

**An environmental management accounting information framework for greener
decision-making in the petroleum industry: The case of Nigeria**

By

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DECLARATION

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I, *Azeez Busayo Kehinde*, declare that: **An environmental management accounting information framework for greener decision-making in the petroleum industry: The case of Nigeria** is my own work and all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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DEDICATION

I dedicate this thesis to the God Almighty for His faithfulness and divine assistance.

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ABSTRACT

There has been an increase in environmental issues across national and international boundaries over the past few decades, with a long history in the Nigerian petroleum industry. The petroleum industry is among the leading industries with the highest environmental impacts, as its operations harm the environment. Although significant progress and efforts have been made to deal with various complex problems, environmental matters remain among Nigeria's most complex and pressing challenges. This research investigates whether the Nigerian National Petroleum Corporation (NNPC) management accounting system provides a valuable flow of environmental information required for greener decision-making and the effectiveness of environmental regulations and sustainability in the Nigerian petroleum industry. This research adds to the body of environmental management accounting (EMA) literature by incorporating institutional and contingency theories to provide the theoretical background of the study. A review of the existing literature identified existing frameworks and identified a gap: a lack of a clear framework that could ensure that decision-makers receive the appropriate environmental information necessary for greener decision-making. The research adopted a mixed method, in which qualitative and quantitative research techniques for data collection, namely, a literature review, a questionnaire, and a focus group, were used to validate the framework. It was established that monetary environmental information has a significant positive relationship with environmental information on decision-making, which means that the company's accounting system captures monetary environmental activity data. However, physical environmental information has a significant negative relationship with environmental information in decision-making. The research also revealed that environmental regulation inversely influences environmental information reporting. Therefore, the results and findings suggest the incorporation of governmental environmental policies and guidelines into a management accounting system to improve the quality of environmental information for decision-making. Input from the focus group assisted in enhancing and validating the framework. Key recommendations indicated that petroleum companies should adopt and implement the enhanced environmental management accounting practices (EMAPs) framework that integrates EMA and government regulatory tools to capture adequate environmental-related information needed for greener decision-making. Future

research could include a similar study to test the enhanced EMA information framework. The NNPC could serve as a case study to apply the framework in a real-life setting.

Keywords: Decision-making, Environmental Management Accounting, Environmental Management Accounting Information, Greener decision-making framework, Monetary Environmental Management Accounting, Nigerian National Petroleum Corporation, Petroleum Industry, Physical Environmental Management Accounting

KAKARETŠO

Go dutše go na le ditaba tšeo di golelago godimo go dikologa mellwane ya bosetšhaba le ya boditšhabatšhaba mo dipakeng tše mmalwa tša go feta, ka histori ya nako ye telele ka go intasteri ya petroleamo ka Nigeria. Intasteri ya petroleamo e gare ga diintasteri tša ketapele yeo e nago le khuetšo ya godimo go feta ka moka ya tikologo, ka ge mešomo ya yona e gobatša tikologo. Le ge go na le tšwelopele le maitapišo a bohlokwa tšeo di dirilwego go šogana le mathata a go raragana a go fapafapana, ditaba tša tikologo di dula e le tlhohlo ye e raraganego gape yeo e hlobaetša go feta ka moka ka Nigeria. Nyakišišo ye e nyakišiša ge e le gore lenaneo la maikarabelo a taolo la Tirišano ya Petroleamo ya Setšhaba ya (NNPC) le aba kelelo ya mohola ya tshedimošo ya tikologo yeo e nyakegago go tšea diphetho tše dikaone le go ba mohola ga melawana ya tikologo le ya go swarelela mo intastering ya petroleamo ka Nigeria. Nyakišišo e oketša dingwalwa tša mmele wa maikarabelo a taolo ya tikologo (EMA) ka go kopanya diteori tša institušene le tiragalo go fa botšo bja teori. Tshekatsheko ya dingwalwa tše di lego gona e utolla ditlhako tše di lego gona gomme ya utolla tšeo di tlogetšwego: go se be le tlhako yeo e ka kgonthišago go dira batšeadiphetho ba hwetša tshedimošo ya tikologo ya maleba yeo e hlokegago go tšea diphetho tše dibotse. Nyakišišo e šomiša mekgwa ye e kopanego, e lego dithekniki tša nyakišišo tša boleng le tša bontši go kgoboketša data, e lego, tshekatsheko ya dingwalwa, dipotšišo, le sehlopha sa nepišo, di šomišitšwe go kgonthiša tlhako. Go utollotšwe gore tshedimošo ya tikologo ye e laolwago e na le kamano ye botse ye kgolo le tshedimošo ya tikologo ka ga go tšea diphetho, seo se ra gore lenaneo la maikarabelo la khamphani le boloka data ya mošongwana wa tikologo ye e laolwago. Le ge go le bjalo, tshedimošo ya tikologo ya motheo e na le kamano ye mpe ye kgolo le tshedimošo ya tikologo go go tšea diphetho. Nyakišišo e utolla gape gore taolo ya tikologo e huetša ka go fapana tshedimošo ya tikologo ya go bega, Ka gona, dipoelo le dikutollo di akanya kopanyo ya dipholisi le ditlhahli tša tikologo tša mmušo go lenaneo la maikarabelo la taolo go kaonafatša boleng bja tshedimošo ya tikologo go tšea diphetho. Kgopolo go tšwa go sehlopha sa nepišo e thušitše go kaonafatša le go kgonthiša tlhako. Maele a motheo a bontšha gore dikhamphani tša petroleamo di swanetše go amogela le go šomiša tlhako ya ditirišo tša maikarabelo a taolo ya tikologo tše dikgolo (EMAPs) yeo e kopanyago EMA le didirišwa tša taolo tša mmušo go boloka tshedimošo ye e amanago le tikologo ye e lekanego go tšea diphetho tše

dibotse. Nyakišišo ye nngwe e ka akaretša thuto ya go swana le go leka tlhako ya tshedimošo ye e kaonafetšego. NNPC e ka šoma bjalo ka thuto ya go tlala go diriša tlhako mo tikologong ya bophelo bja nnete.

Mantšu a motheo: Go tšea diphetho, Maikarabelo a Taolo ya Tikologo, Tshedimošo ya Maikarabelo a Taolo ya Tikologo, Tirišano ya Petroleamo ya Setšhaba ya Nigeria, Intasteri ya Petroleamo, Maikarabelo a Taolo ya Tikologo ya Motheo

OPSOMMING

Daar is 'n toename in omgewingskwessies oor nasionale en internasionale grense heen die afgelope paar dekades, met 'n lang geskiedenis in die Nigeriese petroleumbedryf. Die petroleumbedryf is onder die voorste bedrywe met die hoogste omgewingsimpak, aangesien die bedrywighede daarvan die omgewing skade berokken. Hoewel beduidende vordering en pogings gemaak is om verskeie ingewikkelde probleme aan te roer, bly omgewingskwessies onder Nigerië se mees ingewikkelde en dringende uitdagings. Hierdie navorsing het ondersoek of die Nigeriese Nasionale Petroleumkorporasie (*Nigerian National Petroleum Corporation, NNPC*) se bestuursrekeningkundige stelsel 'n waardevolle inligtingstroom verskaf wat vereis word vir groener besluitneming en die doeltreffendheid van omgewingsregulasies en -volhoubaarheid in die Nigeriese petroleumbedryf. Hierdie navorsing dra by tot die literatuurkorpus van omgewingsbestuursrekeningkunde deur institusionele en gebeurlikheidsteorieë te inkorporeer om die teoretiese agtergrond van die studie te verskaf. 'n Oorsig van die bestaande literatuur het bestaande raamwerke en 'n gaping geïdentifiseer: 'n gebrek aan 'n duidelike raamwerk wat kan verseker dat besluitnemers die toepaslike omgewingsinligting verkry vir groener besluitneming. Die navorser het gebruik gemaak van 'n gemengde metode waarin kwalitatiewe en kwantitatiewe navorsingstegnieke vir die insameling van data, naamlik 'n literatuuroorsig, 'n vraelys en 'n fokusgroep, gebruik is om die geldigheid van die raamwerk te verklaar. Daar is vasgestel dat monetêre omgewingsinligting 'n beduidende positiewe verhouding het met omgewingsinligting oor besluitneming, wat beteken dat die maatskappy se rekeningkundige stelsel die monetêre omgewingsaktiwiteitsdata vaslê. Fisiese omgewingsinligting het egter 'n beduidende negatiewe verhouding met omgewingsinligting in besluitneming. Die navorsing het ook getoon dat omgewingsregulasie die teenoorgestelde uitwerking het op die verslaggewing van omgewingsinligting. Dus suggereer die resultate en bevindings die inkorporasie van omgewingsbeleide en -riglyne van regerings in 'n bestuursrekeningkundige stelsel om die kwaliteit van omgewingsinligting vir besluitneming te verbeter. Insette van die fokusgroep het gehelp om die raamwerk te versterk en geldig te verklaar. Sleutelaanbevelings het aangedui dat petroleummaatskappye die verbeterde raamwerk vir omgewingsbestuursrekeningkundige praktyke moet aanneem en implementeer wat omgewings-

bestuursrekeningkunde en reguleringshulpbronne van regerings integreer om genoegsame omgewingsverwante inligting vas te lê wat nodig is vir groener besluitneming. Toekomstige navorsing kan 'n soortgelyke studie insluit om die verbeterde omgewingsbestuursrekeningkundige inligtingsraamwerk te toets. Die Nigeriese Nasionale Petroleumkorporasie kan dien as 'n gevallestudie om die raamwerk in 'n werklike omgewing toe te pas.

Sleutelwoorde: Besluitneming; omgewingsbestuursrekeningkunde; omgewingsbestuursrekeningkundige inligting; groener besluitnemingsraamwerk; monetêre omgewingsbestuursrekeningkunde; Nigeriese Nasionale Petroleumkorporasie; petroleumbedryf; fisiese omgewingsbestuursrekeningkunde

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ABBREVIATIONS AND ACRONYMS

AEIF	-	Adequate Environmental Information Framework
DPR	-	Department of Petroleum Resources
EIA	-	Environmental Impact Assessment
EMA	-	Environmental Management Accounting
EMAI	-	Environmental Management Accounting Information
EMS	-	Environmental Management Strategy
EPA	-	Environmental Protection Agency
FEPA	-	Federal Environmental Protection Agency
GDP	-	Gross Domestic Product
IFAC	-	International Federation of Accountants
MA	-	Management Accounting
MAS	-	Management Accounting System
MEI	-	Monetary Environmental Information
MEMA	-	Monetary Environmental Management Accounting
MFCA	-	Material Flow Cost Accounting
NESREA	-	National Environmental Standards and Regulations Enforcement Agency
NNPC	-	Nigerian National Petroleum Corporation
NRC	-	National Resources Council
PEI	-	Physical Environmental Information
PEMA	-	Physical Environmental Management Accounting
PWC	-	Price Waterhouse Cooper
ROE	-	Report on the Environment
SMA	-	Social Management Accounting
SPSS	-	Statistical Package for Social Sciences
TMA	-	Traditional Management Accounting
UNIDO	-	United Nations Industrial Development Organisation
WTO	-	World Trade Organisation

CHAPTER 1: INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 INTRODUCTION

There has been an increase in environmental issues across national boundaries over the past few decades (World Trade Organisation [WTO], 2020), and the petroleum industry is among the leading industries with the highest environmental impacts, as the operations of the industry are harmful to the environment (Ismail, 2017). According to Ismail (2017), several major environmental events in the petroleum industry worldwide have revealed how significantly these activities impact the environment. The increasing impact of petroleum company operations on the environment has continued to pose a challenge, and this is due to the lack of a clear framework that could ensure that decision-makers are provided with adequate environmental information necessary for greener decision-making (Benson et al., 2021). Furthermore, a rise in environmental effects-related costs (Mazahrih, 2019) and the inability of traditional management accounting (TMA) to provide the information necessary to reduce costs and impacts prompted decision-makers to modify their current accounting procedures to provide environmental cost information for greener decision-making (Nzama et al., 2022). Therefore, providing adequate environmental information through environmental management accounting, a subset of environmental accounting, for the petroleum industry may be important since oil and gas activities profoundly affect the environment.

The past few years have observed a remarkable increase in interest in the need for environmental information (Arts et al., 2019). It has become a powerful driver that promotes decision-making (Lu et al., 2020). Likewise, Frini, Benamor and Urli (2020) acknowledge that decision-making has evolved to where the environment is important, as decisions should be made while simultaneously evaluating their environmental impacts. In this context, integrating environmental practices into business processes to generate adequate environmental information to support company decision-making may have become more critical.

As stated above, the company's management depends on accurate and relevant information to make informed decisions and to act responsibly. Meanwhile, the essential discipline with diverse practices used in identifying, measuring, analysing, evaluating, and presenting relevant management information is management

accounting (MA) (Drury & Tayles, 2020). The authors describe MA further as a system that generates information that assists managers and decision-makers in making informed decisions and improves operational effectiveness and efficiency (Drury & Tayles, 2020). In this context, MA might be crucial in gathering reliable data that can be processed into information in all business contexts.

Despite MA's crucial role in delivering relevant information, Gunarathne and Lee (2019) established that TMA could not provide management with sufficient information to make necessary decisions on environmental issues on its own. They furthermore suggest encouraging the Environmental Accounting principle in MA to increase the information available to stakeholders. Therefore, TMA has expanded to reflect a distinct branch of accounting, which centres on a company's operations' effects on the environment. This branch of accounting is known as Environmental Management Accounting (EMA).

1.1.1 The goal of this chapter

The goal of this chapter is to introduce the research background, the research problem, and the problem statement. It also describes the motivations and contributions of the research. The chapter also provides an outline of the research methodology used.

1.1.2 The layout of this chapter

Following the introduction in Section 1.1, the background to the problem and the research problem are covered in Sections 1.2 and 1.3, respectively, followed by the research questions in Section 1.4. The research objectives and methodology are presented in Sections 1.5 and 1.6, respectively. The ethical considerations are discussed in Section 1.7. In Section 1.8, the significance of the research is presented, while Section 1.9 discusses the study's scope and limitations. The thesis layout is presented in Section 1.10, followed by Section 1.11, which presents a chapter summary. Figure 1.1 presents this layout of the chapter.

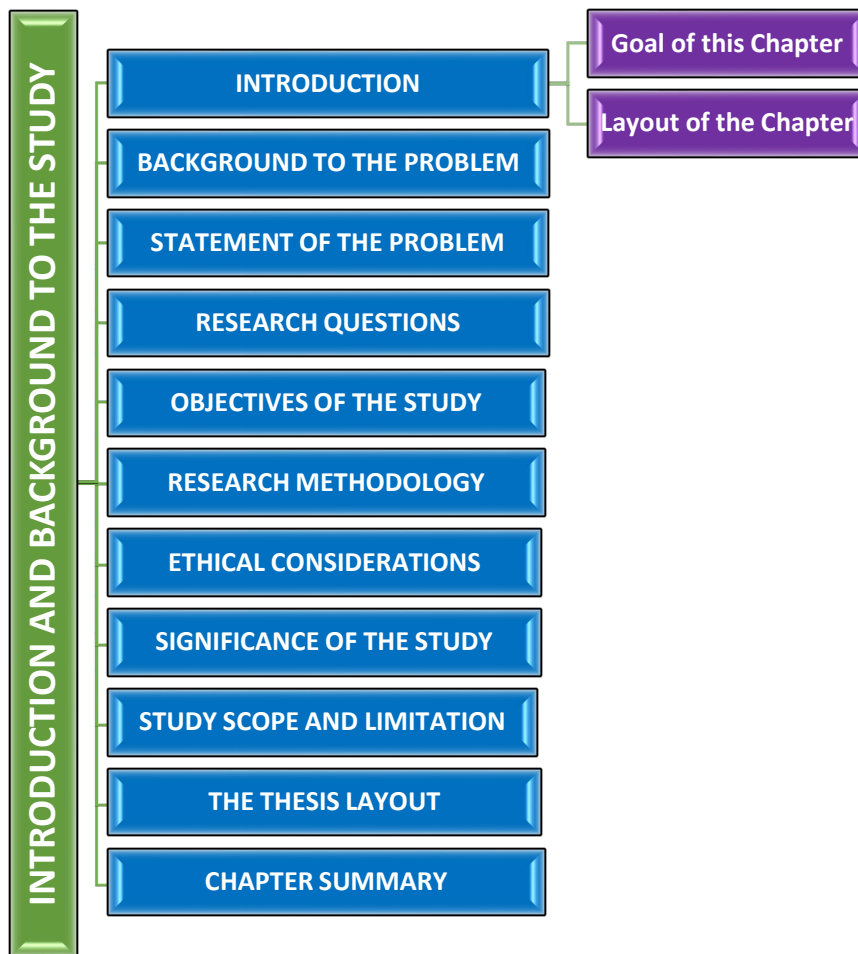


Figure 1.1: A visual representation of the layout of Chapter 1

1.2 BACKGROUND TO THE PROBLEM

Environmental concerns are critical issues globally (Milosevic et al., 2023), and its quest has been a key goal for the global community for the past three decades (Nilashi et al., 2023). Environmental matters can be effectively managed and addressed if decision-makers have access to adequate environmental data (Nilashi et al., 2023). In today's decision-making environments, the value of adequate data is well recognised (van Eupen et al., 2021), as the provision of adequate information is not limited by organisational boundaries (Nilashi et al., 2023). Therefore, it may be a valuable asset if decision-makers have the adequate information needed to make greener decisions.

The aggravation of environmental challenges has prompted companies to seek best practices, necessitating re-evaluating their accounting framework and emphasising the inclusion of environmental and other associated concerns in management

decision-making (Kamruzzaman, 2012; ACCA, 2023). From an accounting perspective, environmental concerns need to be effectively managed prior to reporting, and this requires modifications to management accounting systems (ACCA, 2023). In an ideal environment, companies would reflect environmental considerations into their accounting practices by identifying and recognising environmental costs associated with their operations (ACCA, 2023). However, the current accounting system assumes purely financial information without considering environmental information (Gonzalez & Peña-Vinces, 2022). Hence, companies must have management accounting systems that provide information about their economic performance and the environmental effects of their operations (Gonzalez & Peña-Vinces, 2022). Consequently, researchers constantly emphasise incorporating new environmental data and processes into management accounting systems (Aznar & Estruch, 2015; Van Thanh et al., 2016) to achieve green or environmental accounting (Gonzalez & Peña-Vinces, 2022). Therefore, the need of the hour for companies may not just to analyse accounting data for general decisions, but also to take into account various environmental-related information in their decision-making processes.

The development of an integrated conceptual EMA framework has been suggested in a variety of ways at the global level. Through a comprehensive literature review, Nyakuwanika et al. (2021) examine the environmental impacts of mining operations and propose how environmental management accounting practices (EMAPs) could be integrated into a conceptual framework to effectively address environmental challenges. Likewise, researchers Gunarathne and Lee (2021) propose that the use of EMA and information characteristics varies between organisations at different stages of developing cleaner production strategies. Their study developed an analytical framework based on the contingency theory view of EMA system sophistication, cleaner production strategy development stages, and EMA uses (Gunarathne & Lee, 2021). Generally, the proposals are diverse and use a variety of approaches to environmental accounting (Gonzalez & Peña-Vinces, 2022). Nevertheless, the main similarity among environmental accounting models is that the majority are conceived in developed nations and manufacturing industries, with less attention given to the particularities of developing countries and the petroleum industry, like Nigeria.

Several petroleum companies have encountered environmental difficulties (Al-Tamimi, 2022), which has led to challenges in their decision-making practices (Carlin et al., 2023). In most instances, these decision-makers were typically unaware of the environmental implications of their decisions (Al-Tamimi, 2022). Al-Tamimi (2022) considers an environmental management accounting system a valuable tool for businesses to meet their environmental goals and facilitate informed decision-making. Nigeria has an intriguing background in environmental accounting; however, there is no framework to provide information for greener decision-making. Nilashi (2023) argues that a lack of information makes decision-making uncertain, while adequate information is required to effectively implement and evaluate environmental challenges.

