R^2) and significant p values (<0.05) are not achieved when there is a strong correlation between the independent variables under consideration (Kalnins, 2018; Singh & Kumar, 2021).

As a general principle, when the coefficient of determination (R^2) is greater than 0.7 (a typically used rule of thumb), the chosen model independent variables can explain at least 70% of the variation in the dependent variable and if the value is greater than 0.8 or 0.9, and the model is considered to be very good as it provides a good explanation of the linear relationship between the dependent and independent variables (Armstrong, 2019; Gyimah et al., 2024; Hossine Sharif, 2019; Kalnins, 2018; Opuni-Frimpong et al., 2024; Pandiangan et al., 2021; Senthilnathan, 2019; Singh & Kumar, 2021). Ideally, the closer the (R^2) is to 100% (1), the stronger the influence of the independent variables on the dependent variables studied (Liana & Kaihatu, 2023; Sejake, 2021). Also, when the p values are less than 0,05, the independent variables are statistically significant, and the regression model can be considered to be good (Hadi et al., 2022; Kwak, 2023; Singh & Kumar, 2021). However, where the R^2 is less than 0.7, and p values are more than 0.05, then the causative variables are not significant and could not explain the variation in the dependent variable, which makes it necessary to define new variables or add more data or identify other linear relationships (Kwak, 2023; Singh & Kumar, 2021). However, the (R^2) may be good at more than 0.7, where the p values of the independent variables go above 0.05 and may turn out to be insignificant, which might be due to the presence of multicollinearity in the data (Obilor & Amadi, 2018; Singh & Kumar, 2021).

The presence of multicollinearity results in some of the variables being statistically insignificant, and it poses a risk of distorting the results of the study; hence, it suggested that this needs to be detected, and one of the methods to be used is the variance inflation factor (VIF) (Kim, 2019; Orazalin & Mahmood, 2020). The VIF assesses the degree of correlation among the independent variables in a regression analysis (Kim, 2019; Malekanyo, 2024). A VIF of one (1.00) shows that the independent variables are uncorrelated (Kim, 2019). As a general guideline (thumb rule), multicollinearity becomes problematic if the Variance Inflation

Factor (VIF) is 10 or greater (Epalanga, 2021; Orazalin & Mahmood, 2020). Therefore, the VIF test was employed in this study to assess the impact of multicollinearity among the independent variables. Table 7 displays the correlation between environmental performance and blue accounting disclosure variables.

Column 1 of Table 7 displays all the variables; Column 2 displays environmental performance (EP); Column 3 displays the regulatory framework (REG); Column 4 displays obligations (OBLI); Column 5 displays reporting guidelines (GUID); Column 6 displays value add (VA); Column 7 displays environmental reporting costs (ENVIR); Column 8 displays environmental marine policy (EMP); Column 9 displays waste management (WM). Column 10 displays effluent management (EM); Column 11 displays marine water quality (MWQ); Column 12 displays (Firm Size) and Column 13 displays firm age. Lastly, Column 14 displays the variance inflation factor.

Table 7: Correlational Analysis of Environmental Performance and Blue Accounting Disclosure Variable

	EP	REG	OBLI	GUID	VA	ENVIR	EMP	WM	EM	MWQ	FIRM SIZE	FIRM AGE	VIF
EP	1,00												
REG	-0,23	1,00											1.59
OBLI	0,22	0,22	1,00										2.00
GUID	0,56	0,04	0,56	1,00									2.15
VA	0,20	0,24	0,36	0,36	1,00								1.93
ENVIR	0,48	0,07	0,20	0,32	0,46	1,00							2.26
EMP	0,19	0,39	0,21	0,13	0,48	0,39	1,00						2.26
WM	0,22	0,17	0,38	0,33	0,32	0,22	0,33	1,00					3.48
EM	0,39	0,14	0,50	0,46	0,55	0,53	0,60	0,57	1,00				3.67
MWQ	0,47	0,07	0,46	0,36	0,44	0,55	0,55	0,58	0,76*	1,00			3.48
FIRM SIZE	0,79*	-	0,20	0,29	0,47	0,33	0,52	0,30	0,35	0,46	0,57	1,00	2.39
FIRM AGE	-0,03	-	0,01	-0,24	-0,17	0,31	0,42	0,15	0,04	0,04	0,08	0,29	1.91

Source: Adapted from eViews 14

* High correlation

Where: REG: Regulatory framework; OBLI: Obligations; GUID: Reporting Guidelines; VA: Value Add; ENVIR: Environmental reporting costs; EMP: Environmental Marine Policy; WM: Waste management; EM: Effluent management; MWQ: Marine Water Quality; FIRM SIZE: Firm Size (log of total assets); and FIRM AGE: age of the firm

Table 7 above highlights the correlation between environmental performance and the various independent variables (blue accounting disclosures). The results show no multicollinearity among the independent variables except for the two highly correlated variables (i.e., firm size and environmental performance, and marine water quality and effluent treatment). These results are discussed in depth below.

From the VIF results, the VIFs are below 10 for all the independent variables, indicating that multicollinearity is not an issue in this study (Epalanga, 2021; Mahmood et al., 2018). A Variance Inflation Factor (VIF) score over 10 indicates an alarming level of multicollinearity (Shrestha, 2020). Upon analysing the data in Table 7, it is evident that all the variables possess VIF values below the specified threshold of 10. Furthermore, multicollinearity is absent if the VIF value is less than 10 (Gokmen et al., 2022). Thus, the results are acceptable, and the model was considered good and without possible distortion due to multicollinearity.

The Impact of Blue Accounting Disclosures on Environmental Performance

The environmental performance of organisations seems to be positively correlated with firm size (LogAssets), as reflected by the correlation of 0.79, thus highlighting that the larger the organisation is (as reflected by its asset base), the better its environmental performance is. These results are consistent with the conclusions of previous studies, where the size of the organisation was noted to have a direct positive effect on environmental disclosures and, ultimately, the organisation's environmental performance, as the organisation has the necessary resources to improve its environmental performance and maintain its legitimacy to its broader stakeholders (Antara et al., 2020; Fianko et al., 2021; Hidayah et al., 2022). However, contrary results were obtained in some studies where the results reflected that the relationship between these variables is insignificant (Agyemang et al., 2024; Gölgeci et al., 2019; Haque & Ntim, 2018; Yusoff et al., 2018).