To manage environmental matters in the petroleum industry, adequate environmental data is essential. This is particularly relevant for companies in developing nations, such as the Nigerian petroleum industry, a crucial sector for the country's economy, which often faces significant environmental challenges and lacks resources to manage environmental-related challenges. The industry faces significant environmental degradation and pollution, resulting in over 4,919 recorded oil spill incidents between 2015 and 2021 (Olaifa et al., 2022). Accordingly, the industry's gas flaring contributes to air pollution and health issues, with the World Health Organisation estimating that mortality rate from air pollution in Nigeria is 307.4 deaths for every 100,000 people (WHO, 2024). The petroleum industry needs accurate environmental information to track progress and make effective greener decisions. Hence, the provision of environmental information within this industry is essential for improving decision-making processes, mitigating environmental impacts, and enhancing sustainability practices. Therefore, a framework for providing adequate environmental information through EMA may need to be developed to facilitate greener decision-making in the Nigerian petroleum industry.

1.3 STATEMENT OF THE PROBLEM

Increasing environmental problems have become a serious issue worldwide (Piscitelli & D'Uggento, 2022), with a long history of environmental problems in the Nigerian petroleum industry (Ighalo & Adeniyi, 2020). Even though significant progress and efforts have been made to deal with various intricate problems linked to historical neglect, environmental matters remain among the most complex and pressing

challenges (Newsbatch, 2022). The petroleum industry has consistently ranked as one of the industries that hurt the environment the most at each production phase, raising global environmental concerns (Ismail, 2017). Meanwhile, some petroleum companies give environmental accounting issues little to no thought, which has substantial negative effects on the environment (Benson et al., 2021). An increase in environmental attention due to the petroleum industry's activities (Polycarp, 2019) has led to a call for environmental accounting to capture more information regarding their environmental activities to see if it significantly influences the industry's performance (Oti & Mbu-Ogar, 2018). Therefore, an environmental management accounting framework could ensure that managers and decision-makers have adequate environmental information required for greener decision-making in the petroleum industry.

Likewise, while EMA has been implemented worldwide to improve corporate sustainability management practices, prior studies focused mostly on developed countries (for example, Australia, the United States, and Europe) (Gunarathne & Lee, 2019). Since numerous multinational companies operate in developing countries, research focusing only on implementing EMAPs in developed countries does not provide an accurate picture of EMAPs worldwide (Gunarathne & Lee, 2019). Similarly, past studies that focused on EMA implementation, its drivers, and barriers have left a literature gap, as research that examines environmental information adequacy available for decision-making in the petroleum industries remains scarce.

Meanwhile, the Nigerian petroleum industry, while being a critical driver of the nation's economy, has had profound negative impacts on the environment, leading to significant ecological, health, and socio-economic challenges. Despite its importance, the environmental-related costs associated with petroleum company activities have not been adequately addressed, largely due to insufficient environmental information available for managers and decision-makers. A lack of environmental information within the industry exacerbates these challenges, hindering green decision-making. This may indicate that environmental information is lacking in decision-making; hence, the petroleum industry may not benefit from EMAPs, as many EMAP components are not incorporated into corporate decision-making.

Therefore, the need to expand EMA research and develop a framework that offers appropriate information on the environment may be relevant to address the lack of

information that prevents the knowledge of environmental gains in terms of the adequacy of environmental-related information available to make greener decisions in the Nigerian petroleum industry.

1.4 RESEARCH QUESTIONS

The following are the research questions:

- RQ1:** Which environmental management accounting practices (EMAPs) can provide environmental information to the petroleum industry for greener decision-making?
- RQ2:** Does the Nigerian petroleum industry's current management accounting system (MAS) provide a valuable flow of environmental information required for greener decision-making?
- RQ3:** Are the environmental regulations in place for the Nigerian petroleum industry effective?
- RQ4:** How can a framework be developed to effectively utilise environmental management accounting practices (EMAPs) in providing adequate environmental information for greener decision-making in the Nigerian petroleum industry?

Research question 1 (RQ1) will be answered from the extensive literature review. The questionnaire will answer research questions 2 (RQ2) and 3 (RQ3).

1.5 OBJECTIVES OF THE STUDY

The objectives to answer the research questions are:

- RO1:** Identify the relevant environmental management accounting practices (EMAPs) that can provide environmental information to the petroleum industry for greener decision-making.
- RO2:** Investigate if the Nigerian petroleum industry's current management accounting system (MAS) provides a valuable flow of environmental information required for greener decision-making.
- RO3:** Examine the effectiveness of environmental regulations and sustainability in the Nigerian petroleum industry.
- RO4:** Develop a framework that will provide adequate environmental information through environmental management accounting practices (EMAPs) for greener decision-making in the Nigerian petroleum industry.

The extensive literature review will achieve research objective 1 (RO1). The questionnaire will assist in achieving research objectives 2 (RO2) and 3 (RO3).

1.6 RESEARCH METHODOLOGY

This section explains the methodology employed to address the study objectives. To explain the research process and steps (methodological and philosophical stances) followed in the study, the Research Onion (Figure 4.2) proposed by Saunders et al. (2023) was used as a baseline to explain the logical steps behind the selections, philosophical assumptions, and methodology that resulted in the selection of the specific strategy and research techniques.

Following the onion from the outer layer, the underlying philosophical paradigm of this research is pragmatism. An inductive approach was chosen as this method enables the researcher to establish the research objectives, gather data, and develop a framework. The methodological choice was mixed methods with a triangulation design strategy in which quantitative and qualitative data were gathered. The triangulation approach minimises bias in that every single one of the three methods has distinct advantages. To eliminate bias, qualitative, and quantitative research methods of data collection, namely, structured questionnaire with closed-ended questions, literature review, and a focus group (used to validate the framework developed theoretically), were applied. The structured questionnaire from the quantitative data was analysed with correlation analysis and ordinary least squares (OLS), and thematic analysis was employed to analyse the qualitative (focus group) data.

The scholarly literature was reviewed, and content propositions were derived and integrated into the design of the preliminary conceptual EMA framework. The focus group at NNPC, a petroleum company in Nigeria, validated this framework. The obtained data was employed to enhance the preliminary framework presented at the end of Chapter 7. A detailed description of the methodology is presented in Chapter 4.

1.7 ETHICAL CONSIDERATIONS

Respondents were prompted to sign the consent form before taking the survey (questionnaire in Appendix A) and participating in the focus group. Also, each participant received a participant information sheet (Appendix B), which served as a guide for the focus group. Furthermore, a permission letter (Appendix C) was obtained from the NNPC head office in Abuja. Likewise, an ethical clearance certificate was

obtained from the College of Accounting Sciences with Certificate Number 2016_CAS_002 (Appendix D). Accordingly, the participants were notified that involvement was optional, that they may opt-out at any time, and that their responses would be kept confidential.

1.8 SIGNIFICANCE OF THE STUDY

The research contributes to practice, knowledge, and literature by extending the practice of EMA to stakeholders in developing nations like Nigeria and evidencing that EMAPs may generate adequate information for greener decision-making in developing countries. Furthermore, this study intends to expand the current knowledge beyond the services and manufacturing industries to the petroleum industry since the industry has consistently demonstrated a significant negative impact on the environment on a global scale. Extending EMAPs to this industry may thus make a valuable contribution by developing a framework that generates relevant environmental information required to enhance greener decision-making in the Nigerian petroleum industry through EMAPs.

1.9 STUDY SCOPE AND LIMITATION

The study was limited to the objectives outlined in Section 1.4. The objectives include identifying the relevant EMAPs that could provide environmental information to the petroleum industry for greener decision-making and investigating if the current MAS used in the Nigerian petroleum industry produces relevant flows of environmental information needed for greener decisions. Subsequently, developing a framework for relevant environmental information provision through EMA to enhance greener decision-making is proposed to investigate the efficacy of environmental regulations in the Nigerian petroleum industry.

1.10 THE THESIS LAYOUT

This thesis is divided into various chapters.

Chapter 1 gives background information about the study in terms of the problem statement, the research objectives, the research questions, the research methodology, and the scope of the study. Likewise, it discusses the motivations and contributions of the research.

Chapter 2 is devoted to a brief context section setting the research scene, followed by the study's theoretical lens. Finally, a literature review on the forms of information contained in EMA, Monetary Environmental Information (MEI) and Physical Environmental Information (PEI) is provided, and an explanation of the conceptual framework is provided.

Chapter 3 critically reviews the literature on sustainable development, regulations, and the environmental legislative framework of the Nigerian petroleum industry. The chapter ends with the preliminary framework developed through the scholarly literature reviewed.

Chapter 4 provides an overview of the research process. The process follows the layers of Saunders et al.'s Research Onion. In addition, an explanation of the instruments used, namely the questionnaire and focus group, is provided in this chapter.

In Chapters 5 and 6, data analysis, results, and findings were presented. A presentation and discussion of the quantitative results are discussed in Chapter 5, and the focus group (qualitative) findings are analysed, discussed, and presented in Chapter 6.

Chapter 7 uses the key findings from the focus group in Chapter 6 to enhance the framework for providing adequate environmental information through EMA for greener decisions in the Nigerian petroleum industry developed in the preceding parts of the study.

Chapter 8 concludes the research; it presents the overall results and findings in reaching the study's objectives. Furthermore, the limitations are discussed, and recommendations for theory, practice and future research are made.

1.11 CHAPTER SUMMARY

The importance of relevant environmental information was described in the chapter. The research further notes that decision-makers rely on relevant information to make accurate decisions within a company. Therefore, the research suggests that the availability of relevant and adequate environmental information to assist with sound and green decision-making cannot be over-emphasised. Meanwhile, the most significant discipline with diverse approaches is used to identify, measure, analyse, interpret, and communicate management information in MA. However, TMA does not

offer appropriate data for managing environmental concerns in a context where environmental matters, environment-related revenues, benefits, and costs are increasing. Consequently, EMA has been considered by the business community and may have become a powerful driver that decision-makers rely on in making greener decisions. Even though extensive steps may have been taken to ensure the benefits gained from EMA, research into the adequacy of data provided by EMA may need to be conducted in the petroleum industry.

In addition, this chapter discussed the background of environmental problems in Nigeria in light of EMA's role in the nation's economic development. As noted in the chapter, either indirectly or directly, the activities of petroleum companies may have a substantial environmental impact, which should be controlled along with environmental-related costs in Nigeria. Therefore, Nigeria, where petroleum remains the pillar of the economy, should not be excluded from developing a framework to provide relevant environmental information through EMAPs for greener decisions in the Nigerian petroleum industry.

The chapter introduced the research background, the problem statement, the research objectives, the research questions, methodology, ethical considerations, scope and limitations, and significance of the study. Finally, the thesis outline was presented. The next chapter reviews the context, theoretical lens, and relevant literature on MA for the environment.

CHAPTER 2: THE CONTEXT, THEORETICAL LENS AND MANAGEMENT ACCOUNTING FOR THE ENVIRONMENT

2.1 INTRODUCTION

The previous chapter presented the research background, the problem statement, the research motivations, significance, the methodology to be employed and the ethical considerations. This chapter presents the study's context and the theoretical lens through which the subject is viewed. The relevant scholarly literature on EMA and its uses and benefits, Environmental Management Accounting Information (EMAI) and a review of the two (2) theoretical perspectives that the literature on MA and EMA suggests are provided. The two (2) theoretical perspectives are derived from institutional and contingency theories, respectively.

2.1.1 The goal of the chapter

The chapter aims to provide the research context and the theoretical lens and to gain a general understanding of EMA and its practices. The relevant literature on EMAI and the two (2) theoretical perspectives drawn from institutional and contingency theories are reviewed to fulfil this goal. Understanding the fundamental principle of the two (2) theories from an MA viewpoint may broaden the understanding of companies' decision-makers. Accordingly, EMAI is reviewed to indicate the opportunity in EMAI concerning greener decision-making. A review of the two (2) categories of information companies usually considered under EMA, namely monetary and physical information, is also introduced. Afterwards, an overview of the two (2) broad areas of EMA, namely, Monetary Environmental Management Accounting (MEMA) and Physical Environmental Management Accounting (PEMA), are discussed.

2.1.2 The layout of the chapter

The chapter seeks to provide the context of the research, the theoretical lens, and a broad understanding of EMA and EMAI. Section 2.2 gives the context of the study. Then, Section 2.3 defines EMA, and Section 2.4 discusses the theoretical lens. Finally, Section 2.5 provides a summary of the chapter. The above layout is represented in Figure 2.1 (p. 13).

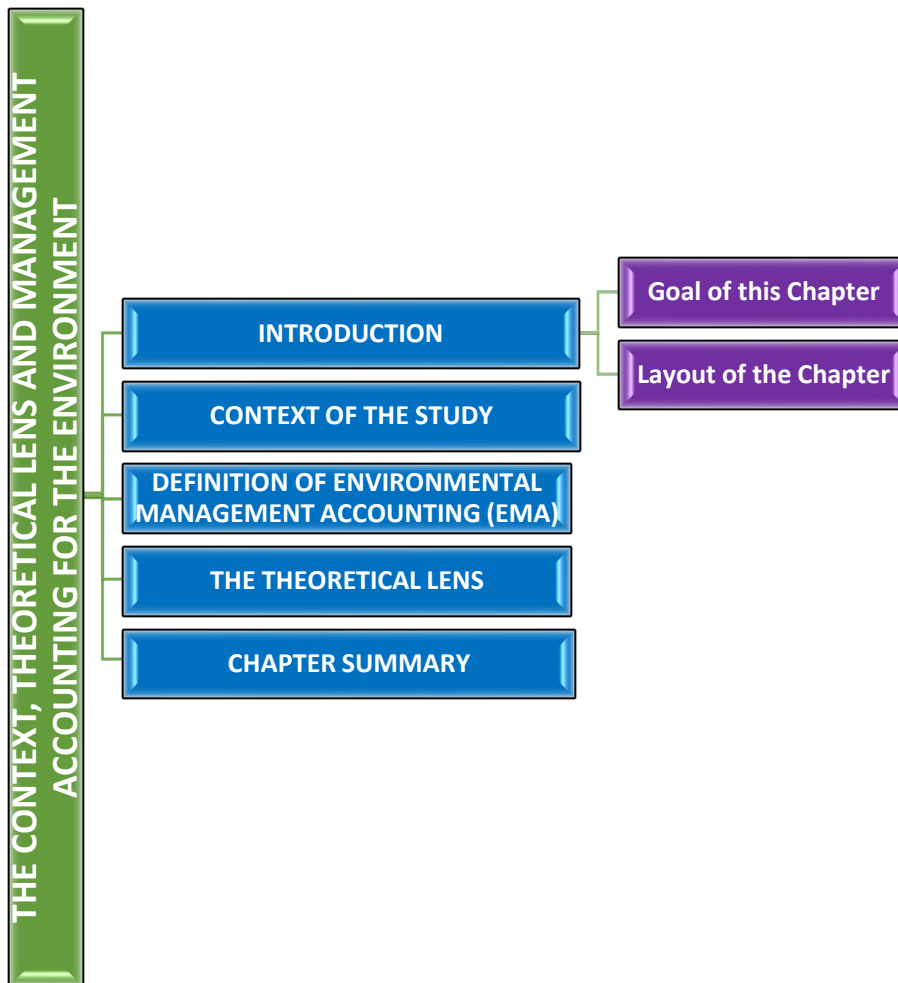


Figure 2.1: A visual representation of the layout of Chapter 2

2.2 CONTEXT OF THE STUDY

The following sub-sections provide the research context by discussing the Nigerian petroleum industry and EMA.

2.2.1 The Nigerian petroleum industry

Nigeria is a country in West Africa with a total area of 923,768 square kilometres (CIA, 2022) and a population of roughly 216,032,337 (Worldometers, 2022). Nigeria is endowed with natural gas and crude oil deposits and is the leading oil producer in Africa (EIA, 2021). The foundation of the country's economy is natural gas and crude oil, as the economy heavily depends on oil revenue (EIA, 2021). It holds the highest natural gas deposits on the continent and is the 5th biggest liquefied natural gas exporter in the world (BP, 2019). The Nigerian petroleum industry is the most dynamic and strategic sector, significantly influencing the country's economy. It centres around

other national economic sectors and generates 60% of the total income and 90% of the country's earnings in foreign exchange (Ajayi, 2021).

Okafor (2011) observes that the country's oil production and exploration are rapidly expanding, significantly and negatively influencing the environment. Meanwhile, due to the lack of adequate baseline information in deep-sea environments, growth in the exploration and production operations has made efforts to manage the environment more complex (Cordes et al., 2016). In dealing with issues in the Nigerian petroleum industry, the Nigerian government has passed several laws and engaged in numerous international and domestic environmentally friendly initiatives to ensure a healthy environment (Okafor, 2011). However, despite the government's commitment to protecting the environment, no significant measures have yet been implemented to address the gap in the environmental data needed for environmental management in the Nigerian petroleum industry (Watts & Zalik, 2020).

Therefore, in light of the roles of EMA in the nation's economic development, either indirectly or directly, the activities of petroleum companies may have a significant impact on the environment that should be addressed alongside environmental-related costs in Nigeria.

2.2.2 Background to the environmental revolution in management accounting

Over the past decade, management accounting has received substantial criticism (CIMA, 2022). The period has attracted interest from both media engagement and a broad range of stakeholders, which include governments, practitioners, consumers, investors, non-governmental companies, employees, finance providers, and scholars around the globe. All these stakeholders have contributed various perspectives to expand the boundaries of MA and integrate methodological changes and environmental measures to enhance the positive environmental footprint of companies (Debnath, Bose & Dhalla, 2011). This environmental consciousness has impacted companies, as they may now benefit from including environmental matters in MA to provide valuable information for improving corporate decision-making (Yang & Liu, 2021). Therefore, MA may be a significant company control and information systems component.

Nevertheless, the United Nations Division for Sustainable Development (UNSD, 2002 as cited in ACCA, 2022a) and Jasch (2009) argue that TMA fails to provide

relevant data for environmental management needs. Most of these environmental expenses are attributed to general overhead categories, making managers less inclined to reduce environmental costs. Likewise, TMA is claimed not to have provided management with pertinent and valuable information for decision-making (Shah, Malik & Malik, 2011; Tuanmat & Smith, 2011; ACCA, 2022a). Therefore, TMA may be inadequate to manage environmental challenges, and the need to incorporate environmental measures to enhance a company's environmental practices may be pertinent, as companies should acquire accurate, timely, and relevant information.

From establishing a further revolution in MA, a new research area in management research and practice was formed to address the shortcomings of TMA (Le & Nguyen, 2018, as cited in Le, Nguyen & Phan, 2019). As a result, EMA was created and provided a pragmatic retort to criticisms that TMA has failed to take environmental issues into account explicitly (Papaspyropoulos et al., 2012; Le, Dang & Le, 2020). Indeed, EMA has drawn more attention in managing environmental operations (Le et al., 2019), and it has seen its growth and usage from corporations throughout the globe, delivering various challenges and benefits (Gunarathne & Lee, 2019). Accordingly, Nga and Dao (2020) acknowledge that EMA could provide users with various benefits. For example, a few benefits are cost savings, better product pricing, cleaner production, resource efficiency, competitive advantage, enhanced shareholder value and improved reputation, innovation, and an improvement in the public profile of environmental friendliness (Jovanović & Janković, 2012, as cited in Nga & Dao, 2020). Therefore, EMA may positively affect companies, in this case petroleum companies, by providing users with the information they need to make informed, sustainable business decisions and enhance their economic performance and environmental profile.

Notwithstanding the significant efforts invested to reap the benefits of EMA, an investigation into the adequacy of information to be provided through EMAPs to the petroleum industry may be needed. A framework for providing adequate environmental information through EMA may need to be developed to facilitate greener decision-making in the Nigerian petroleum industry.

The first content proposition results from the discussions:

- **Content proposition 1 (Pc1):** EMA may provide the necessary information for petroleum companies to make informed, greener decisions, thereby improving their economic performance and environmental profiles.

2.3 DEFINITION OF ENVIRONMENTAL MANAGEMENT ACCOUNTING (EMA)

The TMA and the EMA definition are related. However, there are several key differences, as EMA incorporates data on the physical flows of energy, water, and materials; and environmental costs (Fuadah & Arisman, 2013; Farhood, Abd Ali & Abdulkareem, 2023). No single, broadly recognised definition of EMA exists (International Federation of Accountants [IFAC], 2005; Duman, Yılmaz İçerli, Yücenurşen & Apak, 2013). Instead, there are a variety of views and thoughts on EMA. Prior research has described EMA in various ways. For example, Sulanjaku (2013) describes EMA as a decision-making instrument that manages and improves companies' economic performance and environment by developing proper strategic planning. Similarly, Hyršlová, Bednaříková and Hájek (2008) view EMA as a practice that provides information on environmental facets of corporate operations, services, and products to assist in deciding within the framework of managing the environment. Likewise, Gunarathne and Lee (2019) view EMA as a strategic corporate tool used to manage environmental risks and opportunities for the company while demonstrating to investors that their business strategies are sustainable.