The results also highlight that effluents and marine water quality have a correlation of 0.76, which shows a strong and significant positive correlation between marine water quality and effluents (i.e. these have a high correlation). This emphasises that as the organisation's practice in disposing of its effluents to the marine environment improves, so does the marine water quality. If it digresses, so will the environmental performance (i.e. they move in the same direction). These results are in agreement with a study that found that the measures the organisation has in place to prevent discharging effluents that pollute the water improves the

environmental performance of the organisation (Chen et al., 2022; Cheng et al., 2024; Rehman et al., 2022).

Furthermore, the environmental reporting costs are correlated with the marine water quality, effluent management, environment policy, and the value added from blue accounting, thus demonstrating that the environmental reporting costs incurred by the organisation investing in means to report on its blue accounting practices provide the organisation with information that can be used to ascertain the risks and opportunities presented by its blue accounting practices, which can add value to the organisation. This could enhance the quality of marine water affected by the organisation due to the information its reporting information systems would have provided, enabling the organisation to assess the results of its environmental policy and effluent discharge practices.

These results are supported by studies conducted which alluded to the fact that an organisation's environmental performance is positively affected when the organisation adopts environmental systems that allow it to accurately measure the negative and positive effects of its operations on the environment, as this enhances the adoption of its environmental policy and will enable the organisation to evaluate the risks and opportunities available to enhance its operations and prevent pollution (Agyapong et al., 2023; Alam et al., 2019; Elmagrhi et al., 2019; Kheireddine et al., 2023; Rasit et al., 2020; Ullah et al., 2022). This upholds stakeholder theory as the organisation's adoption of practices to protect marine water quality highlights its commitment to sustainable healthy practices and means to improve environmental performance (Haque & Ntim, 2018).

Furthermore, according to the legitimacy theory discussed in this study, organisations will invest in environmental reporting and incur the necessary reporting costs as they seem to use environmental reporting to manage their image by disclosing environmental information so that they are seen as responsible citizens by their stakeholders and society (Mgilane, 2023; Mukhtar et al., 2023). Hence, organisations focus on the integration of environmental reporting in their systems to achieve high compliance with societal norms, thus enhancing their legitimacy and sustainability performance (Alsayegh et al., 2020). These findings uphold the legitimacy theory in that an organisation's initiatives to integrate blue accounting into its reporting systems are likely to result in high compliance with the social demands and norms of its stakeholders, thus enhancing the organisation's legitimacy. These findings also align with

the assumption of signalling theory, namely that investors and other stakeholders are encouraged to invest more in the organisation when they see the reporting costs incurred to invest in reliable environmental reporting (Alam et al., 2019).

Additionally, the reporting guidelines organisations adopt for blue accounting disclosures positively influence the extent of their environmental performance, as reflected by the positive correlation of 0.56. This is consistent with the results obtained from the other studies, where the environmental disclosures positively affected the environmental performance of the organisation (Baalouch et al., 2019; Khatri & Kjærland, 2023; Omran et al., 2021; Soedjatmiko et al., 2021). Thus, as signalling theory states, organisations adopt the reporting guidelines to produce and publish high-quality and comprehensive environmental information to reduce information asymmetry, signal their environmental performance positively and further enhance their credibility with their stakeholders (Baalouch et al., 2019; Machmuddah & Wardhani, 2020). Furthermore, according to stakeholder and legitimacy theories, these guidelines enable improved accountability and transparency with respect of an organisation's stakeholders and mitigate the possible loss of credibility and the incurring of environmental obligations, thus enhancing the organisation's environmental performance (Alsayegh et al., 2020). However, other studies contradict these results, indicating that following sustainability reporting guidelines such as GRI does not enhance the environmental performance of an organisation as organisations tend to "bluewash", i.e. adopt the reporting guidelines as a means of impressing management and do not translate them into actual environmental performance; this discredits the notion that there is a positive relationship between these variables (Al-Shaer & Hussainey, 2022; Haque & Ntim, 2018; Sampong et al., 2018).

The environmental reporting costs (0.48) to organisations for their blue accounting environmental reporting system and processes show a positive correlation with the organisation's environmental performance; this is aligned with the results of the study which concluded that investment in an environmental management system and reporting costs incurred lead to better environmental performance (Erauskin-Tolosa et al., 2020; Haque & Ntim, 2018; Ifada & Saleh, 2022; Wu & Xu, 2024; Younis & Sundarakani, 2019). Signalling theory upholds these findings in that organisations with good environmental performance are willing to incur environmental costs as they deem the benefits outweigh the costs whereas poorly performing organisations are not willing to do so. However, contrary to these findings, organisations have been known to incur environmental reporting costs and invest in

environmental management systems to hide behind while covering up their wrongdoing instead of improving their blue accounting and environmental performance (Doan & Sassen, 2020; Ullah et al., 2022).

Also, the measures or practices adopted by an organisation that affect the quality of the marine resources or seawater (0.47) contribute positively to the organisation's environmental performance. This is supported by the results of the study, where the organisation's activities in treating wastewater and other waste and the way these impacts affect water quality are managed in an innovative way so that harm to the environment is minimised (Baalouch et al., 2019; Liu et al., 2023; Marchini et al., 2022).