Accordingly, CGMA (2022) reiterates that EMA refers to providing accounting information decision-makers require regarding business operations that affect the company's environmental-related impacts. Meanwhile, a complementary explanation is proposed by the United Nations Industrial Development Organisation (UNIDO, 2010), which defines EMA as a practice that identifies, collects, and analyses the use of two (2) categories, monetary and physical information for internal decision-making. Hence, EMA development is set within the context of environmental management, and the progress has been primarily influenced by the information needs of interested parties (Hájek, Pulkrab & Hyršlová, 2012). Therefore, EMA may be seen as a component of the environmental accounting framework that provides relevant environmental information through financial and physical environmental information to support greener decisions.

The above explanation and the potential of EMA lead to the following content propositions:

- **Content proposition 2 (Pc2):** EMA may serve as a strategic business tool for petroleum companies in managing environmental risks.
- **Content Proposition 3 (Pc3):** EMA may provide relevant environmental information through MEMA and PEMA to assist petroleum companies in making environmentally friendly decisions.

2.3.1 The uses and benefits of environmental management accounting (EMA)

EMA is a relatively new tool and extension of MA (Christ & Burritt, 2015, as cited in Qian, Hörisch & Schaltegger, 2018), and it is a subset of environmental accounting (ACCA, 2022b). Research so far on the uses and benefits of EMA in supporting informed decision-making has shown that EMA has several advantages over TMA. Sari et al. (2020) researched EMA's effect on company performance and concluded that EMA implementation stimulates companies to invent procedures that enhance performance. Hence, EMA is a powerful tool that may assist in reducing a company's environmental impacts and improving environmental performance (Alkisher, 2018). Accordingly, Mohamed and Muhammad-Jamil (2020) investigated EMAPs' influence on environmental performance within the small-medium-sized manufacturing sector. They found both categories of EMA (physical and monetary) significantly and positively impact environmental performance. Therefore, the authors validate the importance of EMAPs in environmental performance enhancement. Likewise, Herawati, Octavia and Rachmawati (2020) analysed environmental accounting implementation in assessing environmental performance. They concluded that environmental accounting implementation influences company performance, particularly environmental performance, which reduces environmental costs and increases earnings. Hence, it is plausible that EMA can generate information on environmental-related costs, earnings, and savings related to a petroleum company's operations.

Meanwhile, Dissanayake and Rajapakse (2020) examined EMA's impact on corporate sustainability. They found that EMA serves as a vital set of practices to support sustainable development. Furthermore, Gunarathne and Lee (2019) acknowledge that EMA is an information management method which employs a set of practices to assist

business managers in considering sustainability when making decisions. Similarly, Yang, Jaidi, and Ab Fatah (2020) also claim that EMA is a valuable and significant practice for a manufacturing company to enhance its performance in terms of corporate sustainability. Therefore, putting EMAPs into place could lead to better corporate sustainability performance by giving the company's management a reason to set up a system that can provide the information needed to evaluate sustainability matters.

The above explanation and benefits of EMA lead to the following content propositions:

- **Content proposition 4 (Pc4):** EMA may be a powerful tool that assists decision-makers in reducing environmental impacts and enhancing environmental performance.
- **Content proposition 5 (Pc5):** EMAPs may act as a key driver for petroleum companies' management to develop a system that provides physical and monetary information required for environmental performance.

2.3.2 Environmental management accounting information

EMA is progressively becoming significant for decisions related to managing the environment and for every form of corporate undertaking (Gunarathne & Alahakoon, 2016; Mohamed & Muhammad-Jamil, 2017). EMA is usually used to generate and analyse non-financial and financial information to make a decision (Jalaludin, Sulaiman & Ahmad, 2010; ACCA, 2024). Christ et al. (2021) found that EMA may provide a significant data set that assists internal decision-making, and initiatives that may reduce environmental impacts. In the same way, Burritt, Herzig, Schaltegger and Viere (2019) acknowledge that EMA provides practices designed to assist management in making informed decisions on cleaner production. In other words, EMA can deliver information on the environmental facets of company activities (Ferdous, Adams & Boyce, 2019) and provide information on managing corporate environmental behaviour and economic effects (Timothy, 2011). Therefore, EMA may generate, analyse, and use non-financial and financial information to support management in making better decisions.

Meanwhile, Heidari (2012) classifies EMA as a business practice offering vital information for a company's environmental management, ranging from modest to complex approaches incorporating monetary and physical information to make a

decision. Similarly, Ramli and Ismail (2013) assert that capturing monetary and physical environmental-related data will undoubtedly benefit companies. In the same vein, Munteanu (2013) maintains that EMA unites physical and monetary data and allows for a new type of analysis based on eco-efficiency indicators that enhance the quality of environmental data for decision-making. Therefore, EMA may play a vital role in handling environmental matters by providing adequate information to control and reduce environmental impacts, specifically in the petroleum industry.

Similarly, Herzig (2012) argues that EMA allows a company to analyse its natural environmental impacts and provides managers with information that makes them aware of and addresses environmentally driven monetary impacts on the company. Likewise, Sulaiman and Mokhtar (2010) reiterated that implementing EMA could improve business decision-making by tracking environmental-related cost information that TMA fails to disclose. Furthermore, Ambe (2007) argues that EMA can help companies track and manage their monetary and physical resources efficiently and identify cost-saving opportunities. Generally, companies use EMA to provide and improve information to support management on their environmental and financial performance, improving their environmental impacts and profit enhancement through cost minimisation (IFAC, 2011). Therefore, EMA may provide relevant users with adequate information to solve existing and future environmental problems and identify new cost-saving opportunities while improving environmental performance.

There is a significant body of research that examines the usefulness of EMAI in decision-making. For example, Vasanth *et al.* (2012) reviewed EMA as a decision-making practice. They found that environmental-related information assists the decision-maker in making sound internal and external decisions within the company. Recently, Le, Dang and Le (2020) assessed factors that influence the implementation of EMA and the quality of environmental information available to make decisions. They found that EMA implementation positively affects environmental information quality available for decision-making. Therefore, EMA may provide and enhance the quality of environmental information available for a company's decision-makers. Likewise, Alewine and Stone (2013) studied how information on environmental accounting impacts attention and investment decision-making. They established that the availability of information on environmental accounting could positively influence

decision-making and has the potential to enhance a company's environmental practices while also assisting in uncovering possible areas for cost savings.

Accordingly, Sarker and Burritt (2008) studied environmental accounting information's role in environmental investment decision-making. They established that information on environmental accounting significantly influences managers' willingness to integrate environmental factors into investment decisions. Hence, information on environmental accounting may influence decision-makers/managers to be more environmentally conscious. Spencer, Adams and Yapa (2013) also suggest that decision-makers can benefit from the accumulated environmental accounting information when evaluating the viability of technology investments to improve and evaluate a company's environmental performance. Lohmann (2009); and Sarker and Monroe (2012) admit that EMA information significantly impacts managers' ability to make sound decisions regarding the scarce resources' allocation efficiency. Therefore, the environmental accounting-related information offered by EMA may be used to make decisions and enable the petroleum industry to evaluate its environmental and economic impacts.

The EMA discussion above brings about the following content propositions:

- **Content proposition 6 (Pc6):** EMA may play a vital role in handling environmental matters by providing adequate environmental information needed to control and reduce the effects of the petroleum industry on the environment.
- **Content proposition 7 (Pc7):** EMA implementation may improve greener decision-making by tracking environmental-related cost information in the petroleum industry.
- **Content proposition 8 (Pc8):** EMA may provide decision-makers with the relevant information to address existing and future environmental problems and identify new cost-saving opportunities while improving environmental performance.

2.3.2.1 Types of information included under environmental management accounting

Burritt *et al.* (2019) acknowledge that physical and monetary information are the two (2) forms of information that companies often consider under EMA to make decisions

that signal a potentially favourable outcome. The combination of physical and monetary EMA aids integration across environmental and economic performance by using procedures like eco-efficiency to enhance the data needed for internal decision-making (Munteanu, 2013). PEMA information relates to the flow and usage of water, material, and energy, while MEMA information relates to costs, savings, and earnings (CGMA, 2022). Furthermore, Burritt, Hahn and Schaltegger (2003) emphasises that this distinction is necessary since monetary and physical environmental information is usually generated from various sources. Both information categories are constantly needed for several purposes and by various stakeholders. Therefore, providing physical and monetary information from EMA may assist in making decisions that likely impact petroleum companies' financial and environmental performance.

- **Physical environmental management accounting**

Companies should gather monetary and non-monetary information to assess their environmental costs properly (IFAC, 2005; Abiola & Ashamu, 2012). IFAC (2005) argues further that PEMA provides not only all the information needed to manage the potential environmental impacts effectively without the monetary information but also essential information that decision-makers can rely on in making decisions. Therefore, it is plausible that PEMA information may successfully supply internal management decision-makers with the required information for managing their corporate impacts.

According to *Burritt et al.* (2003), PEMA comprises all the past, present, and future energy and material totals that affect environmental systems and are reported in physical units, such as joules, kilograms, or cubic meters. As such, Schaltegger and Burritt (2010) stress that PEMA serves as an information practice that collects information on the effects of the environment in physical units as part of internal management decisions concerning corporate impacts. They stress further that PEMA has several functions: It is a practice established to promote ecologically sustainable development (Schaltegger & Burritt, 2010). Therefore, PEMA information may provide the physical information required to manage potential environmental impacts effectively in petroleum companies.

- **Monetary environmental management accounting**

MEMA accounts for the monetary effects of environmental events; it assists operational and strategic planning, offers the primary root for deciding how to realise

intended objectives, and serves as a mechanism for accountability and control (Sulanjaku, 2013). Hence, MEMA may act as a control mechanism that is the efficient core information source for decision-making on accomplishing preferred company objectives.

Hargroves and Smith (2005) acknowledge that MEMA deals with environmental parts of a company's undertakings that are stated in monetary units and provide information for management use internally. Accordingly, Hájek *et al.* (2012) argues that MEMA signifies a valuable practice to enhance internal decision-making by identifying, monitoring, and evaluating costs incurred and the benefits of acting on the environment. They claim further that the resulting information from MEMA is used to achieve objectives and plays a significant role in responsibility management (Hájek *et al.*, 2012). Therefore, MEMA may serve as the key source of monetary information required to manage petroleum companies' potential environmental impacts.

2.3.3 The information concept of environmental management accounting (EMA)

Nowadays, corporate decision-makers are facing challenging decisions on a day-to-day basis. As such, they are constantly required to analyse and evaluate available options before deciding on a full range of matters (Hahn, Seaman & Bikel, 2012) under highly complex and uncertain conditions (EPA, 2012). Furthermore, decision-making entails selecting the optimal course of action and choosing the most appropriate preference, as decision-makers need guidance, typically information (Akrani, 2010). Hence, information is a crucial resource in managing and operating company activities. Providing adequate information is pertinent for carrying out managerial duties effectively (Chimos *et al.*, 2013). Therefore, petroleum companies may benefit from the accessibility of relevant information from EMA, as decisions are affected by relevant information and can make a difference in the outcome.

A crucial role of MA is to provide relevant information (Hamid & Behrad, 2013; ACCA, 2022a). Therefore, an MA information system (MAIS) has been developed to provide an important part of the required information to management. However, TMA can misrepresent and distort environmental matters, allowing managers to make irrelevant decisions for the company and the environment (ACCA, 2022a). In turn, managers need to find a way to factor environmental impact into their decision-making process

(Hahn et al., 2012; Poplavets et al., 2024)). This is typically done by using adequate environmental-related information in analysing their activities. However, TMA may not provide all the relevant information to satisfy managers' decision-making needs; sometimes, environmental-related information may also be needed to arrive at adequate information for decision-making purposes.

As the business environment becomes more unpredictable due to the complexity and change in environmental conditions, it has created a greater need for decision-makers to gather or process more information to reduce uncertainty (Noor, 2012; Daft, 2020). In reacting to the gap, EMA provides adequate information as it provides needed information (Burritt et al., 2019) for companies that aim to reduce their environmental impacts (EC, 2021). As such, EMA information provides a specific environmental component that may be used to improve environmental impacts. Therefore, EMA may increasingly benefit all routine management decisions by providing the decision-maker with sufficient information about environmental factors.

2.4 THE THEORETICAL LENS

There have been growing concerns about environmental development for decades (Kelsall, 2020). EMA has been promoted as a means by which managers optimise their environmental impact decisions (Christ, Schaltegger & Burritt, 2021) and report environmental information to external and internal stakeholders (ACCA, 2022b). Despite the growing presence and increasing interest in EMA, studies have noted a theoretical gap in the accounting literature about the adequacy of environmental accounting information as a tool for making internal decisions (Wang et al., 2018; Siskawati et al., 2019; Ferdous et al., 2019; Zandi & Lee, 2019).

Through the contingency and institutional theory lenses, numerous studies have empirically examined EMAP's adoption and implementation in various industries and country settings (Gunarathne & Lee, 2021). Studies have recommended the usage of contingency (Christ, 2014; Mokhtar et al., 2016; Qian et al., 2018) and institutional theory lenses (Wang et al., 2018; Ferdous et al., 2019; Zandi & Lee, 2019; Siskawati et al., 2019; Iredele et al., 2019; Elhossade, Abdo & Mas'ud, 2021) to understand EMAPs and their development. Through the two (2) theoretical perspectives, the researcher proposes that institutional and contingency theories significantly explain

EMA adoption. Wang et al. (2018) propose combining contingency and institutional theories to address contingent factors' effects on a number of other variables.

Studies reveal that the contingency and institutional theories have traditionally dominated the literature on EMA (Elhossade et al., 2021). This research adds to the body of EMA literature by incorporating institutional and contingency theories to provide the study's theoretical background, which presents a framework for information provision on environmental issues for greener decision-making in the petroleum industry. Therefore, this research will focus on the two (2) theoretical perspectives discussed in the following sections.

2.4.1 The contingency theoretical lens

The concept of contingency theory was emerged in the organisation theory literature in the early to mid-1960s, however, its application in accounting research was insignificant before the mid-1970s (Ferreira & Otley, 2010 as cited in Callado & de Oliveira, 2019). Karim et al. (2016). A contingent theory stresses that the efficiency of an organization's structure is influenced by organizational contextual factors, such as the environment and technology (Karim et al., 2016). Hence, the theory implies that the effectiveness of certain managerial techniques is contingent on the organisation's context and structure. In the context of management accounting, contingency theory is based on the premise that there are no universally fit accounting practices that apply to all companies in all circumstances, as they depend on contextual factors (Ferreira & Otley, 2010 as cited in Callado & de Oliveira, 2019). Therefore, contingency theory suggests that management practices cannot be applied universally; instead, management effectiveness is affected by the context in which an organisation operates.

Contingency theory may assist in explaining environmental accounting, especially EMA. The contingency theory is a concept in management that stresses the design of effective MASs (Otley, 2016). The theory suggests that no unique set of accounting procedures is appropriate for use by all companies in all situations (Otley, 2016; Kenno et al., 2018). Consequently, different companies face different contingency variables (situations) and require different management methods. A significant number of investigators previously used the theory to elucidate the intricate relationships between changes in MA and a company's internal and external factors (Shahzadi et

al., 2018; Suleiman, Yahaya & Abba, 2018; Shonhadji & Maulidi, 2022). According to the contingency theory, accounting information systems should be flexibly designed to consider companies' environmental and organisational structure. Hence, contingency theory considers the organisational attributes, the environment, and the managerial decision-making styles. Accordingly, Pham, Dao, and Bui (2020) maintain that MAS' applicability depends on the circumstances confronting companies. Likewise, Drury and Tayles (2020) admit that the contingency theory in MA is based primarily on the tenet that no single accounting system is suitable for all businesses in all situations. Therefore, identifying specific aspects and designing effective MASs to provide adequate information for greener decision-making requires considering the circumstances in which it will be used.

2.4.1.1 The contingency influence between environmental uncertainty and organisational information

An essential role of MA is offering management sufficient information to make decisions. Wucker (2022); and Usher, Mysore and Finn (2022) admit that as the company's environment turns out to be more unpredictable, managers tend to process additional applicable information to manage the uncertainties. Furthermore, Laguir et al. (2023) argue that management would need to be able to react quickly to unexpected changes due to the perceived high level of physical environmental complexity; hence, the company's management or decision-makers require extra information to make decisions that will reduce uncertainty. EMA will be significant in providing adequate environmental information, as the natural environment has become uncertain.

Researchers in the MA field employed the paradigm to develop the contingency theory in MA. The adoption of the contingency theory to MA research began in the mid-1970s (Otley, 2016). More than a few researchers in MA propose that contingency theory may offer a comprehensive framework for designing MASs (Waterhouse & Tiessen, 1978; Ghorbel, 2017; Habibi Rad et al., 2022). Gerdin (2005) states that effective MAS design should depend on company-specific factors. This means a specific feature of a suitable accounting system may be contingent upon the conditions a company finds itself in. Therefore, contingency theory should establish certain accounting system elements linked to specific distinct conditions and show a suitable matching.

The contingency theory is suitable and relevant for exploring EMA benefits regarding information provision for making decisions. Consequently, the researcher selected the contingency theory since it relates to and provides insights into the relationship between business decision-making and EMA. Therefore, developing a framework that will provide adequate information for greener decision-making may address contingent environmental pressures by assisting managers within the petroleum industry to address environmental contingencies as they arise.

2.4.1.2 The contingency theory assumptions, advantages, and disadvantages

Contingency Theory Assumptions:

- There is no universal best way to manage or organise.
- The appropriateness of management practices depends on the specific context, including factors like technology, environment, size, and strategy.
- Organisations must align their structure and practices with their contingencies to achieve high performance.

Contingency Theory Advantages:

- Flexibility: Recognises the need for different approaches in different situations, promoting a more tailored management approach.
- Practical Relevance: Offers practical guidelines for managers to align practices with contextual factors.
- Dynamic Adaptation: Emphasises the need for organisations to adapt to changing environments and internal conditions.

Contingency Theory Disadvantages:

- Complexity: This can become complex and difficult to apply due to the need to consider multiple contingencies and their interactions.
- Limited Guidance: Offer limited guidance on how to identify and assess relevant contingencies.
- Reactive Nature: Often reactive, focusing on adaptation to existing conditions rather than proactive change and innovation.

2.4.2 The institutional theory perspective

Institutional theory in management accounting stems from the broader field of institutional sociology, which studies how institutions influence behaviour and outcomes. It emerged during the late 1970s and early 1980s as a means of explaining how organisations and institutions function within broader social and cultural contexts (Cai & Mehari, 2015; van Wijk et al., 2019). In its long history, institutional theory has adhered to a pronounced normal scientific ideal of incrementally extending and refining the theory (Glynn & D'Aunno, 2023 as cited in Eitrem et al., 2024). Institutional theory has subsequently been expanded into a dominant strand of organisation research studies (Greenwood et al., 2017) that has had a significant impact on interdisciplinary accounting research (Robson & Ezzamel, 2023). According to the theory, organisations are shaped by the norms, rules, and values that define their institutional environment (Peters, 2021). Thus, the theory argues that organisations seek legitimacy by adhering to institutional values and norms, and the perception of their conformance determines their legitimacy (Omodan, 2023). Therefore, institutional theory highlights the significance of norms, values, and rules in influencing organisational behaviour and outcomes.

In contrast to the contingency theoretical perspective that emphasises efficiency as the motive for EMA implementation, Scott (2013) and Satyendra (2020) claim that efficiency might not necessarily be the sole condition to be considered in corporate decision-making. Meanwhile, Chang (2007) and Alsharari (2018) acknowledge that changes in the accounting system's decisions could hinge on other psychological or sociological factors that offer institutional explanations. As a result, the second typology of explanations, which focuses on institutional theory, was proposed (Wanxin & Xiao, 2021).

The institutional theory emphasises how the institutional environment affects companies. This is achieved by exploring how a company's structures and activities are influenced by institutional forces like governmental authority, professional bodies, and society surrounding the company. The theory advocates that the institutional environment impacts their companies' environmental, economic, and social performances (Latif et al., 2020). Furthermore, the institutional environments feature includes complex guidelines and rules that companies must adhere to be supported and granted legitimacy (Scott, 1995). Hence, the institutional perspective gives a

better clarification, as government agencies require certain information or impose institutional pressure to enhance companies' environmental performance.

In an attempt to explore EMA benefits in terms of information provisions for greener decision-making, researchers such as Bouma and van der Veen (2002); Wang et al. (2018); Chathurangani and Madhusanka (2019); and Latif et al. (2020) support the usage of institutional theory in EMA research. For example, Bouma and van der Veen (2002) used institutional theory to examine organisational changes in a case study focusing on how a company captures environmental costs. They established that external parties influence a company's perception of environmental costs. These external parties, in particular, were considered to substantially affect the company's management in creating a strategy to capture environmental costs. The researchers highlighted the organisational field's vital role in EMA's implementation and development (Bouma & van der Veen, 2002).

Wang et al. (2018) examined the institutional pressures' impacts on EMA implementation and how such impacts are influenced by top management's perceived benefits and support. The result indicates that institutional pressures significantly and positively influence the implementation of EMA. Accordingly, Chathurangani and Madhusanka (2019) examined the relationship between institutional pressure and the level of EMA adoption from the perspective of new institutional sociology. The results indicate that political or/and legitimacy influences and education or/and training are positive pressures for adopting EMA. The authors conclude that institutional pressure, responses to legitimacy influences, and political influences play a vital role in pressuring the adoption of EMA. According to Latif et al. (2020), institutional pressures impact EMA adoption positively. These authors examined the impact of institutional pressures on EMA adoption based on a case study conducted in Pakistan's manufacturing sector. Latif et al. (2020) conclude that institutional pressures positively and significantly impact EMA adoption. Bananuka et al. (2021) stressed that institutional pressures and environmental management techniques significantly predict environmental performance. Therefore, the institutional theory may provide a valuable path for researchers to investigate environmental benefits in terms of institutional forces like government roles in supporting environmental information adequacy available for decision-making.

The above discussion on government regulations leads to the following content propositions:

- **Content Proposition 9 (Pc9):** Government agencies may exert institutional pressure to improve the petroleum industry's environmental performance;
- **Content Proposition 10 (Pc10):** Government and other regulators may significantly influence the management of the petroleum company in creating a strategy to capture environmental costs;
- **Content Proposition 11 (Pc11):** Institutional pressures (like government regulations) may significantly and positively influence the implementation of EMA.

2.4.2.1 The Institutional Theory influence on organisational performance and decision-making

DiMaggio and Powell (1983) acknowledge that companies and decision-making within companies cannot be understood without considering the institutional context. Chang (2007) claimed that changes in the institutional environments of companies could lead to uniformity, which could either encourage or impede the adoption of new company practices, including accounting. In addition, the author admits that pressure to implement EMA may be one sort of institutional pressure; with the institutional pressure, the company may respond to this pressure and adopt EMA. Hence, with an institutional influence, a company may adjust their management control systems to adhere to government regulations to gain legality. Therefore, institutional theory may be applied to inform EMA acceptability and make accountability more realistic since information is needed for accountability. EMA will attract less attention if governments do not enact specific accounting procedures and practices. As a result, accounting for the environment and providing adequate information for green decision-making may be jeopardised.

To explore companies' performance and decision-making, institutional theory is suitable and relevant for the study phenomena. Researchers such as Imtiaz-Ferdous, Adams and Boyce (2019); Chaudhry and Amir (2020); and Gunarathne, Lee and Hitigala-Kaluarachchilage (2021) support the use of institutional theory on company performance and decision-making in an EMA study. From the institutional theory perspective, Imtiaz-Ferdous, Adams and Boyce (2019) investigate the influences of

EMA adoption in corporatised water supply companies. Imtiaz-Ferdous et al. (2019) observed that both the government regulator's emergence and the community's expectations concerning environmental performance and disclosure are the two (2) crucial drivers for the emergence and adoption of EMA. Accordingly, Chaudhry and Amir (2020) assess the effects of institutional pressures on the company's environmental performance alongside EMA adoption mediation and moderation of environmental proactivity between them. The findings show that institutional pressures are significant in determining environmental performance. The authors also found that institutional pressures improve EMA implementation significantly, positively affecting the company's environmental performance.

Gunarathne et al. (2021) investigate the implementation of EMA in translating EMS into company performance. Furthermore, the authors investigate the influence of institutional pressure on EMS and EMA to describe the institutional environment's impact on environmental practices properly. A review of the results indicates that there are significant indications that the EMS is positively related to the economic and environmental performance of companies. They further show that a company's institutional environment positively affects both EMS and EMA. Finally, they conclude that when implementing EMS in the quest for sustainable corporate development, companies' information systems, like EMA, are valuable in tracking financial and environmental performance and providing environmental cost information. Therefore, the institutional theory may assist companies in adopting best practices that positively influence company performance and greener decision-making.

The above discussion on government regulations leads to the following content propositions:

- **Content Proposition 12 (Pc12):** Government and other regulators may enact laws and regulations that oblige petroleum companies to specific accounting procedures and practices, for example, EMAPs.
- **Content Proposition 13 (Pc13):** Institutional forces (like government regulations) may assist petroleum companies in adopting best practices that improve company performance and encourage greener decision-making.

2.4.2.2 The Institutional Theory assumptions, advantages, and disadvantages

Institutional Theory Assumptions:

- Organisations are influenced by social and cultural norms and values.
- Institutional pressures (coercive, mimetic, and normative) lead organisations to adopt certain practices.
- Organisations seek legitimacy and social acceptance, often by conforming to institutionalised norms.
- Practices become institutionalised over time, often independent of their technical efficacy.

Institutional Theory Advantages:

- The concept of non-economic behaviour: Elucidates the reasons behind organisations' adoption of practices that may lack economic rationality yet maintain social acceptance.
- Focus on Legitimacy: Highlights the importance of legitimacy and social approval in organisational survival and success.
- Change Insight: Provides insight into how and why organizational practices and structures evolve over time.

Institutional Theory Disadvantages:

- Overemphasis on Conformity: Overemphasise conformity and neglect innovation and strategic choice.
- Limited Predictive Power: Less effective at predicting specific outcomes than theories that focus on economic rationality.
- Ambiguity in Mechanisms: The mechanisms through which institutional pressures operate can be vague and difficult to measure.

Conclusion: Institutional and contingency theories offer valuable insights into management accounting practices. Institutional theory helps to explain why organizations adopt certain practices based on social and cultural pressures. In contrast, contingency theory provides a framework for aligning management practices with contextual factors to enhance effectiveness. Therefore, understanding these

theories can help managers and researchers better analyse and design accounting systems that are both technically efficient and socially and contextually appropriate.

2.5 CHAPTER SUMMARY

This chapter discusses the general background of EMA and the Nigerian petroleum industry. In addition, the relevant literature on EMAI was reviewed. It is argued that TMA has failed to collect and evaluate environmental-related information efficiently, resulting in decision-making based on missing or inaccurate information. However, EMA may broadly offer environmental information to enhance company performance and decision-making. EMA originates from TMA. However, it integrates environmental costs and information into MA practices. Therefore, the researcher suggests that extending research on EMA information adequacy towards developing a framework that would enrich greener decision-making in the petroleum industry may be pertinent.

Furthermore, the uses and benefits of the EMA are discussed in detail. It is argued that environmental-related information is required to reduce and manage the companies' environmental impacts. It is therefore advocated that the availability of environmental-related information can enable effective decision-making in any business activity.

Accordingly, the types of information included under EMA are discussed. As noted, EMA unites monetary and physical information and allows for a new analysis based on eco-efficiency indicators. This may enhance the quality of environmental-related information available for making decisions. Therefore, it is argued that providing relevant information (both environmental physical and environmental monetary information) may assist decision-makers in making decisions that impact a company's environmental and financial performance.

Additionally, the literature surrounding the two (2) theoretical perspectives (that is, the contingency and institutional theories) was reviewed. The two (2) theories were applied in various studies, and it was determined that each had its advantages in terms of their suitability. The two (2) theoretical perspectives are particularly important in understanding whether a company will make a profitable environmental decision based on the available information.

The relevant literature on institutional pressures was reviewed. It is argued that institutional forces are significant environmental performance determinants. Likewise,

it is suggested that institutional pressures enhance EMA adoption, consequently improving environmental performance. Accordingly, institutional pressures (government regulations) and environmental management practices such as EMA significantly predict environmental performance. Finally, the content propositions derived from the literature review were used to develop the preliminary conceptual frameworks in Chapter 3.

The next chapter gives the background and reviews of the relevant literature on sustainable development, the environment, EMAPs (CMA, WMA, CA, SA, and MFCA), and government regulations and policies.

CHAPTER 3: SUSTAINABLE DEVELOPMENT AND THE ENVIRONMENT

3.1 INTRODUCTION

The previous chapter provided a general understanding of EMA and EMAI. This chapter broadly discusses sustainable development, environmental legislative frameworks, and regulations in the Nigerian petroleum industry. Over the last decade, sustainability and sustainable development have become trendier and a worldwide imperative (Ratiu & Anderson, 2014; Mensah, 2019). In recent decades, companies have become important players in promoting sustainable development (Utting & O'Neill, 2020) by developing tactics to achieve sustainability while governments enact sustainability policies (Ratiu & Anderson, 2014; Elborai et al., 2022). Sustainable development is defined as keeping the globe a safe place to dwell in for existing and upcoming generations (IISD, 2022). Therefore, sustainability involves protecting and preserving the world's fortune and creating resources by initiating the necessary economic and social conditions for transformation.

The World Summit on Sustainable Development (WSSD) emphasises that sustainability is important and provides information for decision-making (WSSD, 2002). Similarly, Winograd and Farrow (2009) argued that the lack of data to measure and monitor the development process concerning the environment, ecological functions, natural resources, and society triggered the need for sustainable development. They further claimed that such a reformed viewpoint on sustainable development suggests new demands. One is the invention of adequate information critical in providing a company's base for evaluating decision-making (Winograd & Farrow, 2009). As such, implementing a more formalised approach toward sustainability may assist in providing social, economic, and environmental data to support the decision-making processes (Winograd & Farrow, 2009). Therefore, even in the petroleum industry, adequate information and guidance for sustainability-based decision-making may be needed.

3.1.1 The goal of this chapter

The chapter discusses sustainable development and how information adequacy may support it. Hence, this chapter focuses on how to use EMAPs' adequate information to enrich sustainability and sustainable development through decision-making. In

addition, the environmental legislative framework and regulations in the Nigerian petroleum industry are also discussed.

3.1.2 The layout of the chapter

This chapter provides a detailed discussion of sustainable development, environmental legislative frameworks, and regulations in the Nigerian petroleum industry. The chapter begins with an introduction, and the concept of sustainable development in Sections 3.1 and 3.2, respectively. Section 3.3 defines sustainable development, while an overview of the relevant literature on sustainability accounting, carbon accounting, water accounting, energy accounting, Material Flow Cost Accounting (MFCA), sustainability and decision-making, and regulatory concepts of environmental sustainability is discussed in Sections 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, and 3.10, respectively. Subsequently, Section 3.11 discusses sustainable development in the Nigerian petroleum industry. Finally, the environmental legislative framework and regulations in the Nigerian petroleum industry are reviewed in Section 3.12. Section 3.13 provides insight into the development of the conceptual framework. Finally, the chapter is concluded with a summary in Section 3.14. The above layout is represented in Figure 3.1 (p. 33).

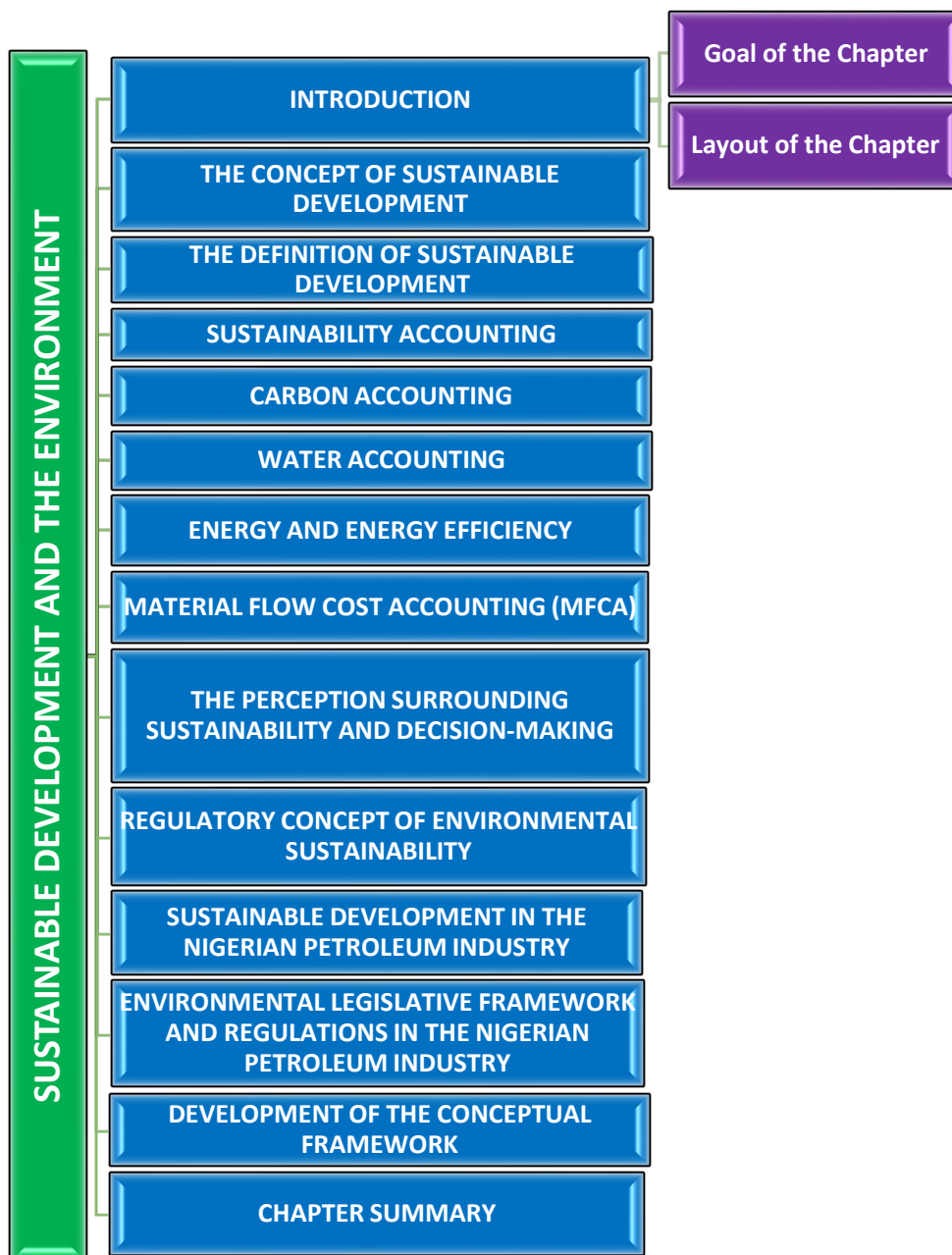


Figure 3.1: A visual representation of the layout of Chapter 3

3.2 THE CONCEPT OF SUSTAINABLE DEVELOPMENT

Sustainability, or the sustainable development concept, has attracted increased interest from certain parts of society, especially academics, businesses, and policymakers (Sadhukhan et al., 2020). This movement was strengthened due to the potential consequences of recent growth in population, economic, and natural resource consumption (Environmental Protection Agency [EPA], 2019), as well as global commitments to address resource shortages, reduce greenhouse gas (GHG) emissions, and rethink waste management (Nerini et al., 2019; Zhang et al., 2019).

The idea of sustainable development relates to the need for institutionalising business best practices by companies (Afinotan & Ojatorotu, 2009). According to Omojemite (2012), sustainable development is a goal that emphasises a long-term (intergenerational) and holistic perspective, uniting political, cultural, social, environmental, and technological dimensions. Accordingly, Schwarz, Beloff and Beaver (2002) argue that sustainability offers a framework for effectively integrating economic, environmental and social interests into a business strategy's effectiveness. Therefore, sustainable development may be useful and relevant for petroleum companies to improve their decision-making processes to reach more sustainable outcomes.

The ongoing sustainability missions have created a range of practices and decision methods that focus on sustainable development (EPA, 2019). Among the practices and the decision methods is the EPA Sustainable Research, which provides sophisticated practices (such as EPA's Report on the Environment [RoE]) that are widely used in managing and protecting resources across the Nation (EPA, 2019). Likewise, the National Resources Council (NRC) of the National Academies recently published a report titled "Green Book", which proposes a framework for sustainable implementation (EPA, 2019). The book also outlines how EPA can integrate sustainability considerations into decision-making, in which the decision-makers can select a sustainability indicator to track specific outcomes of the decision (EPA, 2019). Therefore, it is plausible that managing, protecting, and restoring environments through providing relevant information for strategic decision-making towards a prosperous future may be pertinent.

3.2.1 Sustainability and the significance of COP-21

There is an urgent need to accelerate international sustainable development and advance the green economy (COP-21 Paris, 2015). Business leaders, government, public bodies, and the United Nations (UN) steering the transition to a greener economy emphasised multi-trillion dollar project prospects in reacting to climate change at the Forum on Sustainable Innovation held during the COP-21 Paris Climate Summit (UNEP, 2015). The 2015 COP-21 was charged with achieving a universal, legally binding climate agreement (COP-21 Paris, 2015). The outcome of COP-21 created an environmental agreement (Kampmark, 2015; Kollar, 2015) that set the world on a pathway toward limiting temperature rise to less than two degrees (United

Nations Climate Change [UNIC], 2015). Accordingly, the COP-21 new agreement underwrites ample support for emerging countries and creates a worldwide objective to improve climate change adaptation significantly through international cooperation (UNCC, 2015). Hence, the COP-21 new agreement is a dynamic, ambitious, and universal agreement that contains a transparent framework that builds confidence and mutual trust globally (UNCC, 2015).

In acknowledging the significance of the COP-21 international climate negotiations in Paris, the Accounting Bodies Network (ABN) has urged the global leaders (governments) to hasten climate change action by creating a strong global agreement and outlining how the accounting profession can help businesses build corporate resilience (A4S, 2023). Therefore, the COP-21 new agreement may serve as a crucial step in raising funds, providing technological support, and building capacity for sustainable energy development, which offers opportunities to promote economic growth, lessen economic inequality, improve health, and raise living standards.

3.2.2 Sustainability and the significance of COP-27

Recently, the UN Climate Change Conference (UN COP-27) was held in Sharm el-Sheikh, Egypt, in November 2022, where countries gathered to take action towards attaining the Paris Agreement's global climate targets as agreed upon (UNCC, 2022). While the 2015 Paris Agreement establishes a framework for global action on offering climate funds to developing nations (Zielinski, 2022), this support became a reality with the COP-27, which ultimately produced a historic result as developed countries finally agreed to finance developing nations to deal with the damage and loss caused to the environment and handle the effects of climate change beyond the adaptation limitations (Cox & Sura, 2022).

In light of the present energy crisis, the COP-27 climate summit reaffirmed the world's commitment to combating climate change (ClimateChangeCommittee, 2022). However, when world emissions remained at record high levels, governments made no progress in stepping up efforts to address the underlying causes of climate problems. The authors concluded that COP-27's "Together for Implementation" initiative has failed to increase ambition and accelerate the emissions reduction pace (Cox & Sura, 2022).

3.3 THE DEFINITION OF SUSTAINABLE DEVELOPMENT

A commonly accepted definition of sustainability was provided in the Brundtland report, which defines sustainable development as meeting the needs of the present without impeding future generations' ability to meet their own demands (United Nations [UN], 1987). Likewise, Hall, Daneke, and Lenox (2010) define sustainable development as targeting the efficient and productive use of scarce resources for the welfare of current and upcoming generations without compromising the upcoming generations' ability to fulfil their desires. Accordingly, sustainable development requires companies to make proper decisions about their business operations concerning social and environmental performance and simultaneously enhance the quality of the environment and society where companies operate (CIPFA, 2004). According to this definition, conserving the environment and using resources efficiently requires integrating economic, social, and environmental concerns into policies and programs (Wolters & Danse, 2002). Therefore, sustainable development may be relevant as it continually strives to achieve economic, social, and environmental progress in such a way that will not deplete the earth's finite natural resources.