Furthermore, an organisation's environmental policies (0.48) enhance the value add the organisation attains from evaluating its blue accounting practices with respect to its practices relating to effluent treatment and marine water quality. This is in agreement with the findings of a study that sound environmental policy reflects sound corporate governance, and these policies can positively contribute to an organisation's environmental performance (Haque & Ntim, 2018; Makhoulfi et al., 2022; Shahab et al., 2020; Wendling et al., 2022). These findings uphold stakeholder theory as the organisation's implementation of the value-add initiatives would improve the organisation's ability to evaluate its marine environmental practices in accordance with its policies and identify the related risks and opportunities. This would enable the organisation to align with its stakeholders' needs for sustainable and responsible environmental activities which would then influence the organisation's environmental performance (Singh et al., 2020). These results also uphold legitimacy theory as environmental policies allow organisations to follow guidelines on ensuring consistent environmental practices aligned with society's expectations of how organisations should be sustainable in their environmental activities (Haque & Ntim, 2018; Pittrakkos & Maroun, 2020). This explains the effect on organisations' environmental performance.

The results further suggest that the way an organisation treats its effluent and its ultimate effect on marine quality is anchored in its environmental policy. Furthermore, the organisation's adoption of environmental reporting guidelines enhances marine water quality and efficient treatment of wastes by the organisation as the guidelines would offer more guidance on how to sustainably discharge them in a manner that will not have an adverse effect on the marine water.

This would ultimately enhance the organisation's transparent and detailed disclosures of its obligations regarding its environmental practices and any fines or penalties incurred.

Lastly, regarding the matter of positive correlations, the organisation's practices in treating its effluents (0.39) to the ocean or marine environment positively contribute to its environmental performance. The results are in support of the study where the environmental performance of the organisation is positively affected by the organisation's engineered activities to reduce the number of polluting effluents that are disposed of during the organisation's activities (Li et al., 2018; Liu et al., 2023; Makhoulfi et al., 2022; Wu & Xu, 2024).

However, the results also show that there are negative correlations, with the regulatory framework (-0.23) reflecting a negative correlation with the environmental performance of the organisation, and this is in agreement with results from other studies (Adjanor-Doku et al.; Bounadi et al., 2022; Dey et al., 2018; Wu et al., 2020). Furthermore, it was evident from the reviewed integrated and sustainability reports that organisations do not disclose the environmental legislations they are complying with but instead contain a generic statement indicating that the organisation is complying or has complied "with all the relevant legislation and regulations", thus making it challenging to decipher which legislation they have complied with in their marine operations, which could have led to the results produced. However, contrary results to this study have been recorded where it was established that compliance with the environmental laws and regulations led to better environmental performance, thus indicating a positive correlation. The effectiveness of this positive contribution is dependent on the enforcement of the regulations, as poor enforcement has been noted to lead to poor results from this positive relationship (Elmagrhi et al., 2019; Nguyen et al., 2021; Ullah et al., 2022; Zhang et al., 2021).

Surprisingly, there is a weak negative correlation between firm years (-0.03) and environmental performance; irrespective of how long the organisation has been in operation, this does not affect its environmental performance. These results are contrary to the result reflecting a positive relationship between firm years (age) and environmental performance, with marginal significance (Makhoulfi et al., 2022; Zhang et al., 2022).

The results suggest that an organisation's size (LogAssets) plays a key role in blue accounting disclosures, with larger organisations demonstrating stronger environmental performance due

to their ability to adopt marine environmental practices compared to smaller ones. However, firm age does not significantly influence blue accounting disclosures challenging prior studies that suggest that older firms tend to have more developed sustainability practices.

Furthermore, the results show that if organisations improve their environmental reporting costs, marine quality practices and effluent management this improves their environmental performance. However, there is a poor correlation between environmental performance and regulations showing that the current legislative framework is not improving organisations' environmental performance. This is contrary to the literature reviewed. Also, blue accounting disclosures related to waste management could also improve organisations' environmental performance.

The environmental reporting costs and effluent discharge also reflect a positive correlation (0.55). This possibly highlights that as organisations incur various reporting costs, the environmental reporting processes enable them to employ better discharge practices as they are conversant with the negative effects of their effluents. These results are in agreement with findings indicating that the effluent discharge practices of an organisation amount to environmental protection measures employed by the organisation and, as such, improve the organisation's environmental performance (Baalouch et al., 2019; Camilleri, 2022; Ifada & Saleh, 2022; Wu & Xu, 2024). However, there are contrary results, suggesting that environmental reporting costs do not always translate into better discharge practices (Ardito & Dangelico, 2018). Having discussed multicollinearity, the next section proceeds to the panel regression results, which reveal the statistical significance of each variable concerning environmental performance.

4.3.3 Discussion of Panel Regression Results

The panel regression results reveal which blue accounting factors most significantly impact environmental performance. Key findings include the strong positive effects of firm size, environmental reporting costs, and reporting guidelines, while environmental obligations and firm age have negative impacts. The results below are an estimation of this relationship.

Table 8: Impact of Blue Accounting Disclosure on Environmental Performance

Total panel (balanced) observations: 70				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
REG	-1,27	1,92	-0,66	0,51
OBLI	-3,92	1,67	-2,35	0,02**
GUID	7,48	3,00	2,49	0,02**
VA	-0,22	2,38	-0,09	0,93 ^
ENVIR	6,35	2,30	2,76	0,01***
EMP	0,13	2,64	0,05	0,96 ^
WM	-0,91	1,98	-0,46	0,65
EM	-1,23	2,32	-0,53	0,60
MWQ	0,51	2,30	0,22	0,83 ^
FIRM SIZE	16,07	2,06	7,80	0,00***
FIRM AGE	-0,18	0,04	-4,22	0,00***
C	-39,89	11,71	-3,41	0,00
R-squared	0,78	Mean dependent var		53,33
Adjusted R-squared	0,74	S.D. dependent var		19,47
S.E. of regression	9,86	Akaike info criterion		7,57
Sum squared resid	5643,17	Schwarz criterion		7,96
Log likelihood	-252,97	Hannan-Quinn criterion		7,72
F-statistic	19,18	Durbin-Watson stat		1,03
Prob(F-statistic)	0,00			

Source: Adapted from eViews 14

(significance: *** p<0.01, ** p<0.05, * p<0.1)

^ p-value >0.10, insignificant.

Based on the results, at least 78% of the variance in environmental performance was explained by the independent variables that have been explored for blue accounting disclosures. Therefore, this emphasises that the model applied is statistically significant, while 22% is

explained by other variables that have not been included in the model applied. Furthermore, 0.74 can be assigned for the number of predictors in the applied model.