Accordingly, Kim, Ko, Xu, and Han (2012) argue that sustainable development presents a chance to enhance a company's image and is integrated into the governance and operational mandates of various protuberant international bodies (Drexhage & Murphy, 2010). However, despite the commitment and recognition of sustainable development principles, action has not progressed past the fringes and has certainly not resulted in the fundamental adjustments required to facilitate the shift to sustainable development (Drexhage & Murphy, 2010). Hence, more sustainable development pathways may be needed. This may require high-quality information that will pave the way towards sustainable development.

3.4 SUSTAINABILITY ACCOUNTING

Sustainability accounting entails enhancing company decisions and providing sustainability reports to increase shareholders' value (Lamberton, 2005). Sustainability accounting, therefore, aims to optimise decision-making processes for quantifiable indicators of social and environmental impact factors (Burja, 2012). Furthermore, sustainability accounting entails integrating sustainability activities into company strategy, assessing opportunities and risks and providing tools for measurement,

accounting, and performance management for sustainability to become a part of the business's daily operations (American Institute of Certified Public Accountants [AICPA], 2015). Sustainability accounting supports corporate economic, social, and environmental performance by generating, analysing, and using monetarised social and environmental-related information (Sigma, 2003). However, monetarised environmental information presents a narrow representation of sustainability accounting (Sigma, 2003).

Meanwhile, a comprehensive definition recognises monetary and physical information's significance in performance assessment (Verghese, Lewis & Burritt, 2008). Hence, measuring eco-efficiency involves both financial (monetary) information to calculate the numerator and non-financial (physical) information on the environment to calculate the denominator (Stevanović & Petrović-Ranđelović, 2012). Furthermore, a combination of physical and monetary information will allow the calculation of eco-efficiency and eco-effectiveness for planning, controlling, and decision-making (Verghese et al., 2008). Afterwards, companies can develop comprehensive internal decision-making policies, matching and supporting stakeholders' demands (Epstein, 2008). Therefore, it is plausible that petroleum companies may need to integrate eco-efficiency measures into their activities for effective management decision-making.

Several studies investigated sustainability accounting concerning monetary and physical measurements to enhance financial management (Taplin, Bent & Aeron-Thomas, 2006; Schaltegger & Wagner, 2006; Stevanović & Petrović-Ranđelović, 2012). These studies show that sustainability accounting is needed to incorporate and enhance the goal of sustainability for effective management decision-making. Nonetheless, Unerman, Bebbington and O'Dwyer (2007) noted that companies could benefit from sustainability accounting by obtaining more precise information to enhance internal decision-making reporting and manage stakeholder expectations. Accordingly, UNDSO (2002) claimed that companies could use sustainability accounting to manage environmental and social costs and generate cost information for corporate decision-making. In general, sustainability accounting aims to deliver better information to support sustainable initiatives and performance. Therefore, sustainability accounting may be a valuable tool to help petroleum companies become more sustainable.

The above explanation and benefits of sustainability accounting led to the following content propositions:

- **Content Proposition 15 (Pc15):** Sustainability accounting may assist companies in integrating eco-efficiency measures into their activities for effective management decision-making.
- **Content Proposition 16 (Pc16):** Sustainability accounting information may enhance companies' internal decision-making and manage stakeholder expectations.

3.5 CARBON ACCOUNTING

Carbon accounting is becoming more relevant in various user decision-making processes (He et al., 2021). Carbon accounting aims to collect the right information, organise it properly, and use the information to inform company decisions (Jonkers, 2022). The need for carbon accounting grows as many companies face increasing pressure from stakeholders like investors, advocacy groups, legislators, and even company executives to reduce their greenhouse gas (GHG) emissions (Kaplan & Ramanna, 2021). Beck et al. (2020) acknowledge that the petroleum industry significantly contributes to global carbon emissions, accounting for approximately 42%. The industry faces many challenges due to the need to manage its emissions more efficiently (PwC, 2023).

Consequently, the industry is under increasing pressure to make informed decisions on managing its emissions by shifting to a clean energy transition (IEA, 2020). However, reducing emissions in the petroleum industry is a complex challenge (Kolaczowski et al., 2021), as the industry is highly energy-intensive and several processes are challenging to decarbonise. Therefore, petroleum companies may utilise carbon accounting information to identify the most significant sources of emissions and prioritise efforts to reduce them.

3.5.1 Carbon Management Accounting (CMA)

The growth of environmental awareness, especially through carbon management accounting techniques, commonly known as CMA systems (Zvezdov & Schaltegger, 2015, as cited in Nartey, 2018), plays a crucial role in offering accurate carbon information and effectively managing carbon performance (Burritt et al., 2011 as cited in Prajogo et al., 2023). The creation and use of CMA practices aid companies in

realising the informatisation of carbon emission management and enhancing the effectiveness of using both internal and external carbon assets (Wang & Xia, 2022). CMA is a sub-part of carbon accounting (Mahmoudian et al., 2021), which generates both long and short-term carbon data to aid management decisions regarding carbon emission matters (IPCC, 2014).

Gibassier and Schaltegger (2015:346) define CMA as the recognition, evaluation (monetary and non-monetary), and monitoring of greenhouse gas emissions at all stages of the value chain, as well as the recognition, evaluation, and monitoring of these emissions' consequences on ecosystem carbon cycles. The approach involves gathering and classifying the appropriate carbon information, which assists companies in making decisions and finding places to improve (Jonkers, 2022).

Within the context of this research, CMA is more closely related to EMA. It is part of sustainability accounting (Nartey, 2018), which enables companies to account for and manage their carbon emissions by providing information on the sources, the processes that contribute, and the impact of these emissions on the environment (Farbstein & Buggie, 2022; IBM, 2023). Furthermore, Nartey (2018) argues that CMA is designed to provide information regarding carbon dioxide (CO₂) release management (Nartey, 2018). In this way, CMA has developed as a practice to assist companies in making better decisions about carbon-related matters (Tsai et al., 2012). Hence, CMA may be described as an information-driven strategy that allows decision-makers to improve sustainability transformation initiatives (Jonkers, 2022).

3.5.2 Carbon Management Accounting Information

Managing GHG emissions at the corporate level is a relatively new challenge, and accounting is a key part of lowering GHG emissions (Mahmoudian et al., 2021). One of the primary challenges that companies face in reducing their carbon footprint is a lack of information (Gardes-Landolfini & Natalucci, 2022). Without accurate information on emissions, it is hard to identify the most significant sources of emissions or track progress towards reduction targets (Campbell, 2022).

Sphera (2021) acknowledges that carbon accounting information enables companies to measure, track, and identify GHG emissions by revealing their production and absorption locations. Furthermore, He et al. (2021) acknowledge that carbon information can be used to evaluate GHG reduction efforts, track corporate climate

risks, and support investment decision-making. Therefore, CMA may serve as the missing link in decision-making by providing information that companies in general and petroleum companies in particular need to make informed decisions on how to determine the most significant sources of emissions, reduce their carbon footprint, improve their environmental performance, and achieve their sustainability goals while maintaining profitability.

The above explanation and benefits of CMA lead to the following content propositions:

- **Content Proposition 17 (Pc17):** CMA information may assist petroleum companies in identifying their emission sources and prioritising efforts to reduce them.
- **Content Proposition 18 (Pc18):** CMA may generate short- and long-term carbon information to aid management decisions on carbon-related matters.
- **Content Proposition 19 (Pc19):** CMA information may be used to evaluate GHG reduction efforts, track corporate climate risks, and support investment decision-making.

3.6 WATER ACCOUNTING

Water has emerged as a top strategic concern for companies worldwide amid concerns about increasing water shortages, insufficient water to meet basic human requirements, degraded ecosystems, problems with human health, and the effects of climate change (Morrison et al., 2023). This has called for a strong business argument for companies to use corporate water management to reduce water-related effects (Morrison et al., 2023). Accordingly, Mahmud et al. (2022) maintained that concern about water stems from the lack of responsibility, transparency, and dependability in sustainable water management, which can be addressed by effecting water accounting. Hence, clean water management may be analysed using water accounting (Elmahdi, 2019).

Water accounting refers to the systematic quantitative valuation of the state and patterns in the demand, supply, accessibility, allocation, and use of water in specific domains, creating information that guides water science, governance, and management to support social and environmental sustainability (FAO, 2016, 2018). According to Morrison et al. (2010), water accounting is the study and practice of delivering information to enhance water management by companies. Hence, the

importance of water to the global economy equals that of information on oil (Hundertmark et al., 2020), as all companies in every industry depend on water in some way to continue to survive (Larson et al., 2012; Hundertmark et al., 2020). Furthermore, according to Copas (2022), the oil and gas industry uses hundreds of millions of barrels of fresh water daily, demonstrating the importance of water in producing petroleum.

The water problem is the reverse of the carbon issue. When demand and supply for water are out of balance, the complex environmental, social, and financial ecosystems we rely on are at risk (Hundertmark et al., 2020). Christ and Burritt (2017) acknowledge that accounting needs to be enhanced due to the lack of detailed information that enables companies to make informed decisions regarding water surpluses, scarcity, and opportunities for water management. The authors argue that companies need access to relevant information to manage water resources in a way that assists them in making effective, efficient, enough, and consistent decisions. Therefore, the current need for water management has made it imperative to carefully plan how to manage water, which gave rise to Corporate Water Management Accounting (Morrison et al., 2010; Sahin et al., 2015).

3.6.1 Water Management Accounting (WMA)

The WMA is an expansion of the EMA designed to support a company's management decisions and enhance water-related business outcomes on both an economic and environmental level (Christ & Burritt, 2017). It can be defined as providing and analysing both financial and non-financial information in order to aid management in water management decision-making (Olusanmi et al., 2021). In addition, water accounting provides managers with information to evaluate company risks associated with water management (Tingey-Holyoak & Pisaniello, 2019), facilitating decision-making (Escriva-Bou et al., 2020).

Water accounting allows stakeholders such as investors and consumers to analyse and evaluate the water risks and impacts of various companies in order to make informed decisions and take appropriate actions (Morrison et al., 2023). Likewise, companies can use effective water accounting to assess the effects of their indirect and direct water usage and discharges on communities and ecosystems (Morrison et al., 2010:11, cited in Burritt & Christ, 2017). Therefore, efficient WMA is crucial to

corporate water management for cleaner production; it enables companies to identify significant water-related hazards, monitor the effects of alterations to their water management procedures, and accurately report their effects and trends to relevant parties (Morrison et al., 2023). Therefore, WMA may be a useful practice for petroleum companies to combat and enhance sustainable water management.

The above explanation and benefits of WMA lead to the following content propositions:

- **Content Proposition 20 (Pc20):** WMA may generate and analyse financial and non-financial information to support management in making water management decisions.
- **Content Proposition 21 (Pc21):** WMA may provide information for managers to evaluate company risks associated with water management.

3.7 ENERGY AND ENERGY EFFICIENCY

Energy is one of the utmost important components of a company's production process, and stakeholders are increasingly paying attention to it. It is the primary driver of global economic growth, and the foundation for human prosperity and development (Almagtome et al., 2020a). Similarly, in the case of companies, energy usage is inevitable despite knowing how damaging it is to the environment regarding its release of GHGs (Sidik et al., 2019). Since energy significantly impacts companies' environmental footprint and financial costs, management accounting is under increasing pressure to control and monitor energy costs (Christensen & Himme, 2016). In light of this, energy efficiency was brought to the forefront as an efficient system to manage energy by regulating energy use and seeking to lower energy costs, which in turn lessens a company's environmental impact and enhances its corporate image.

Almagtome and Abdlazez (2021) assert that understanding the elements of energy costs and efficiently managing energy efficiency is essential to assist decision-makers and managers in conducting critical analyses and developing efficient cost management by delivering information covering all energy aspects. Accordingly, Setiawan and Izzaty (2021) acknowledge that energy efficiency is using energy smartly and carefully that does not reduce the energy needed to support growth. Hence, enhancing sustainable energy efficiency is essential to meeting the sustainable development goals (SDGs) at all scales since it reduces GHG emissions that are harmful to the environment (Almagtome et al., 2020a).

Furthermore, Almagtome et al. (2020a) claimed that energy efficiency measurement is one of the most efficient ways to provide information for decision-making on the degree of reliance on fossil fuels and to increase industrial companies' competitiveness while enhancing energy sources' long-term security. Similarly, Razmjoo et al. (2019) argue that energy efficiency measurement is crucial to achieving sustainable development as energy experts and decision-makers methodically prepare to carry out required policies, such as gradually decreasing fossil fuel usage and substituting for renewable energy. Therefore, it may be essential to have an energy reporting system that provides the information required for effective energy management and promotes sustainable energy efficiency.

To reach this goal, many nations and significant multinational companies have started to focus on saving energy and reducing emissions (Almagtome et al., 2019). Most nations and other stakeholders, such as accounting professional groups, have started to recognise the significance of accounting for energy resources (Su, 2019). Therefore, accounting for energy may be charged with providing stakeholders with the energy efficiency information needed for making energy-related decisions.

3.7.1 Energy Accounting

For companies to use energy resources as efficiently as possible, they need to move away from the traditional (conventional) perception of accounting as a system that provides valuable information for making economic decisions and adopt a system that can be applied to various purposes. To accommodate new accounting goals like energy conservation and sustainable energy, energy accounting was developed to provide information on a company's consumption of various energy sources (Almagtome et al., 2020a).

Energy accounting and reporting is a subset of EMA, a subset of sustainability accounting (Burrill et al., 2021a). It is a new branch of accounting that integrates the methods and theories of both economics and accounting to measure and account for energy, mainly to manage and control energy costs, budgeting for pollution prevention and treatment, and maximising energy conservation and emissions reduction benefits (Almagtome & Abdlazez, 2021). This specialised discipline was designed to assist management in addressing emissions and waste, along with the finite availability of natural resources, as energy use and availability should be highly sustainable and

have economic significance (Burritt et al., 2021a). Therefore, energy accounting may be used in managing and controlling energy costs to contribute efficiently to a substantial decrease in the cost of energy.

Energy accounting goals are to enhance company energy efficiency and keep track of the environmental effects of all energy-consuming activities. Su (2019) asserts that energy accounting is designed to provide useful information to accomplish three (3) fundamental functions: energy management and control, treatment and prevention of toxic substances, and energy savings and emission reduction. Meanwhile, Almagtome et al. (2020b) refer to energy accounting as calculating, analysing, and communicating daily energy consumption. Similarly, Bhattacharyya (2019) defines energy accounting as a balanced system for recording, analysing, and reporting energy costs and consumption information. Accordingly, Almagtome and Abdlazez (2021) maintain that energy accounting is a standard information system that documents, categorises, measures, analyses, and reports energy consumption. In addition, it improves the system's effectiveness by tracking the environmental effects of all sorts of energy-consumption activities (Almagtome & Abdlazez, 2021). Therefore, energy accounting may be referred to as a management approach that quantitatively tracks energy use, relates usage to key independent variables, and evaluates energy efficiency over time and against relevant metrics.

3.7.2 Energy Accounting information for driving greener decision-making in the Petroleum Industry

The petroleum industry accounts for a substantial portion of the world's energy consumption (CFI, 2023). In addition, petroleum product production processes require substantial energy from the exploration phase to the finishing refining and transportation phase (Farajzadeh et al., 2022). Evolving energy consumption and pricing outlooks are reshaping the petroleum industry (Ernst & Young, 2023). To attain sustainable growth in the industry, accurate information on the amount of energy consumed and its effects on the environment should be provided to management (Almagtome et al., 2020a).

Management's desire for information about and control over company energy consumption, efficiency, losses, and costs leads to energy accounting methods (Bierer & Götze, 2012). Identifying and analysing the overall energy-related usage and losses

to calculate the costs associated with the company's undesired and desired energy flows to fulfil these demands is crucial. This lays the groundwork for energy-related information provision for planning, monitoring, and management purposes. Detailed information on energy usage, losses, and costs can be used to identify energy inefficiencies and potential savings. Burritt et al. (2021a) argue that energy accounting can provide stakeholders with needed physical and monetary information about energy use for accountability. Therefore, energy accounting may provide the information required to improve energy efficiency and drive cost savings in the petroleum industry.

Accordingly, energy accounting provides information by tracking and evaluating energy consumption and costs within a system or a company (Siva, 2023). The author recognises that energy accounting information is used to monitor energy consumption, identify inefficient areas, and implement strategies that reduce energy consumption and costs. Likewise, Bierer and Götze (2012) admit that energy accounting information is critical for identifying energy-saving opportunities and/or enhancing environmental decision-making. As such, energy accounting information can be employed to strengthen economic analysis and understand the value-added nature of petroleum companies' operations (Grassian & Olsen, 2019). Therefore, energy accounting information may be essential for making greener investment decisions, as it may allow petroleum companies to assess the energy cost exposure and energy benefit rewards of a project before committing significant resources.

The above explanation and benefits of energy accounting led to the following content propositions:

- **Content Proposition 22 (Pc22):** Energy accounting may be used in managing and controlling energy costs.
- **Content Proposition 23 (Pc23):** Energy accounting may provide the physical and monetary information required to improve energy efficiency and drive cost savings in the petroleum industry.
- **Content Proposition 24 (Pc24):** Energy accounting information may be critical for identifying energy-saving opportunities and/or enhancing environmental decision-making.

3.8 MATERIAL FLOW COST ACCOUNTING (MFCA)

In recent years, an EMAP has been invented globally, known as Material Flow Cost Accounting (MFCA). It is an EMAP that measures and tracks the inventory and flow of various materials within a company, including raw materials, water, energy, auxiliary materials, and chemical catalysts, in physical units and assesses the costs related with these material flows in monetary units (ISO, 2011). The MFCA approach differs from the conventional manufacturing cost of production, which enables companies to track inventory efficiency through material waste control (Arieftiara et al., 2021). With MFCA, companies can identify improvement opportunities for material consumption and cost accrual by combining physical and monetary information (Walz & Guenther, 2020). Therefore, MFCA may combine ecological and economic goals to promote less wasteful or more effective material use.

MFCA is a practice that companies use to improve material efficiency and is standardised through ISO 14051 (Christ & Burritt, 2016). It keeps track of the physical flows and inventories of the materials in the process and estimates the cost of those materials by multiplying their quantity by their unit price (Walz & Guenther, 2020). Tachikawa (2015) acknowledges that the MFCA can be applied to any industrial scope and field and is not restricted to a certain industry or company size. The author claims that through MFCA, companies can lower costs by minimising material waste, improving energy efficiency, and maximising material efficiency. Therefore, MFCA is generally recognised as being entrenched with broader benefits and roles that companies may leverage in minimising costs, improving energy efficiency, and maximising material efficiency.

3.8.1 Material Flow Cost Accounting for decision-making

Management accounting and EMA emphasise providing companies with information to support internal decision-making (ISO, 2011; Farhood et al., 2023). MFCA aims to support current environmental management and management accounting practices by providing the information needed for internal decision-making (ISO, 2011). Several studies have addressed MFCA's significance because it assists in visualising waste (Kitada et al., 2022). According to Qu et al. (2022), MFCA is a valuable practice in managing intricate resources and streams of waste. Likewise, Kitada et al. (2022) describe MFCA as a practice that simultaneously encourages cost and environmental

impact reduction through increased resource efficiency. Therefore, MFCA may support material flow-oriented analyses and decision-making to enhance resource and cost-efficiency in the petroleum industry.

Furthermore, MFCA seeks to offer information to decision-makers regarding the chances of lowering material use and enhancing companies' economic performance (Huang et al., 2019; Tran & Herzig, 2020). The information obtained via MFCA can catalyse companies and managers to seek possibilities to maximise economic benefits while minimising adverse environmental effects (ISO, 2011). Additionally, companies can optimise material and energy efficiency through MFCA information by concentrating on material waste. Hence, MFCA information encourages companies to decide how to evaluate investments, choose alternative raw materials, and examine product designs (Kokubu & Tachikawa, 2013, as cited in Arieftiara et al., 2021). As a result, MFCA improves decision-making processes and enhances profitability (Arieftiara et al., 2021). Therefore, MFCA's information may enable effective monitoring of improved environmental performance, which is crucial for making decisions. In this case, MFCA may assist petroleum companies in improving their environmental and economic performance through waste reduction, energy consumption improvement, and improved accountability and decision-making.