Examining the significant variables, which are the variables with a probability of less than 0.05, indicated that firm size (log asset) (coefficient 16.07 and probability: 0.00), has a strong positive effect on the environmental performance of an organisation, which is in congruence with the positive correlation that has been identified in prior studies (Antara et al., 2020; Makhoulfi et al., 2022; Younis & Sundarakani, 2019). This confirms that the larger the organisation, the better its environmental performance. This finding also upholds the legitimacy and stakeholder theory assumption that blue accounting can improve the environmental performance of large companies, as the large companies would opt to improve their performance by undertaking blue accounting activities due to the high societal pressure they are exposed to.

Secondly, environmental reporting costs showed a coefficient of 6.35 and a probability of 0.01, thus reflecting the strong positive effect of an organisation's environmental reporting systems on its environmental performance. This is consistent with results which reflected that the environmental reporting costs of an organisation, which are usually reflected through the environmental management systems the organisation adopts, are positively associated with the organisation's environmental performance (Erauskin-Tolosa et al., 2020; Haque & Ntim, 2018; Nkundabanyanga et al., 2021). These are other studies that support these findings (Ardito & Dangelico, 2018; Gerged et al., 2024; Yusoff et al., 2018).

Reporting guidelines with a coefficient of 7.48 and a probability of 0.02 highlight the strong positive effect that complying with the sustainability reporting guidelines for blue accounting disclosures enhances an organisation's environmental performance.

However, some of the variables reflect a negative effect, with environmental obligations having a co-efficient of -3.92 and a probability of 0.02, highlighting that the disclosure of the environmental obligations the organisation has incurred adversely affects its environmental performance. These results agree with the results of the study, in which it was concluded that obligations in the form of penalties or obligations lower the organisation's environmental performance (Gerged et al., 2024; Sun et al., 2024; Tadros & Magnan, 2019; Wu et al., 2020). In light of these findings, legitimacy and stakeholder theories establish the reasons for such in that organisations will tend not to disclose their environmental obligations (non-compliance

with environmental regulations) and rather opt to disclose more proprietary information to conceal and negate the negative impacts of their non-compliance on their environmental performance. Signalling theory also highlights that due to the adverse effect of disclosing non-compliance and the obligations the organisation has incurred for its environmental performance, it would not disclose its negative actions so as to signal better environmental performance.

Also, the firm years (co-efficient of -0.18 and probability, 0.00) highlight that there is an inverse effect, i.e. the longer the firm has been in existence, the more likely it is to show lower environmental performance than a younger organisation. This is contrary to the results, which reflected that firm years or age is not related to the organisation's environmental performance (Ardito & Dangelico, 2018; Cheng et al., 2024; Gölgeci et al., 2019; Younis & Sundarakani, 2019). There are further contrary results to be found in the literature, results reflecting a positive relationship between these variables, indicating that older companies pay more attention to environmental issues and devise means to increase their environmental performance progressively; this positive relationship has been noted to be significant in some of these studies (Bounadi et al., 2022; Makhouloufi et al., 2022; Nkundabanyanga et al., 2021; Sarfraz et al., 2020; Setiawan et al., 2021). A positive relationship has also been found between the firm's age and its environmental sustainability and environmental performance (Ma et al., 2019; Okafor et al., 2021).

The regulatory framework (co-efficient: -1.27 and p: 0.51) is not statistically significant based on the significance levels adopted for the study. Therefore, according to this model and the data analysed, the regulatory framework adopted by the marine organisations does not provide strong evidence that it has a meaningful relationship and effect on the organisation's environmental performance. This aligns with findings that there is uncertainty about the effect environmental laws and regulations have on the organisation's environmental performance (Haque & Ntim, 2018; Iraldo et al., 2011). However, some studies found contrary results, showing positive results that suggested that the laws and regulations enforced by the government enable prompt adherence to the environmental legislation and regulations and that, in the absence of pressure and demands from the various stakeholders, including the government, organisations may not necessarily adopt environmental reporting (Hassan et al., 2021; Mgilane et al., 2023). Thus, the contrary results are aligned with legitimacy theory as non-compliance with these regulations could damage the reputation of an organisation,

especially with those stakeholders with a great interest in and concern for environmental practices. This would threaten the legitimacy of marine organisations and negatively affect the organisations' environmental performance (Maama & Mkhize, 2020).

Value add (co-efficient: -0.22 and p: 0.93) is not statistically significant based on the significance levels adopted for the study. Therefore, according to this model and the data analysed, the risks, opportunities, and sustainability information an organisation obtains from blue accounting disclosures do not provide strong evidence that they have a meaningful relationship with and effect on the organisation's environmental performance. As blue accounting is a fairly new concept, several factors have been evaluated as contributing towards marine organisations' environmental performance; however, the value add variable has not been highlighted as having an effect on environmental performance (Wang et al., 2023). These findings uphold stakeholder theory as organisations' implementation of the value-add initiatives would improve their ability to evaluate their marine environmental practices and identify the related risks and opportunities. This would enable organisations to align with their stakeholders' needs for sustainable and responsible environmental activities, which would then influence those organisations' environmental performance (Singh et al., 2020).

Environmental policies (co-efficient: 0.13 and p: 0.96) are not statistically significant based on the significance levels adopted for the study. Therefore, according to this model and the data analysed, organisations' environmental policies do not provide strong evidence that they have a meaningful relationship with and effect on their environmental performance. This is supported by findings from a study that highlighted that further research needs to be conducted to evaluate how policies influence or affect environmental performance aimed at addressing environmental management and performance (Wendling et al., 2022).

Effluent management (co-efficient: -1.23 and p: 0.60) is not statistically significant. Therefore, according to this model and the data analysed, the effluent treatment by the organisation does not provide strong evidence that it has a meaningful relationship with and effect on its environmental performance. This is in support of the results of a prior study, which identified that the environmental effects of some of the effluents need to be studied further to obtain conclusive results on the effect on environmental performance (Gallego et al., 2008; Mearns et al., 2020).