The above explanation and benefits of MFCA information led to the following content propositions:

- **Content Proposition 25 (Pc25):** MFCA may assist petroleum companies in improving economic and environmental performance through energy usage improvement and improved decision-making and accountability.
- **Content Proposition 26 (Pc26):** MFCA may assist petroleum companies in improving decision-making processes and enhancing profitability.

3.9 THE PERCEPTION SURROUNDING SUSTAINABILITY AND DECISION-MAKING

The word sustainability and its implications for business decisions have received growing recognition since the matter first became a topic two decades ago; as such, many companies have incorporated the sustainability concept as a core business value (Bennett, Schaltegger & Zvezdov, 2013; Pacas, 2021). It is becoming widely acknowledged that sustainability poses an ethical concern and directly affects

economic performance implications, consequently impacting the professions that support businesses (Bennett et al., 2013). The authors maintained that sustainability management has created the need for new information supporting managerial decisions. Accordingly, Schwarz et al. (2002) stressed that incorporating the goal of sustainability into management decision-making processes is an excellent way for a company to achieve environmental and economic performance. Hence, sustainable development may be relevant to the business and reliable for decision-making, even in the petroleum industry.

Within sustainable development, every stakeholder is a provider and user of information for decision-making, and the demand for adequate information emerges at all levels, ranging from high-level decision-makers at national and global levels to the individual at grass-roots levels (DSD, 2021). As such, investments in sustainability should be more linked to business and social benefits and, at the same time, assist companies in meeting societal and environmental expectations and obligations (Christenson & Platko, 2014). Furthermore, Winograd and Farrow (2009) claimed that the impact and consequences of ecological functions, natural resources, and societal development had triggered the need for sustainable development. However, access to and availability of adequate information to measure and monitor environmental development are still lacking (Winograd & Farrow, 2009). Therefore, improving or reforming the decision-making process to ensure that environmental and socio-economic considerations are fully integrated may be pertinent.

Efforts towards sustainability and providing adequate information to make sustainable business decisions have been broadly recognised (IFAC, 2011). Today, companies make decisions involving sustainability-related trade-offs, and individuals also make sustainability-related decisions, which have significant implications on profits, the environment and society (Arvai, Campbell-Arvai & Steel, 2012). Hence, companies should put sustainability at the heart of decision-making (Lim, 2014). Furthermore, according to research published by the Securities and Exchange Commission (SEC), investors support environmental-related disclosures because investors need and use reliable extra-financial (environmental) information to analyse companies' performance and inform investment decisions (SEC, 2022). As such, sustainability information is a key tool that supports short-term operational requirements and meets senior management's ad hoc needs (Bennett et al., 2013). The authors commented

further on the increasing demands for information and noted that an increase in demands and standardisation of its provision indicates a growth in the use of sustainability information for planning and daily business management. Therefore, the need to provide relevant environmental information to support sustainability-based decision-making may be pertinent.

Conversely, Winograd and Farrow (2009) confirmed that professionals are rarely able to provide decision-makers (environmental managers/sustainable development experts) with reliable and adequate information on the benefits and costs of development or on social growth towards sustainability. They stressed further that using inadequate information in routine decision-making hinders effective, sustainable development. Accordingly, Bonvoisin (2009) confirmed that inadequate information leads to poor decisions, and without adequate information, changing concepts into action will not be possible. However, the need for sustainable development concerning information adequacy and decision-making aids that lead to the necessary transformations may need to be addressed to achieve the goal of sustainability to be incorporated into management decision-making.

3.10 REGULATORY CONCEPT OF ENVIRONMENTAL SUSTAINABILITY

Sustainability issues are becoming progressively important for companies worldwide (Epstein-Reeves, 2012; Quintos, 2020). These issues are driven as companies face mounting pressure from legislative bodies to reduce their environmental impact (Pember, Lemon & Gould, 2014). The authors acknowledge further that limiting this impact often requires companies to change how they conduct their businesses, causing a major impact on their company. Therefore, it might be in the interest of petroleum companies to handle environmental sustainability programmes efficiently and effectively.

From a regulatory perspective, an increase in the demands of environmental regulation is pressuring companies to modify their operations since so many nations now compel them to measure and disclose their environmental-related activities (Doody, 2010). The author emphasises further that companies cannot avoid environmental sustainability issues, as they need to consider the influence of environmental regulation on their operations. In the same way, Li, Simunic and Ye (2018) argue that environmental regulation can create a compliance risk in many

industries. Likewise, PWC (2013) admits that regulation is essential to establish certain types of beneficial commercial exchanges that would not otherwise take root and flourish. The new regulations, laws and public expectations have raised the bar for governance and compliance to the extent that executives worldwide now recognise that their companies must maintain strong, effective, and dependable governance and compliance systems and employ them (PWC, 2013). Hence, the scope of regulation now appears to be rising, as companies around the globe are being scrutinised by regulators, with plans for new regulations and incentives in a broad range of industries (PWC, 2013). Accordingly, Harrison (2002) emphasised that coercive law and regulation from the government may play a significant part in regulating companies' activities. In addition, the literature on regulation advocates that the government is acting in the public's interest by influencing companies' activities through rules and legislation (Sarker & Monroe, 2012). However, for sustainability-based decision-making to be successful, adequate information and guidance may be required, especially within the petroleum industry.

According to Bouma (2000), EMA implementation should reinforce the efficacy of government rules by showing the real environmental costs that those regulations enforce on the companies. Sulanjaku (2013) comments that the government could use environmental-related information from companies for both decision-making and policy formation. Likewise, Newman and Bach (2004) investigated how regulations influence environmental investment decisions. They found that regulatory factors significantly influence decision-making about environmental investments. Foulon, Lanoie and Laplante (2002) also examined how companies that used pollution prevention strategies were affected by environmental information strategies and regulatory factors. The findings revealed that environmental legislation provides extra and profound inducements for companies to accept greener pollution control policies in the presence of environmental information policies.

Sarker and Monroe (2012) also examined how information and regulations impacted environmental investment decision-making. They found that the decision to invest in the environment is strongly influenced by regulatory influence and an information strategy. They suggest that the impact of regulations and the environmental information strategy could be a highly effective social control method for companies that seek to incorporate ethical and environmental factors into their investing

decisions. Therefore, the regulatory system may need to stand like a normal standard for companies to operate in, as an adequate level of environmental regulations may support environmental impact-related decisions within petroleum companies.

The above discussion on government regulations leads to the content proposition:

- **Content Proposition 14 (Pc14):** Coercive law and regulation from the government may play a significant role in regulating petroleum companies' activities.

3.11 SUSTAINABLE DEVELOPMENT IN THE NIGERIAN PETROLEUM INDUSTRY

Nigeria is known as one of the top petroleum exporters in the world (EIA, 2021). The country is ranked 11th globally for oil production and 6th in the Organisation of Petroleum Exporting Countries (OPEC) (OPEC, 2021; EIA, 2021). The petroleum industry remains Nigeria's leading and the highest generator of the Gross Domestic Product (GDP) since petroleum was discovered in commercial quantities in 1956 (Omofonmwa & Odia, 2009; Anyanwu, 2012). Petroleum, as the bedrock of the economy, plays a dynamic role in modelling the economy by generating almost 95% of total revenue from petroleum exports (Ejibunu, 2007; Ajiboye, Jawande & Adisa, 2009; Agwu, 2013). However, Nigeria's high dependence on petroleum exploration and exploitation that boosts the economy has caused substantial impacts on the environment (Okafor, 2011). Eregha and Irughe (2009) further stressed that continuous petroleum exploration and exploitation in Nigeria has resulted in environmental destruction due to the petroleum companies' activities and attention to environmental impacts. Hence, attention may be required to protect the environmental implications of the exploration and exploitation activities to promote sustainable development in the petroleum industry.

It is considered that most Nigerian businesses have not consigned their sustainable vision towards effective environmental management. This may be related to a lack of knowledge or poor commitment towards environmental management and protection (Adegbite et al., 2012). As a result, the petroleum companies' environment suffers a high-level of environmental impurity (Ukhurebor et al., 2021) since environmental matters were not incorporated into petroleum prospecting investment and planning (Anyanwu, 2012). Anyanwu (2012) stressed further that the petroleum industry's

contributions to environmental degradation and pollution in Nigeria are relatively substantial and potentially harmful to human health due to environmental pollution and contamination, and the consequential results may be due to an absence of adequate information on the scope of the environmental activities in the petroleum industries.

Similarly, Iniaghe, Tesi and Iniaghe (2013) and Ukhurebor et al. (2021) acknowledge that the environment is severely ruined as a result of unsustainable activities (such as crude oil spillage during exploitation and transportation) by petroleum companies. Environmental consequences of petroleum companies' activities, with particular emphasis on oil spillage and sustainable development in Nigeria, have been substantial (Bello & Nwaeke, 2020). Therefore, attention may be required to safeguard the environment during petroleum operations, which, in turn, may promote the development of a sustainable Nigerian petroleum industry.

3.12 AN ENVIRONMENTAL LEGISLATIVE FRAMEWORK AND REGULATIONS IN THE NIGERIAN PETROLEUM INDUSTRY

Environmental matters have turned out to be a transnational issue which unites environmental integrity and development (Anyanwu, 2012; Ndinwa, 2013). Attention has been drawn to the devastating effect of the unrestrained utilisation of environmental resources since the release of the Environmental Standards and Guidelines for the Petroleum Industry (Ajayi et al., 2014). The Department of Petroleum Resources (DPR) issued standards and guidelines which outlined programmes and agendas to ensure environmental control in the petroleum industry (Ajayi et al., 2014; Aziza, 2020). In compliance with Nigeria's Environmental Guidelines, standards, legal and administrative framework, Environmental Impact Assessment (EIA) has become a standard procedure in project planning and environmental activities. However, the Nigerian petroleum industry involvement suggests that not much progress has been made in preserving the environment. Hence, the need to enable a mechanism whereby adequate monitoring is undertaken to realise effective environmental management may be appropriate.

The first response to Nigeria's need for environmental protection was the abandonment of toxic waste in Koko in 1987 (Nesrea, 2023). Prior to the unlawful disposal of toxic waste in Koko village, there were no mechanisms or institutional

arrangements for protecting the environment and enforcing environmental regulations in the nation (Anyanwu, 2012).

Following the Koko waste incident, numerous environmental rules aim to manage, control, and guide natural resource exploitation (Nesrea, 2023). The Harmful Waste Decree '42' of 1988 was released by the Nigerian government, marking the beginning of the environmental policy and laws in the country with the creation of the Federal Environmental Protection Agency (FEPA) through Decree '58' of 1988 (Benebo, 2011; Nesrea, 2023). At that time, FEPA was assigned to improve and protect Nigeria's environment (Nesrea, 2023). The 1988 Decree was revised in 1992, expanding the scope of FEPA's authority over preserving natural resources and enhancing its capabilities to become "the supreme reference authority in environmental matters in Nigeria" (Adelegan, 2004:6).

In reacting to environmental issues, a document aiming to protect the environment in Nigeria was established in 1992, named The EIA Decree No. 86 of 1992. To enforce environmental regulations, laws, and standards effectively in Nigeria, the National Environmental Standards and Regulations Enforcement Agency (NESREA) was created to substitute the FEPA Act (Nesrea, 2023). The aforementioned signifies that Nigeria has a wide range of contemporary policies that should promote sustainable growth (Asokoroogaji, 2011). Nigeria has implemented extensive measures to enhance environmental sustainability regulations by issuing procedural guidelines and decrees. Yet, environmental challenges are still noticeable and becoming more severe in the Nigerian petroleum industry, which includes regulatory instability, inadequate infrastructure, and price inefficiencies (PWC, 2021).

Recently, the Nigerian government has made significant efforts towards addressing environmental and sustainable development issues. Among the initiatives implemented was decommissioning the current DPR and replacing it with the Petroleum Industry Act (PIA) in 2021. Before the PIA, the petroleum industry had four (4) major regulations, and most of the regulations and laws were outdated and inconsistent with current industry and economic conditions (PWC, 2021). PIA comes into effect at a pivotal point to provide the regulatory, financial, and governance framework for change (PWC, 2021). Hence, the PIA is responsible for addressing and simplifying the fiscal and regulatory challenges that have thrown the industry, and it is anticipated that the PIA will spur investment (PWC, 2021). Although PIA is claimed to

offer improved incentives and regulations for the petroleum industry, Nigeria should take additional steps in providing an appropriate regulatory framework, infrastructure, and a proper investment level for environmental change and industry growth.

According to Ogunkan (2022), Nigeria has policies and environmental governance frameworks that are less effective at achieving sustainable environmental management. Consequently, environmental challenges in the country may not be dealt with as the regulations are not often enforced (Budnukaeku & Hyginus, 2021). Therefore, developing a framework that will provide adequate environmental information through EMAPs for greener decision-making in the Nigerian petroleum industry may be pertinent.

3.13 DEVELOPMENT OF THE CONCEPTUAL FRAMEWORK

This section presents and discusses the conceptual framework. This section summarises and outlines the EMAPs and government regulatory content propositions. Accordingly, the researcher's illustration of the conceptual framework that provides adequate environmental information through EMAPs for greener decision-making in the Nigerian petroleum industry is presented in Figure 3.1 (p. 60).

3.13.1 The EMAPs conceptual development

Several accounting practices have been developed in response to the need for adequate information to manage environmental-related costs and improve economic performance and the environment. Bennett and James (1998, as cited in ACCA, 2022a) recognise that EMA collects environmental-related data, which is processed into information for managers' use through practices and processes. Likewise, Gunarathne et al. (2020) highlight that accounting systems like EMA provide information to companies that are useful for tracking financial and environmental performance and providing information on environmental costs. Meanwhile, ACCA (2022a) asserts that EMA is part of the environmental accounting framework incorporating physical and monetary data for management's use. EMA has different practices to measure and generate information on physical and monetary units. These are called EMAPs.

Towards the provision of adequate environmental information for greener decision-making in the petroleum industry through the lens of sustainability, a comprehensive literature review of EMA, CMA, WMA, SA, EA, MFCA, and government regulations

and policies was done. EMAPs were chosen as they generate both monetary and physical information, which could promote economic and environmental performance within the petroleum industry and greener decisions. Therefore, EMAPs' literature was reviewed, and content propositions were derived and integrated into designing the conceptual EMA framework that provides adequate environmental information through EMAPs for greener decision-making in the Nigerian petroleum industry.

3.13.2 The government regulatory conceptual development

Companies are under growing scrutiny from regulatory authorities and stakeholders to adopt prudent environmental initiatives as concerns about environmental issues grow (Mady et al., 2022). As a result, the government may need to promote EMA adoption using various institutional strategies. Institutional pressure from regulatory authorities reinforces conformity or non-conformity acts through policies and regulations and sends precise signals to businesses with deterrent and rigid traits (Ashton et al., 2017, as cited in Ma et al., 2022; Wei, 2021). According to Wang et al. (2019), governments may impose sanctions and penalties on non-compliant companies to deter illicit activities and promote greener practices.

The government and other regulators may persuade decision-makers to embrace environmental management initiatives through various forces, leading to greener business practices in the petroleum industry. Hence, government regulations and policy literature were reviewed, as petroleum companies may have to adhere to environmental regulations. Content propositions were derived from the literature and integrated into designing the conceptual framework that provides adequate environmental information through EMAPs for greener decision-making in the Nigerian petroleum industry.

3.13.3 Summary of the content propositions

As indicated in Chapters 2 (the context, theoretical lens, and management accounting for the environment) and 3 (sustainable development and the environment), 26 qualitative content propositions, depicted with Pc1, Pc2, Pc3, Pc4, Pc5, Pc6, Pc7, Pc8, Pc9, Pc10, Pc11, Pc12, Pc13, Pc14, Pc15, Pc16, Pc17, Pc18, Pc19, Pc20, Pc21, Pc22, Pc23, Pc24, Pc25, and Pc26, were formulated on the strength of observations and findings in the literature. The content propositions Pc1-Pc8 and Pc15-Pc26 centre around the EMAPs discussed in the literature to facilitate adequate environmental

information for greener decision-making in the Nigerian petroleum industry in response to the research objectives (RO1 and RO2), while the content propositions Pc9-Pc14 were centred around the government regulatory system in response to research objective (RO3). Accordingly, these propositions were included in designing the framework for environmental information through EMAPs in the Nigerian petroleum industry in response to the research objective (RO4). Table 3.1 summarises the 26 propositions.

Table 3.1: Summary of the content propositions

	Propositions Number	Content Propositions Description
ENVIRONMENTAL MANAGEMENT ACCOUNTING	Proposition 1 (Pc1)	EMA may provide the necessary information for petroleum companies to make informed, greener decisions, thereby improving their economic performance and environmental profiles.
	Proposition 2 (Pc2)	EMA may serve as a strategic business tool for petroleum companies in managing environmental risks.
	Proposition 3 (Pc3)	EMA may provide relevant environmental information through MEMA and PEMA to assist petroleum companies in making environmentally friendly decisions.
	Proposition 4 (Pc4)	EMA may be a powerful tool that assists decision-makers in reducing environmental impacts and enhancing environmental performance.
	Proposition 5 (Pc5)	EMAPs may act as a key driver for petroleum companies' management to develop a system that provides physical and monetary information required for environmental performance.
	Proposition 6 (Pc6)	EMA may play a vital role in handling environmental matters by providing adequate environmental information needed to control and reduce the effects of the petroleum industry on the environment.
	Proposition 7 (Pc7)	EMA implementation may improve greener decision-making by tracking environmental-related cost information in the petroleum industry.

	Propositions Number	Content Propositions Description
	Proposition 8 (Pc8)	EMA may provide decision-makers with the relevant information to address existing and future environmental problems and identify new cost-saving opportunities while improving environmental performance.
GOVERNMENT REGULATORY	Proposition 9 (Pc9)	Government agencies may exert institutional pressure to improve the petroleum industry's environmental performance.
	Proposition 10 (Pc10)	Government and other regulators may significantly influence the management of the petroleum company in creating a strategy to capture environmental costs.
	Proposition 11 (Pc11)	Institutional pressures (like government regulations) may significantly and positively influence the implementation of EMA.
	Proposition 12 (Pc12)	Government and other regulators may enact laws and regulations that oblige petroleum companies to specific accounting procedures and practices (for example EMAPs).
	Proposition 13 (Pc13)	Institutional forces (like government regulations) may assist petroleum companies in adopting best practices that improve company performance and encourage greener decision-making.
	Proposition 14 (Pc14)	Coercive law and regulation from the government may play a significant role in regulating petroleum companies' activities.
SUSTAINABILITY ACCOUNTING	Proposition 15 (Pc15)	Sustainability accounting may assist companies in integrating eco-efficiency measures into their activities for effective management decision-making.
	Proposition 16 (Pc16)	Sustainability accounting information may enhance companies' internal decision-making and manage stakeholder expectations.
	Proposition 17 (Pc17)	CMA information may assist petroleum companies in identifying their emission sources and prioritising efforts to reduce them.
	Proposition 18 (Pc18)	CMA may generate short- and long-term carbon information to aid management decisions on carbon-related matters.

	Propositions Number	Content Propositions Description
CARBON ACCOUNTING	Proposition 19 (Pc19)	CMA information may be used to evaluate GHG reduction efforts, track corporate climate risks, and support investment decision-making.
WATER ACCOUNTING	Proposition 20 (Pc20)	WMA may generate and analyse financial and non-financial information to support management in making water management decisions.
	Proposition 21 (Pc21)	WMA may provide information for managers to evaluate company risks associated with water management.
ENERGY ACCOUNTING	Proposition 22 (Pc22)	Energy accounting may be used in managing and controlling energy costs.
	Proposition 23 (Pc23)	Energy accounting may provide the physical and monetary information required to improve energy efficiency and drive cost savings in the petroleum industry.
	Proposition 24 (Pc24)	Energy accounting information may be critical for identifying energy-saving opportunities and/or enhancing environmental decision-making.
MFCA	Proposition 25 (Pc25)	MFCA may assist petroleum companies in improving economic and environmental performance through energy usage improvement and improved decision-making and accountability.
	Proposition 26 (Pc26)	MFCA may assist petroleum companies in improving decision-making processes and enhancing profitability.