Waste treatment (co-efficient: -0.91 and p: 0.65) is negative and insignificant. Therefore, according to this model and the data analysed, the waste treatment measures by the organisation do not provide strong evidence that they have a meaningful relationship with and effect on the organisation's environmental performance. This is in line with the study, which highlighted that the waste treatment of material, including waste products such as plastics, has not been found to have a significant impact on the organisation's environmental performance (Phan & Baird, 2015; Schmidt et al., 2020).

Marine water quality (co-efficient: 0.51 and p: 0.83) is not statistically significant based on the significance levels adopted for the study. Therefore, according to this model and the data analysed, marine water quality measures by the organisation do not provide strong evidence that they have a meaningful relationship with and effect on the organisation's environmental performance. This is in support of a study of the effect of the quality of marine water on environmental performance due to the complex nature of the marine ecosystem (Chng et al., 2022). After a thorough analysis of the results, the chapter concludes with reflections on the overall findings and their implications for blue accounting disclosure and environmental performance.

4.4 Chapter Reflections and Conclusion

This chapter analysed and discussed the scoping review and content analysis results. The scoping review for Objective 1 revealed stakeholder pressure due to the information needs and the organisation's desire to be in alignment with the UN Sustainable Development Goals encourages blue accounting adoption. Also, the organisation's ocean governance and desire to have an effective accounting system to identify the positive and negative effects of its operations on the marine ecosystem also encourage blue accounting adoption. However, the lack of knowledge about blue accounting, the lack of a standardised blue accounting framework and consistent regulatory enforcement hinder blue accounting adoption.

For Objective 2, findings from the content and regression analysis confirmed that blue accounting disclosures have a significant effect on environmental performance among JSE-listed South African ocean-based companies. The findings highlighted the positive effect of reporting costs, indicating that investment in environmental reporting systems enhances an organisation's environmental performance by providing insights for operational improvements and environmental sustainability. Larger firms demonstrate higher environmental performance

due to greater resource availability for sustainable practices. Furthermore, implementing reporting guidelines evidenced by adopting frameworks such as the GRI positively impacts environmental performance by guiding sustainable practices, enhancing overall ESG reporting, and aligning with stakeholder and legitimacy theories.

However, the negative impact of environmental obligations, such as fines and penalties associated with non-compliance, reduces environmental performance. Finally, the findings reflected that younger firms are generally more responsive to blue accounting practices than older firms. This research contributes to understanding blue accounting's role in environmental performance, filling a gap in the literature concerning South African JSE-listed ocean-based organisations.

This study was conducted on the maritime companies listed on the JSE; it did not replicate an existing study and was conducted over five years. The study adds to the developing literature on blue accounting and environmental performance, and considers the progressive degradation of natural resources, the ocean, and its ecosystem.

The chapter began with an introduction and discussed the descriptive statistics and results from the scoping review for Objective 1 concerning identifying factors influencing blue accounting practices. This was followed by a content analysis of blue accounting disclosures and how these influence the environmental performance of marine-based companies. A correlation analysis was applied to the quantitative content analysis results to provide insights into the relationship between blue accounting variables and environmental performance. Finally, the pooled OLS regression analysis results were applied to investigate the effects of the independent variables on environmental performance. The chapter concluded with a discussion of the findings and their implications. The following chapter synthesises the study's findings, discusses limitations, and offers recommendations for future research studies.

CHAPTER 5: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The study aimed to provide insights into the factors that influence marine-based organisations to adopt blue accounting disclosures and further assess the significant effect of blue accounting on JSE-listed organisations' environmental performance.

This chapter presents a comprehensive summary of the study findings, emphasising the objectives and the key insights gained on factors influencing blue accounting disclosures. The chapter concludes with recommendations for industry and policy improvement, a reflection on study limitations, and suggestions for further research to deepen understanding and address identified gaps.

5.2 Summary of the Results

The introduction and background to the study were outlined. This was followed by a discussion on the evolution of corporate reporting from being mainly financial data-based to the present emphasis on non-financial data disclosure, with a growing focus on social and environmental disclosures. This led to a further discussion of environmental reporting, including blue accounting, a form of environmental reporting specifically for marine-sensitive organisations. However, this developing area of environmental reporting/disclosure has undergone limited research in the marine sphere. As a result, there is limited information on how marine-sensitive organisations should account for the way their operations interact with the marine ecosystem and the extent to which such interaction is sustainable. This was explored within the context of South African JSE-listed companies. The gaps in the existing literature were identified, the problem statement was presented, and the research objectives and questions were presented. Furthermore, the scope of the study and the methodology to be applied were outlined.

The study further delved into a discussion of the theoretical and empirical literature concerning the current related literature, which was examined to determine the extent of the limited literature and the gap the study can seek to provide some information about. Thus, necessitating a determination of what blue accounting is and what influences the organisation to adopt blue accounting. Furthermore, seeing that South Africa's JSE-listed organisations have organisations that are interacting with the marine ecosystem in their operations, an

investigation was done into how they are disclosing, if any, their blue accounting practices and to what extent these are significantly influencing their environmental performance.

Of the various available theoretical frameworks, the signalling, stakeholder, and legitimacy theories were chosen to underpin the study, as these theories highlight the power of stakeholders and the pressure, they can exert on marine organisations to influence them to adopt blue accounting as a means of legitimising their operations. Additionally, organisations would be able to effectively use blue accounting disclosures to reduce the information asymmetry that tends to exist between an organisation and its stakeholders, especially concerning the voluntary nature of environmental information, including blue accounting practices. Therefore, blue accounting disclosures might signal transparency and accountability to stakeholders, who might improve organisations' environmental performance over time.

Even in an era when environmental disclosure is becoming increasingly important, there is still limited knowledge about the environmental disclosure of marine-sensitive organisations regarding how they interact with the ocean. Hence, the need to conduct this study in this area. This limited knowledge is partly attributed to the lack of a blue accounting framework or uniform and consistent reporting guidelines the organisations could follow to provide more relevant disclosures to stakeholders. This limited or non-existent regulatory guidance has limited organisations' knowledge of how to account for their marine interaction and how to accumulate, disclose, and interpret such information.

5.2.1 For Objective 1: To identify factors that influence the organisation's adoption of blue accounting disclosure, the following findings were noted:

The primary driver for adopting blue accounting is stakeholders (e.g., investors, the public), who demand transparency in environmental impacts, which aligns with stakeholder theory. Furthermore, marine organisations are more likely to adopt blue accounting when they see value in the data it provides, such as insights for improving operations and aligning with climate and sustainability goals. The absence of a standardised blue accounting framework and inconsistent regulatory enforcement hinder widespread blue accounting adoption, thus leading to variability and gaps in disclosure practices.

5.2.2 For Objective 2: To test whether blue accounting has a significant effect on the environmental performance of South African maritime companies listed on the Johannesburg Stock Exchange, the following findings were noted:

The environmental reporting cost incurred by an organisation positively affects its environmental performance as it offers insights for sustainable marine improvements, consistent with signalling theory. A positive significant correlation between firm size and the environment was also noted, emphasising that larger organisations exhibit higher environmental performance due to greater resources available for blue accounting practices. In addition, adopting sustainability reporting guidelines like GRI positively impacts environmental performance by providing a structured framework for disclosures, which supports legitimacy and stakeholder theory.

Environmental obligations such as fines and penalties for non-compliance negatively affect environmental performance, emphasising how regulatory breaches result in financial and reputational costs. Firm age was shown to have an inverse relationship with environmental performance, suggesting that younger firms generally perform better environmentally, probably due to their adaptability and openness to innovation, compared to older firms that may adhere to traditional practices. These results are tabled in Table 9. Column 1 of Table 9 reflects the research objective 2 description and Column 2 reflects the results for the objective.

Table 9: Objective 2 Summary of the results

Research Objective 2	Results
To test whether blue accounting has a significant effect on the environmental performance of South African maritime companies listed on the Johannesburg Stock Exchange.	<p>Firm size has a significant positive effect on an organisation's environmental performance.</p> <p>Environmental reporting costs have a significant positive effect on organisations' environmental performance.</p>

Research Objective 2	Results
	<p>The sustainability reporting guidelines significantly positively affect organisations' environmental performance.</p> <p>Environmental obligations have a negative effect on organisations' environmental performance.</p> <p>An organisation's firm age also has an inverse or negative effect on the organisation's environmental performance.</p>

Source: Own compilation

This summary provides context for the study's key conclusions, which are discussed in the next section.

5.3 Conclusions on Objectives

This section addresses the research problem, which aimed to identify the factors influencing the adoption of blue accounting and its implications for environmental performance. It also answers the research questions, which sought to explore the relationship between blue accounting disclosures and environmental performance and to identify the factors that either hinder or facilitate blue accounting adoption. The insights gained from data analysis form the basis for these conclusions.

The qualitative scoping review of various publications identified deeper insights into factors influencing blue accounting adoption. In addition, quantitative content analysis and regression analysis of JSE-listed marine-sensitive annual integrated reports provided information about organisations' blue accounting practices and how these influence those organisations' environmental performance. The research questions were specifically designed to align with the study's objectives, and this section concludes by summarising the findings in relation to those objectives.

5.3.1 Conclusions on the findings for Factors that Influence the organisation's Adoption of Blue Accounting Disclosure

The first research objective was: *To identify factors that influence the organisation's adoption of blue accounting disclosure.*

The findings reveal that while blue accounting is still developing, it has gained noticeable traction over recent years, with 2023 marking a high point in academic publications. Several factors regarding blue accounting adoption emerged from the literature, namely the influence of stakeholders, particularly investors, who play a central role by demanding transparency regarding marine-related environmental impacts. This finding aligns with stakeholder theory, as organisations are motivated to meet these demands to maintain legitimacy and avoid reputational risks. In addition, commitment to environmental sustainability, climate change mitigation, and contributing to global initiatives like SDG 14 (Life Below Water) incentivises organisations to adopt blue accounting as a method to showcase their environmental responsibility. Adopting blue accounting gives organisations a strategic advantage by enhancing their reputation as responsible corporate citizens. This positioning attracts environmentally conscious investors and partners, aligning environmental stewardship with competitive business practices. All these contribute to the acceleration of blue accounting adoption.

However, significant barriers to adoption were also noted, such as the absence of a standardised framework, leading to inconsistent reporting practices. In addition, marine organisations lack expertise or fail to perceive the value of blue accounting, which impacts their willingness to invest in environmental reporting systems that enable blue accounting disclosures. Furthermore, the lack of regulatory enforcement limits the widespread adoption of blue accounting, as companies are less motivated to disclose marine-related environmental data voluntarily. Geographically, the review revealed a concentration of studies in Indonesia and Africa, underscoring a research gap and the need for studies in other regions with substantial marine economies, such as South Africa, China, and Pakistan.

These findings uphold multiple theoretical perspectives, including stakeholder theory, highlighting stakeholder influence as the main driver of transparency and accountability in environmental reporting. Signalling theory emphasises that blue accounting disclosures are a positive signal to stakeholders, reducing information asymmetry and enhancing trust.

In conclusion, the factors influencing blue accounting adoption reflect both opportunities and challenges. Stakeholder demands, climate action, and competitive positioning drive adoption, while the lack of a standard framework and regulatory support presents significant barriers. This study contributes to the literature by identifying these factors and underscoring the need for a standardised framework, regulatory enforcement, and expanded geographical research to support the consistent growth and development of blue accounting practices globally.