Objective 1: Identify the relevant environmental management accounting practices (EMAPs) that can provide environmental information to the petroleum industry for greener decision-making.

The framework below was conceptualised from the literature review as the study addresses objective 1.

Conceptual Environmental Information Framework for Decision-Making

(Enhanced greener decision-making through EMAPs)

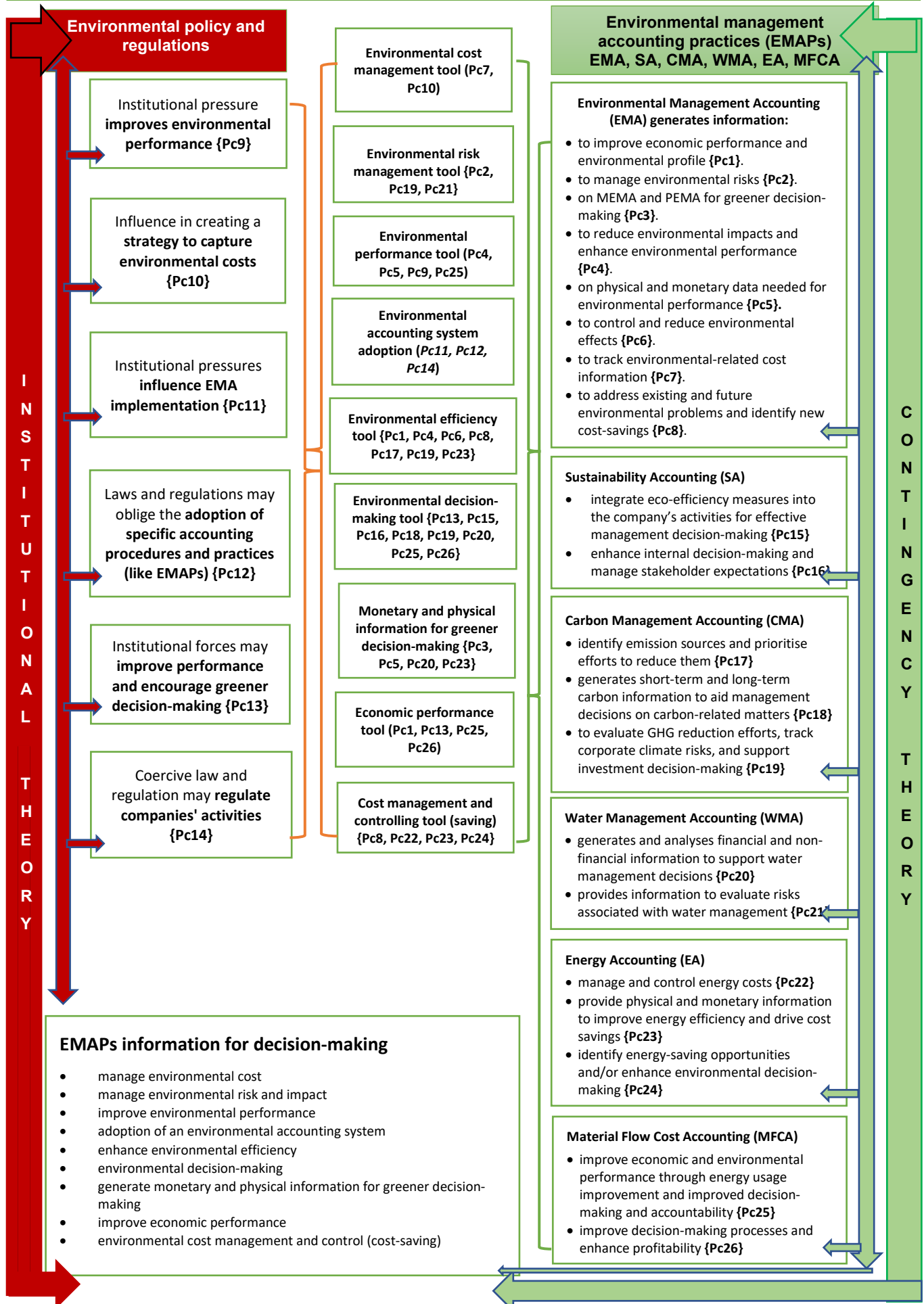


Figure 3.2: The conceptual Environmental Management Accounting Information Framework for greener decision-making in the Petroleum Industry

The Conceptual Environmental Management Accounting Information Framework for greener decision-making in the petroleum industry illustrated in Figure 3.2 (p. 60) outlines the types of information contained within EMAPs for greener decision-making. Also, it highlights government regulations in terms of their roles in providing environmental policies and guidelines for improving the quality of environmental information that can be used to make a decision.

3.14 CHAPTER SUMMARY

This chapter critically reviewed the relevant literature on sustainable development, SA, CMA, WMA, EA, MFCA, regulations, and the environmental legislative framework in the Nigerian petroleum industry. EMAPs (SA, CMA, WMA, EA, and MFCA) generate, analyse, and use physical and monetary environmental information to improve corporate performance and promote transparency in material usage within the petroleum industry. Therefore, integrating sustainability considerations into business activities includes incorporating environmental, economic, and social activities.

Meanwhile, the leading companies are now inculcating these factors (environmental, economic, and social) into their decision-making processes, bearing in mind the benefits of sustainability accounting, which assists in providing information flows to support decision-making procedures. An effort towards improving social and environmental performance requires flows of information to support the management of sustainability matters. However, it is evident that environmental and social information needed to support decision-making processes is not readily available. Although a few companies' information on environmental performance may be accessible, decision-makers still lack environmental information since they can seldom integrate environmental-related information into economic factors. Therefore, companies may need to incorporate sustainability concerns into their decision-making practice; this is done by taking a formal and systematic approach towards ensuring that adequate information to promote decision-making is readily available.

From the chapter, it is evident that business culture and society, in general, are changing due to the present recognition that companies and governments are committed to the importance of sustainability. Meanwhile, the Nigerian government

has made significant efforts towards addressing its environmental and sustainability issues by taking several steps to develop policies on environmental sustainability. However, environmental issues are still noticeable, mainly in the petroleum industry. Hence, the need for improving sustainable development in Nigeria is imperative, largely because of the country's dependence on the development of the petroleum industry for its economic growth. Therefore, integrating sustainability through EMAPs into their decision-making practice among the petroleum companies in Nigeria may ensure that adequate information to support decision-making is readily available.

The research design and methodology are presented in the next chapter.

CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY

4.1 INTRODUCTION

The previous chapter discussed sustainable development, regulations, and environmental legislative frameworks in the Nigerian petroleum industry. This chapter addresses the research design, introduces the philosophical assumptions underpinning this study, outlines the research strategy, and presents the applied empirical methods. Hence, this chapter describes and explains the methodology deployed and clarifies the grounds for choosing the methodology used. The researcher administered a questionnaire at the NNPC to obtain primary data from participants. To mitigate bias, qualitative and quantitative research methods of data collection, namely a questionnaire, an extensive literature review, and a focus group, were used to validate the enhanced framework developed. The questionnaire and focus group allowed the researcher to consolidate the study's findings and enhance the framework developed in the study. The research onion provided by Saunders et al. (2023) was employed to give direction and depict the variety of choices, strategies, approaches, time horizons, philosophies, techniques and procedures employed during the research (Figure 4.2, p. 65).

4.1.1 The goal of this chapter

The chapter presents the research method adopted in this study. The primary research techniques employed are discussed and described to solve the research problem systematically.

4.1.2 The layout of the chapter

This chapter outlines the research methodology employed, as shown visually in Figure 4.1. An introduction to the research methods begins the chapter in Section 4.1. The research design is addressed in Section 4.2. Accordingly, in Section 4.3, the ethical considerations are discussed. Section 4.4. provides the chapter summary. The layout is represented in Figure 4.1 (p. 64).

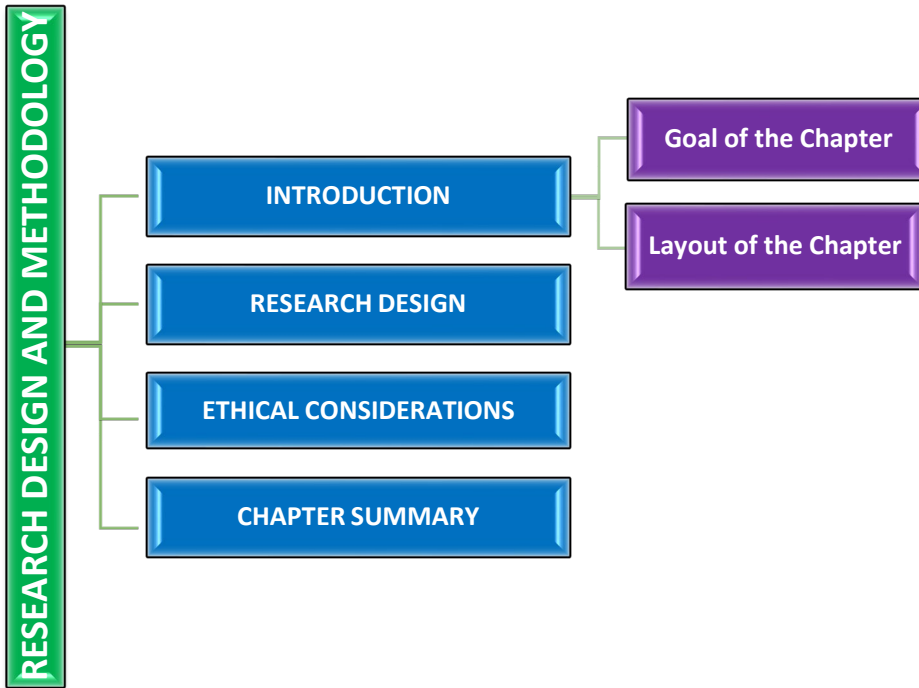


Figure 4.1: A visual representation of the layout of Chapter 4

4.2 RESEARCH DESIGN

A research design outlines the broad strategy that researchers devise to address the research topic (Saunders et al., 2023) and provides the connection between a practical and a theoretical finding from empirical evidence or alternative techniques like a survey (Frankfort-Nachmias, Nachmias, & DeWaard, 2014). Therefore, the research design plays a crucial and significant part in management and business inquiries, as well as in many other fields (Al Kindy, Shah & Jusoh, 2016).

To define the steps of the research process (philosophical and methodological stances) taken, the research onion developed by Saunders et al. (2023) was used as a basis for describing the logical processes behind the philosophical presumptions and the approach that led to the choice of a specific strategy and techniques employed in the research.

Saunders et al. (2023) describes a research process as an onion, with several layers that need to be peeled back to reveal the centre or the core of the onion. The model is broken down into three (3) tiers of decisions: the first two (2) outer rings, that is, research philosophy and approach; the second outer ring is the research design, which includes (i) methodological choices, (ii) research strategy and (iii) time horizon; and the third is techniques and procedures, which is, the centre layer of the research

onion, that includes data gathering and analysis facets. The research structure is built on these layers, as shown in Figure 4.2 below.

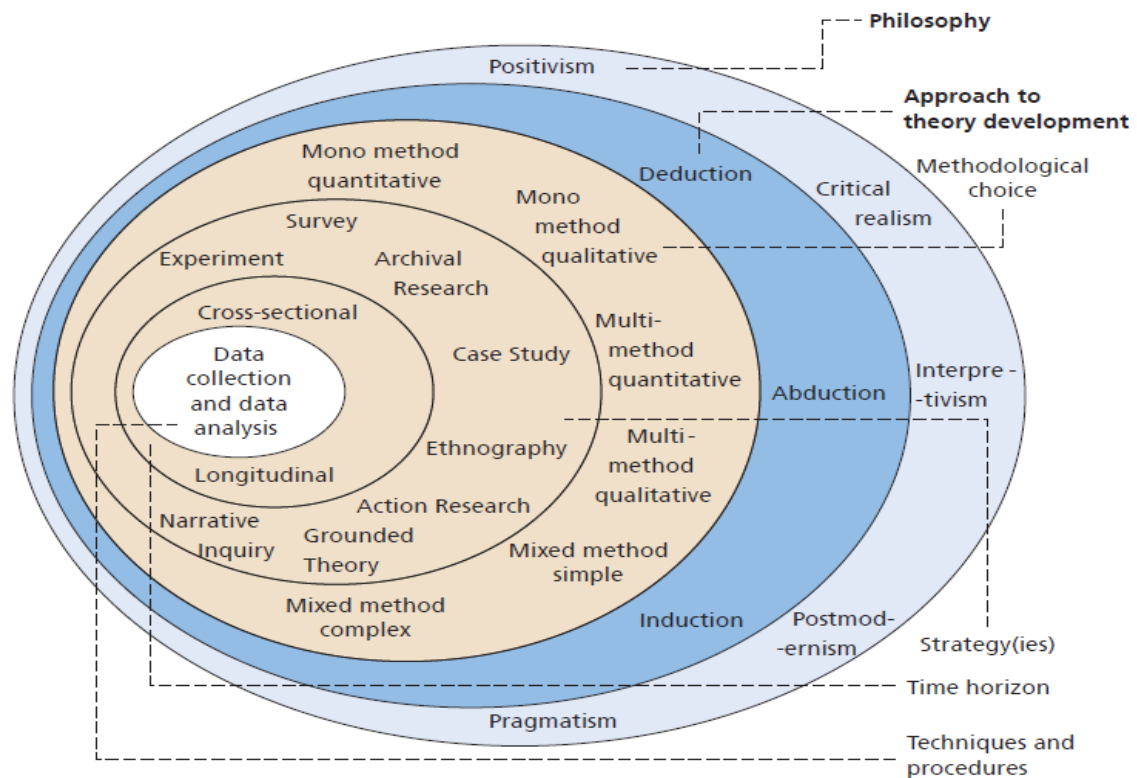


Figure 4.2: Research onion

Source: Saunders et al. (2023)

4.2.1 Research philosophy

Saunders et al. (2023) refer to the research paradigm/philosophy as a term that applies to knowledge development and the type of knowledge in a specific field. The authors further acknowledge that there are three different perspectives on research philosophy: axiology, epistemology, and ontology, and for each of these perspectives, there are four (4) distinct philosophies to consider: positivism, interpretivism, realism, and pragmatism. These philosophies influence how the investigator views the research process (Saunders et al., 2023).

On the positive side of this research philosophy, unlike the interpretivism and positivism research philosophies, pragmatism can incorporate several research strategies and methods into a single study. The main data obtained through pragmatic studies may be linked to a high level of validity because the data in such studies tend to be honest and trustworthy. In conclusion, for this study, using the pragmatism

philosophy is suitable for conducting a thorough investigation on whether the current MAS in the petroleum industry offers a relevant flow of environmental information needed for making decisions and examining the environmental regulations' effectiveness in the Nigerian petroleum industry. Therefore, pragmatism was employed in this study. Two instruments were developed: the first for the structured questionnaire and the second for the focus group. The focus group validated the preliminary framework developed to source unbiased opinions from the NNPC. The framework was enhanced in light of feedback received through the validation process.

4.2.2 Research approach

Saunders et al. (2023) emphasise that three (3) methods can be employed to conduct research, including inductive, deductive, and abductive. According to the authors, a deductive approach employs the study of literature to identify propositions and theories by utilising a research technique specifically designed to test them. However, the inductive approach entails data collection and theory development as a consequence of investigator data analysis. Finally, the third approach is abductive, combining deductive and inductive methods (Saunders et al., 2023).

Based on the approaches suggested by Saunders et al. (2023), a primary inductive approach was employed through a broad review of scholarly literature to develop a conceptual framework. Subsequently, a secondary deductive approach was employed to validate the developed framework through a focus group.

4.2.3 Research strategy

A research strategy is defined as a blueprint that outlines the researcher's method of answering the research question (Saunders et al., 2023). As suggested in the research onion by Saunders et al. (2023), a few of the most common research strategies include archival research, case studies, experiments, grounded theory, action research, surveys, and ethnography. Based on the methodology employed, some strategies are more suitable than others. This study employed a survey strategy through a questionnaire and a focus group.

4.2.3.1 Surveys

Surveys are one of the most considerable measurement areas in applied social research, with various measuring techniques that involve asking respondents questions (Trochim, 2021). A Likert scale is a popular tool for gathering data for

surveys. It measures attitudes and requires respondents to select from a range of propositions, from strongly agree to strongly disagree (Saunders et al., 2023). The respondent typically selects a response from a group of five (5) assertions, with a weight assigned to each statement to allow the researcher to conduct statistical analysis (Zikmund, 2003). In the quantitative section of the study, a Likert scale that adopted a five-point scale was used instead of a seven-point scale. A five-point scale was chosen since it lessens the respondents' level of discomfort and boosts the number and rate of responses (Prayag, 2007).

4.2.3.2 Justification for the survey strategy

According to Shuttleworth (2008), conducting meaningful and accurate surveys is one of the most essential facets of research. The author states further that accurate research can quickly solve a research problem. Accordingly, Mitchell and Jolley (2007) emphasise that using a survey is a simple way to collect a significant amount of information for research. Furthermore, Zikmund (2003) argues that the survey has gained acceptance as an accurate and scientific means of collecting data to quantify obtained information. Hague (2002) acknowledges that conducting a survey is a simple, quick, and economical method to collect data about a population sample. Hence, the survey strategy was appropriate for this research.

4.2.4 Choices

The research onion by Saunders et al. (2023) highlighted mono-method, multi-method, and mixed methods as choices in research. As its name implies, the mono-method uses a single research methodology, whereas the mixed-method uses two (2) or more methodologies and typically combines quantitative and qualitative methodologies. This research used a mixed methodological choice, integrating quantitative and qualitative methodologies.

4.2.4.1 Mixed method and the triangulation design

According to Creswell and Poth (2017), a mixed method is an approach used to gather, analyse, and combine both qualitative and quantitative data at certain phases of the research process within a single study, and this is to understand a research problem better. Creswell and Poth (2017) acknowledge further that neither quantitative nor qualitative methodologies effectively capture the details and trends of the situation in complex research studies. Hence, mixed methods have been prolific in analysing data

from various sources and enhancing the interpretation between the qualitative and quantitative choices. Therefore, both text and numerical data collected concurrently or sequentially can assist in understanding the research problem. This research employed a mixed method to gather company responses to the adequacy of EMA's information generated within the NNPC for decision-making.

The triangulation approach minimised bias because each of the three (3) approaches possesses unique advantages. To eliminate bias, qualitative and quantitative research methods of data collection, namely, a comprehensive review of scholarly literature, a structured questionnaire with closed-ended questions, and a focus group to validate the preliminary framework developed theoretically, were applied. The choice of the selected method can be justified based on the ability of the method to integrate both qualitative and quantitative data collection and analysis in one single study to generate new knowledge. Therefore, the method's comprehensiveness increased the confidence in the findings. Likewise, the variation in the collection of data procedure leads to the greater validity of the data collected. Accordingly, the principal justification for the mixed methods is pragmatism. Triangulation is associated with this pragmatic justification, which refers to using multiple techniques to study a research question to boost confidence in the results (Bryman, 2016). The researcher used mixed methods to gather and analyse data and triangulation for credibility, thereby eliminating social bias and providing reliable research results and findings. Therefore, implementing mixed methods in this study may create flexibility, reliability, and trustworthiness in the data collection procedure and improve confidence in the research outcomes.

4.2.5 Data collection and data analysis

The research instrument used to obtain the quantitative data was a structured questionnaire in this research section. The questionnaire is a prearranged collection of statements envisioned to solicit data from respondents to meet particular needs. Hence, to obtain data that accurately met the research's objectives, a questionnaire was administered to determine whether the MAS used at the NNPC offers a relevant flow of environmental information needed for making decisions. Also, the questionnaires addressed the environmental regulatory standards in the company. This study also followed a qualitative approach; the instrument employed in this phase of the research to gather data was a focus group. Packer (2011) acknowledges that a qualitative choice is equally suitable for support when quantitative studies cannot fully

explain a phenomenon in research. This choice was justified because, while quantitative data and results would present an overall picture of the research problem, qualitative data and analysis would enhance and interpret these statistical results by delving deeper into the participants' perspectives (Kokkinaki, 2010). Hence, a focus group was conducted, to validate the developed framework.