5.3.2 Conclusions on The Findings In Respect Of Whether Blue Accounting Has A Significant Effect On The Environmental Performance Of South African Ocean-Based Companies Listed On The Johannesburg Stock Exchange

The second research objective was: *To test whether blue accounting has a significant effect on the environmental performance of South African maritime companies listed on the Johannesburg Stock Exchange*

Based on the findings from descriptive and regression analyses, several key insights have emerged regarding how various blue accounting factors influence environmental performance:

Firm size has a significant positive effect on environmental performance, highlighting that larger organisations exhibit better environmental performance than smaller ones, probably due to more resources being available for environmental investments, which aligns with legitimacy and stakeholder theories. Larger organisations have greater stakeholder visibility, leading them to adopt sustainable practices to maintain legitimacy and fulfil stakeholder expectations.

Environmental reporting costs also positively influence an organisation's environmental performance, highlighting that investing in environmental reporting systems positively influences environmental performance. Such costs allow organisations to track, analyse, and disclose their environmental impact more accurately. This finding is consistent with signalling theory, as the investment in these systems signals the organisation's commitment to environmental stewardship to stakeholders.

Adopting reporting guidelines also improves an organisation's environmental performance, as compliance with international reporting guidelines, such as the Global Reporting Initiative (GRI), positively impacts environmental performance. The absence of a formal blue accounting

framework makes these guidelines valuable for South African maritime companies that are attempting to establish credible and comparable disclosures. This supports stakeholder theory, which states that adopting widely recognised standards enhances transparency and accountability.

However, environmental obligations were found to have a negative effect on environmental performance. Organisations incurring environmental commitments, such as fines and penalties, demonstrate lower environmental performance, reflecting non-compliance with regulatory standards. This outcome supports legitimacy theory, as organisations with environmental violations find it difficult to maintain credibility and positive relations with stakeholders.

There is also an inverse relationship between firm age and environmental performance, highlighting that older firms are less likely to show strong environmental performance than younger firms, which are often more innovative and willing to adopt sustainable practices. Younger firms are more likely to respond to changing environmental expectations, which aligns with signalling theory; younger firms seek to attract stakeholder trust by signalling their commitment to sustainability.

The study found no significant correlation between the existing regulatory framework and environmental performance, suggesting that current regulations may lack effective enforcement. This implies that regulatory improvements and enhanced compliance measures could be needed to drive better environmental outcomes among maritime companies.

Variables like value add, internal environmental policies, waste treatment, and effluent management were not found to have a significant effect on environmental performance. These findings suggest that although these practices may contribute incrementally to performance, they may not be primary drivers without more comprehensive support systems or standards.

5.3.3 Implications and Contributions

The quantitative findings highlight the need to invest in environmental reporting systems and adopt standardised blue accounting practices from renowned reporting guidelines to enhance environmental performance in South African maritime organisations. The results of the study reinforce the theoretical perspectives of stakeholder, legitimacy, and signalling theories, emphasising that transparency and accountability in environmental disclosures can drive better environmental performance. By illustrating the significant impact of firm size, reporting costs,

and guideline adherence, this research contributes to the evolving literature on blue accounting, especially within the context of developing countries.

5.4 Recommendations

Based on the study's findings, several actionable recommendations are provided for marine-sensitive organisations, stakeholders, and policymakers. Marine-based organisations should adopt blue accounting to enhance transparency in reporting on their marine activities and possibly gain a competitive advantage. For this to be possible, the companies must implement acceptable and recognised sustainability reporting guidelines such as ISO, CDP and GRI and invest in environmental reporting systems that are aligned with these guidelines. Lastly, these organisations must maintain continuous stakeholder engagement and communication by providing blue accounting disclosures to close expectation gaps and ensure that stakeholders are provided with such information.

Regulators and policymakers should develop a structured framework for blue accounting implementation to provide clear and consistent guidelines for these disclosures and enhance comparability and uniformity in making these disclosures. As the organisations are likely to continue interacting with the marine ecosystem, a framework is necessary to strengthen sustainable marine resource management. Governments, including the South African government, would need to devise means to ensure strict enforcement of marine-related regulations and impose significant penalties, fines, or loss of operating licences for failing to adhere to the marine legislation and regulatory requirements. The government could also incentivise organisations to practise marine sustainability actively and continuously through taxation relief, subsidies, or grants, thus accelerating blue accounting adoption.

In line with stakeholder theory, the marine-sensitive companies' investors and primary stakeholders could leverage their influence to accelerate the adoption of blue accounting by demanding that companies disclose the environmental effect of their activities as part of their accountability to their stakeholders. Stakeholders could also increase emphasis on key performance indicators that are environmentally performance-centred when seeking to invest in organisations, with the result that organisations with effective blue accounting practices would experience a competitive advantage.

For the preparers of the corporate reports, this will necessitate the sourcing of reporting systems that have been developed to allow integration with sustainability principles such as ISO, GRI CDP etc., to produce high-quality disclosures and ultimately meet the environmental reporting needs of the organisation and stakeholders. Lastly, the preparers of the corporate reports might need to work closely with stakeholders to identify gaps and continue improving their corporate reporting to ensure they adequately meet stakeholders' needs and regulatory demands.

Thus, the growing pressure on these marine natural resources in terms of sustainability and effective management is becoming even more important. While these recommendations provide actionable steps, it is essential to acknowledge the study's limitations in order to contextualise its findings.

5.5 The Study's Contribution to the Existing Body of Knowledge in the Field

This section outlines the study's contributions to the existing literature in this field, encompassing its theoretical advancements in stakeholder theory, methodological innovations through the chosen research approach, and practical recommendations relevant to ocean-based businesses.

This research study provides the perspective of stakeholder theory for ocean-based organisations by illustrating how this theory supports the adoption of blue accounting. This shows how stakeholder pressure can encourage transparency regarding the environmental impact of the organisation's marine activities. This, therefore, adds another perspective on how accountability can drive sustainable practices in marine ecosystems.

While sustainability accounting is widely researched, blue accounting remains an emerging concept, particularly within marine-sensitive industries. This study enriches the theoretical framework surrounding sustainability in marine contexts by presenting blue accounting as a structured method for organisations to disclose their environmental impact. This approach broadens the environmental accounting field by focusing on the unique challenges and responsibilities of ocean-based organisations, an area that has received limited attention to date.

The study offers actionable insights for policymakers and regulators, such as incentive structures and compliance measures, which could drive the adoption of blue accounting practices. These recommendations provide a foundation for future policy-making efforts

toward marine conservation and sustainable resource management, especially in regions like South Africa, where critical marine ecosystems are found.

Another contribution of this research is its emphasis on blue accounting within the context of a developing country, thereby addressing an important gap in the existing body of literature. The study responds to calls for further research by exploring this under-researched area. It provides insights into factors influencing the adoption of blue accounting and its impact on the environmental performance of marine-sensitive organisations. Studies on blue accounting, sustainability, environmental disclosures, and environmental performance include those by authors such as (Abreu et al., 2017; Agyemang et al., 2021; Bednárová et al., 2019; Syah et al., 2020). The current study adds to the work of various studies on blue accounting and environmental performance by providing information about factors influencing blue accounting adoption and the effect that blue accounting has on JSE-listed marine organisations' environmental performance.

Finally, the study addressed the gap between corporate reporting and sustainability frameworks, which often lack comprehensive guidelines on marine organisations' environmental disclosures. By highlighting the need for standardised guidelines, this research highlights the significance of uniformity and consistency in the way marine-sensitive organisations report their interactions with marine ecosystems, laying the groundwork for future research and policy development.

5.6 Limitations and Suggestions for Further Study

This study investigated the factors that influence blue accounting and the effect blue accounting practices have on the environmental performance of JSE-listed marine-sensitive organisations. Hence, the study's findings were considered to be relevant and applicable only to marine-sensitive South African JSE-listed companies, limited to the disclosures made about their environmental factors. However, they may also hold true in other contexts, which warrants further investigation. The strength of the study lies in using a scoping review, allowing for a broad and comprehensive literature search for the factors influencing blue accounting disclosures. Through its purposive, convenient, and theoretical sampling methods, the study evaluated the blue accounting practices of JSE-listed companies, focusing on their impact on environmental performance. It also considered the reporting requirements for non-financial and environmental disclosures, ensuring the provision of robust blue accounting information. This approach strengthens the credibility and reliability of the findings. However, as with any

research, this study was not without its limitations. Organisations without operations in shipping and logistics, fishing, and the oil and gas and energy sectors were excluded. This research was conducted in English and thus might not be useful to other stakeholders who use different languages.

Future studies could perform an assessment to determine whether the organisations have the necessary competence for such reporting and if required, the necessary capacity to enhance the accuracy of the blue accounting disclosures. The level of assurance auditors can provide and whether such affects the reliance stakeholders place on the credibility and usefulness of these disclosures could also be explored. Additionally, a study could be conducted on how these disclosures could effectively be incorporated into the sustainability, ESG, and integrated reports. This would provide useful insights as these are the current reporting formats for non-financial information.

A further limitation was that the study focused on South African marine-sensitive companies listed on the JSE, excluding those not listed on the JSE. Therefore, an analysis could be conducted to assess this relationship for marine-sensitive companies not listed on the JSE, addressing the limitation posed by the survivorship bias. Furthermore, the study could be extended to other regions than those within the scope of Africa, such as the Caribbean, Australia, Pakistan, China, Indonesia, and certain other regions that make considerable use of their marine resources and are invested in the blue economy. The same study could also be conducted but using a different proxy or measurement for environmental performance than the Bloomberg environmental score.

A study could be conducted over a shorter period, perhaps the last three years, which may lead to a bigger sample size, and the results could throw further light on blue accounting adoption in the South African context and how this affects environmental performance. Furthermore, the relationship between blue accounting adoption and the organisation's environmental performance could be investigated using other research methods and regression models (e.g. fixed and random effects models). Lastly, the blue accounting effect on marine organisations' financial, social and governance performance could be measured.

This study contributes to the emerging literature on blue accounting, emphasising the critical role of stakeholder engagement, resource allocation, and regulatory support in shaping

environmental performance. The findings highlight a pressing need for standardised blue accounting frameworks and enhanced reporting systems to support marine-sensitive organisations. By integrating these recommendations and the results of continuing research, policymakers and organisations could better address the environmental impacts of marine activities and foster sustainable marine management.

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Appendix 1: Ethical Clearance



1 July 2024

Ms Ntombizandile Mbiza (222130134)
School Of Acc Economics&Fin
Westville

Dear Ms Ntombizandile Mbiza,

Original application number: 00025404

Project title: The effect of blue accounting on South African ocean-based companies' environmental performance: Evidence from Johannesburg Stock Exchange listed companies.

Exemption from Ethics Review

In response to your application received on 20 June 2024, your school has indicated that the protocol has been granted **EXEMPTION FROM ETHICS REVIEW**.

Any alteration/s to the exempted research protocol, e.g., Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through an amendment/modification prior to its implementation. The original exemption number must be cited.

For any changes that could result in potential risk, an ethics application including the proposed amendments must be submitted to the relevant UKZN Research Ethics Committee. The original exemption number must be cited.

In case you have further queries, please quote the above reference number.

PLEASE NOTE:

Research data should be securely stored in the discipline/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours sincerely,

Prof Claire Lauren Vermaak
Academic Leader Research
School Of Acc Economics&Fin

UKZN Research Ethics Office
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
Website: <http://research.ukzn.ac.za/Research-Ethics/>

Founding Campuses: Edgewood Howard College Medical School Pietermaritzburg Westville

INSPIRING GREATNESS

Appendix 2: Language Editor's Language Certificate

1

AA Mills (Sandra)

Translation and Editing Services

2024/11/21

This is to certify that I, Alexandra Anne Mills, a qualified and highly experienced academic editor and translator, have edited the dissertation by Ntombizandile Mbiza titled '**The effect of blue accounting on South African Ocean-Based company's environmental performance (Evidence from Johannesburg Stock Exchange listed companies)**'. I can certify that it is free of language errors provided that the changes I have recommended have been introduced.

A.A. Mills

Mobile: [REDACTED]

Email: [REDACTED]

Appendix 3: Turnitin Originality Report



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The first page of your submissions is displayed below.

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