4.3 QUANTITATIVE RESEARCH

According to Creswell and Poth (2017), quantitative research tests the theory's objective by evaluating the relationship between variables, which can be measured with instruments to analyse the numerical data through statistical processes. Creswell and Poth (2017) admit that quantitative research should use a representative population sample to draw statistically significant conclusions about the population. In quantitative research, surveys, questionnaires, and experiments are used to gather data (Hittleman & Simon, 1997), and the gathered data are converted to numerical data and analysed using statistical methods (Polit & Beck, 2021).

4.3.1 Quantitative population

Blumberg et al. (2014) recognise a population as a whole set of elements from which a researcher intends to draw some conclusions. The institution selected for the research population is the Nigerian National Petroleum Corporation (NNPC). This institution was chosen because it is the largest petroleum company and the largest asset holder in the Nigerian petroleum industry. The company has a substantial presence in the petroleum industry. Established in 1977, NNPC is a state-owned corporation responsible for petroleum exploration, production, refining, and marketing (EITI, 2024). Its extensive reach and control over the nation's oil and gas resources position it as the cornerstone of Nigeria's petroleum sector. NNPC's asset base is unparalleled in the Nigerian petroleum industry. The corporation controls vast reserves, infrastructure, and financial resources that dwarf those of other players in the sector. NNPC's assets are estimated to be valued at approximately \$60 billion and provide over 48% of total revenue for this country from the oil and gas sector (Dougas, 2023). In terms of employees, NNPC has the largest workforce in the country, with over 7,338 permanent employees and a large number of contractors (Jeremiah, 2022). This dominance underscores the corporation's capacity to influence industry standards, drive economic growth, and shape environmental practices. Therefore,

focusing on enhancing environmental management accounting information within NNPC is not only necessary but also critical for promoting sustainability and mitigating the adverse environmental impacts of the petroleum industry in Nigeria. Hassan (2014) acknowledges that an accessible and a target population are two (2) types of population in research.

Meanwhile, Polit and Beck (2021) make a distinction between the accessible population and the target population; the accessible population refers to all cases that meet the established criteria and are available to the researcher as a pool of participants, while the target population consists of all the cases that the researcher wishes to generalise about. The target population for this research comprised managers and decision-makers in the financial, management, and environmental departments within NNPC. Sampling, the benefits and drawbacks of the purposive sampling method, the criteria set for including respondents in the sample, and the sampling method used in this study are discussed below.

4.3.2 Quantitative sampling

Sampling involves choosing units from a participating population so that the results of the selected sample can be properly extrapolated to the population from where they were originally chosen (Trochim, 2021). The researcher employed purposive sampling to select the participants, and this is discussed below.

4.3.2.1 Purposive sampling method

Purposive sampling was used to identify the target population and is a method that involves choosing participants based on the population's knowledge and the research's objectives (Crossman, 2014). The researcher used expert judgment in selecting participants who represented the population. This sampling method was employed because it is reliable in delivering the typical information required for collecting substantial volumes of information using various methods, providing the researcher with a broader range of information (Wilkinson, 2023). Purposive sampling was also more economical and convenient than other sampling techniques (Brink et al., 2018). This sampling method aims to ensure that representative or typical participants who could provide the needed information are selected, as proposed by Krishnaswamy et al. (2009). The suitable participants were identified and contacted by the researcher.

Furthermore, a permission letter (Appendix C) was obtained from the NNPC. Respondents were prompted to sign the consent form before taking the survey (questionnaire in Appendix A). Accordingly, the participants were notified that involvement was optional, that they may opt-out at any time, and that their responses would be kept confidential.

4.3.2.2 Sample size

A sample size of 250 managers and decision-makers was chosen based on their job descriptions to ensure a broad spectrum of representatives. The targeted employees are financial accountants, environmental managers, and management accountants at the NNPC. This subset of employees is particularly relevant because they are the ones most involved in strategic decision-making and are likely to have in-depth knowledge and experience related to environmental management accounting. Managers and decision-makers at NNPC play a crucial role in implementing environmental management practices and are likely to share similar knowledge and perspectives on EMA, making a slightly smaller sample still representative of the population. Hence, focusing on 250 respondents ensures that the study captures significant insights from those directly involved in decision-making processes. Brink et al. (2018) argue that the larger the sample size, the better the quantitative research results. Hence, the selected sample size was considered large enough, as Polit and Hungler (1993) recommend, who argue that researchers should use the largest sample possible when using quantitative research methods since a larger sample will enhance the representativeness of the results. However, the researcher could ascertain that only 246 respondents provided complete feedback, with irregular patterns of omitted responses to some questions. Hence, the 246 (98.4% of administered questionnaires) sample size is sufficient to provide reliable and generalizable results while ensuring the study remains manageable and ethically sound.

4.3.2.3 Inclusion criteria for a respondent to be considered in the sample

The researcher determined that for participants to be included in the study, they needed to possess the following attributes:

- The participants should currently be staff members of NNPC.
- The participants should be managers or decision-makers in the financial, management, and environmental disciplines.

- The participants should be willing to take part in the study.

4.3.3 Quantitative data collection

Data collection involves collecting and analysing information on relevant variables reliably and methodically so that one may provide answers to targeted study questions, test theories/hypotheses, and assess results (Ori, 2022). Meanwhile, Sekaran and Bougie (2020) acknowledge that information required for research can be gathered from various contexts and sources, like questionnaires, interviews, site observations, and other motivational strategies like the projective test. Among all data collection instruments available, the questionnaire method was adopted in the quantitative section due to its applicability and to enhance the study's realism. Ryan, Scapens and Theobald (2002) argue that the questionnaire is the easiest method to collect data in MA and is the most suitable for studying a naturally occurring event when accessible information regarding the research subject is not readily accessible. As such, a structured questionnaire (with closed-ended questions) was used to collect information for the quantitative part of this research.

4.3.4 Questionnaires

A questionnaire comprises a set of statements carefully developed to obtain data and information for analysis; the results are employed to address the research problems or test hypotheses (Asika, 2002). Yates (2004) observes that a questionnaire remains the most common data collection method as it is cost and time-efficient and can have either open- or closed-ended questions. Ghauri and Grønhaug (2003) noted that the questionnaires employed by researchers could be administered to respondents electronically, in person, or via mail, depending on their location. However, Sekaran and Bougie (2020) acknowledged that physically administered questionnaires are typically a reliable technique to gather information when the survey is confined within a small region, and the companies are capable and willing to put together groups of employees to answer the questions at their place of employment. As such, structured questionnaires were personally administered to the employees of the NNPC.

4.3.4.1 The design of the questionnaires

To obtain data that accurately satisfies the research objectives, a questionnaire was administered to determine whether the current MAS used within the NNPC delivers a

relevant flow of environmental information needed in decision-making and to examine the efficiency of existing environmental regulations.

The research objectives, along with scholarly reviewed literature, assisted the researcher in designing the structured statements in the questionnaire. The structured statements were categorised into five (5) sections to collect information from the targeted employees (Financial Accountants, Environmental Managers, and Management Accountants) of the NNPC. Section A covers the demographic data of the respondents. The respondents were required to provide broad information about themselves (for example, gender, level of education and time in service). This demographic information about respondents is considered essential since it affects the quality and reliability of the questionnaire response (Ferreira et al., 2010). Section B was designed to examine the nature of MATs within the NNPC concerning EMA usage and reporting. Section C aimed to gather more details about the type of data generated by the used practices. Section D was developed to explore if the environmental information generated within the NNPC is adequate for decision-making. Finally, section E was developed to gather information on regulatory and environmental policy issues.

The questionnaires were designed in that some statements needed a response on a five-point Likert scale, ranging from strongly agree to strongly disagree, extremely high to extremely low, and extremely high to extremely low importance. The statements were not designed to prompt responses but to allow for some degree of response flexibility (Foddy, 1993). A cover letter detailing the purpose and significance of the research was attached to the questionnaire, along with detailed instructions on how to complete specific items. Respondents were guaranteed anonymity and given the choice to participate or not.

4.3.5 Quantitative data analysis

Data analysis is the systematic process of employing logical and/or statistical methods for describing, explaining, illustrating, and evaluating data (Ori, 2021). The three (3) concurrent processes of action that constitute data analysis are data reduction, visualisation and verification, and conclusion drawing (Miles et al., 2014). In the quantitative section of this study, the data analysis began after receiving the questionnaire feedback from the targeted key staff. In a study, data analysis starts with

the commencement of data gathering; besides the analysis during this time, a prolonged phase of immersion occurs after the data collection (Streubert & Carpenter, 1999). Data analysis began after all the data had been collected. First, however, data needs to be organised and prepared for interpretation to analyse the data adequately.

This research employed correlation analysis and ordinary least squares (OLS). The research question and the objectives influenced the choice of data analysis. According to Farahani et al. (2010); and Kilmer and Rodríguez (2017), the ordinary least squares regression estimate model is specified by determining the equation that minimises the sum of the squared distances between the values predicted by the equation and the data points in the sample. An OLS regression assumes that the regression coefficients are linear, all predictors are uncorrelated with the residuals, the residuals should not be correlated with each other (serial correlation), the residuals have a constant variance, the predictor variables must not be perfectly correlated with one another (avoiding multicollinearity), and that the residuals are normally distributed.

The study required the construction of some variables by using multiple corresponding analyses (MCA). It is crucial to specify that these variables are categorical. The tools used for the analysis include Stata (version 15) for the quantitative analysis and manually computed thematic analysis to mimic Atlas.ti for the qualitative study.

4.3.5.1 Application of Multiple Correspondence Analysis

The researcher applied multiple correspondence analysis (MCA). The research creates an index of the environmental report from categorical variables of the major physical environmental activities being captured within current accounting systems and of the major monetary environmental activities being captured within current accounting systems by using MCA. The MCA is a data restructuring method for a battery or number of categorical variables (Greenacre, 2010). The first part displays the normalised principal inertia and percentage of dimension. The latter part displayed statistics for column categories in standard normalisation. The study constructed an index for some variables such as policy, sustainability, physical environmental accounting information for greener decision-making, monetary accounting information, management accounting practices and environmental accounting systems (a composition of physical and monetary environmental information. To achieve the study

objectives, the study uses correlation analysis and ordinary least squares (OLS) (Verardi & Croux, 2009).

Model specification:

The functional form for the study objective two (2) can be expressed as:

$$Y_i = \beta_0 - \beta_1 X_{1i} + \mu_t$$

Where: Y_i denotes the environmental information required for greener decision-making; X_{1i} is the management accounting system; β_0 is the intercept; μ_t is the error term.

$$Y_i = \beta_0 - \beta_2 X_{2i} + \mu_t$$

Where: X_{2i} implies physical environmental information.

$$Y_i = \beta_0 + \beta_3 X_{3i} + \mu_t$$

Where: X_{3i} is the monetary environmental information; β_1 , β_2 , and β_3 are the slopes or coefficients of the independent variables.

The functional form for the study objective three (3) can be expressed as:

$$S_i = \beta_0 + \beta_1 E_{1i} + \beta_2 E_{2i} + \beta_3 E_{3i} + \mu_t$$

Where: S_i denotes the sustainability; E_{1i} represents the Environmental mission statement; E_{2i} is the Environmental value statement; E_{3i} is the Sustainability report.

4.3.6 Quantitative Data Interpretation

The quantifiable data from the questionnaires were analysed for consistency and coded. The coded questionnaires were entered into the Statistical Package, Stata software for analysis. The choice of Stata was since datasets in the social sciences are easily translated into Microsoft® Excel and imported into Stata, which invariably reduces the basic activities needed to explore the data. Descriptive statistics were employed to analyse the data, and the results were presented using charts and tables.

4.3.7 Reliability

Reliability refers to an instrument's ability to consistently produce an error-free, stable result. Additionally, reliability refers to the quality of the procedures and processes used to replicate the results obtained from the study (Saunders et al., 2023). An analysis of reliability allowed the researcher to understand the attributes of

measurement scales and the elements that make up the scales (IBM, 2021). Cronbach's Alpha was employed in this study to measure internal consistency. Based on Cronbach's Alpha, researchers can see how closely the Likert scale items complement one another. Using Cronbach's Alpha as a measure of internal consistency, it takes values from 0 to 1, where 1 is the maximum value, which represents perfect internal consistency. A Cronbach's Alpha value greater than 0.7 is considered reliable compared to a value lower than 0.7 (Nunnally, 1978).

Meanwhile, a Cronbach's Alpha of 0.6 was recommended by Sekaran and Bougie (2020) as a suitable degree of internal consistency. Likewise, a Cronbach's Alpha of 0.7 and higher was suggested by other authors as acceptable internal consistency (Saunders et al., 2023). Hence, the current research has opted for an internal consistency of 0.7 or higher. To further validate the survey instrument and determine whether the items for a particular construct are representative, the researcher chose to apply content validity to the study. The content validity process is described in the next section.

4.3.8 Content validity

The main focus of content validity was the extent to which the chosen items assessed the subject of interest (Saunders et al., 2023). When determining content validity, only two approaches are available, judgement and statistics, but their application varies from study to study (Torkzadeh & Dhillon, 2002). To establish content validity, the researcher adopted a judgmental approach, which entailed comprehensive literature reviews and follow-ups with an expert judge's evaluation. The questionnaire was developed from the literature review process to ensure that the scale includes most items necessary to measure the concepts of interest. Additionally, the researcher supervisor, who has extensive experience in the area of study, played a crucial role in ensuring the content validity of the measuring tool by examining the questionnaire questions and comparing them with the study's objectives.

4.4 QUALITATIVE RESEARCH

The qualitative research was conducted to validate the conceptual environmental management accounting information framework for greener decision-making in the petroleum industry developed in the study through follow-up focus group questions. The justification for the method is that while quantitative data and results will present

a broad overview of the research problem, the qualitative data and analysis will amplify and clarify these statistical results by closely examining the respondents' opinions (Kokkinaki, 2010). Hence, a focus group was subsequently set up to validate the developed framework.

4.4.1 Focus group

A focus group effectively gathers users' feelings, opinions, and suggestions about an issue, product, or topic (Krueger & Casey, 2015). Hence, a focus group interview is conducted by engaging in a group conversation with respondents who are of interest to the researcher. To validate the proposed conceptual framework, the study employed a focus group. The focus group included managers (Financial Accountants, Management Accountants, and Environmental Managers) representing a crucial focus point when using environmental information for decision-making at the NNPC. The findings obtained from the focus group were used in validating and enhancing the preliminary framework developed.

4.4.2 Qualitative (focus group) data analysis

A thematic analysis was used to analyse the focus group data, where themes were produced from the focus group transcripts, and codes were generated from the focus group extract, as suggested by Kiger and Varpio (2020). Finally, the focus group assisted the researcher in consolidating the study's findings and validating and enhancing the developed framework.

4.4.2.1 Establishing trustworthiness

Trustworthiness is a method that researchers employ to convince readers and themselves of the worthiness of their research findings (Lincoln & Guba, 1985). Guba's trustworthiness model was used in the research. This model specifies four (4) strategies and criteria for assuring and establishing trustworthiness and is used to evaluate the qualitative research process. These include dependability (consistency), transferability (applicability), confirmability (neutrality), and credibility (truth value) (Polit & Beck 2021).

4.4.2.2 Credibility

The first criterion considered in determining trustworthiness is truth value, which reflects the researcher's confidence in the integrity of the data and its interpretation.

Credibility, as described by Lincoln and Guba (1985), plays a crucial factor in determining trustworthiness. Hence, credibility is used to determine the truth value in qualitative research. The researcher took the following actions to establish credibility:

- All respondents were taken through the same main questions.
- Interacted with the respondents and kept a precise record of all details.
- The specific data collection and analysis methods were drawn from widely used techniques.
- Respondents were allowed to deny participation or withdraw to ensure honesty while gathering data.
- Privacy and confidentiality were protected to promote sincere involvement.

4.4.2.3 Transferability

The second criterion considered in attaining transferability is applicability, which demonstrates how findings can be modified to different contexts, populations, and situations. According to Lincoln and Guba (1985), the researcher is accountable for ensuring that the research areas are adequately contextualised so readers can relate the findings to their situations. Hence, transferability is used to attain applicability.

The researcher took the following actions to attain transferability:

- A detailed description of the phenomenon under study is provided in the first chapter. This ensures that readers thoroughly comprehend the research event to make a transfer.
- Detailed descriptions of the research findings provide the reader with a relevant depiction of the studied phenomena.
- Information is provided on the study's boundaries, as proposed by Shenton (2004):
 - the nature and size of the organisations who participated in the study and their locations;
 - the number of respondents;
 - the method used to collect data;
 - limits on the respondents' profiles who provided the data.

4.4.2.4 Dependability

The third criterion considered in ensuring dependability is consistency, which focuses on the likelihood that studies will yield the same outcomes when replicated in a similar setting or with similar informants. According to Lincoln and Guba (1985), dependability and credibility are closely related, claiming that demonstrating the latter helps to ensure the former. Hence, dependability is used to ensure consistency.

The researcher took the following actions to ensure dependability:

- A detailed research methodological description was provided.
- The data were organised into categories and themes, and a thorough analysis was provided.

4.4.2.5 Confirmability

The fourth criterion considered in achieving confirmability is neutrality, which reflects the level at which the study's results are free of influence. Neutrality in qualitative research should consider the data's naturalness rather than emphasise the researcher's objectivity (Lincoln & Guba, 1985). Hence, confirmability is used to achieve neutrality.

The researcher took the following actions to achieve neutrality:

- Confirmability was achieved through the use of triangulation.
- A thorough methodological description was provided to enable closer scrutiny of the validity of the research findings.
- The data that were recorded were meticulously documented.

4.5 ETHICAL CONSIDERATIONS

In research, ethics has emerged as a keystone for carrying out meaningful and effective research. Research involves collecting data (Punch, 2014). Therefore, researchers should prepare for potential ethical concerns that may surface during research (Creswell & Poth, 2017). Conducting research requires not only diligence and expertise but also integrity and honesty, as these are the only ways to ensure human rights are recognised and protected. Researchers must safeguard the participants by establishing trust and integrity and guarding against impropriety and misconduct that could negatively affect the participant's company (Creswell & Poth,

2017). To establish the ethical conduct of this research, the study adhered to the principles of self-determination, anonymity, confidentiality, and informed consent.

A written letter giving permission (Appendix C) to conduct the research study was obtained from the NNPC head office in Abuja. Likewise, an ethical clearance certificate was obtained from the College of Accounting Sciences Research Committee at Unisa with Certificate Number 2016_CAS_002 (Appendix D).

Each participant's consent was obtained before being permitted to take the survey. According to Gray and Grove (2021), **informed consent** is the voluntary consent of a prospective subject to take part in a study after the assimilation of all the study's essential information. The participants were notified about the nature of the study by providing each participant with a participant information sheet. This sheet facilitated participants' understanding of the scope, objectives of the research, their involvement, and the utilisation of the outcomes upon study completion. Participants were informed that they could voluntarily consent to participate, decline to participate, or withdraw their involvement at any time with no penalty. Participants were guaranteed that no potential risks or costs were involved.

The researcher ensured that all required **anonymity** and **confidentiality** protocols were maintained throughout the research study. Gray and Grove (2021) define **anonymity** as the inability to link subjects' responses back to them, even by the researcher. To protect anonymity in this study, no names were associated with any of the responses or research reports, so anonymity was maintained. Accordingly, Polit and Hungler (1993) define **confidentiality** as the fact that no participant's identifying information will be publicly disclosed in a way that identifies the subjects. This study maintained **confidentiality** by maintaining the **confidentiality** of the collected data and by not revealing the identities of the subjects in its report or publication.

The last principle of ethics to consider is the autonomy principle, which denotes the need for full disclosure and **self-determination** (Polit & Beck, 2021). Hence, researchers should obtain informed consent before conducting research per the **self-determination** principle, which implies that respondents can participate or not participate in the study or cease to participate at any time. This study maintained the ethical principle of **self-determination**. The study participants were treated as autonomous representatives by informing them about the nature of the study and what

would be done with the outcomes once the study was completed, and by allowing the participants to voluntarily choose to participate or not.

Streubert and Carpenter (1999) state that the researcher should follow ethical guidelines when interpreting data and reporting results and findings. Therefore, the researcher should follow the suggested ethical guidelines and steps by reviewing data and keeping personal biases separate. In doing this, a researcher is guided by ethical standards in carrying out the research responsibly and ethically.

4.6 CHAPTER SUMMARY

The quantitative and qualitative research design, research populations and samples, data collection methods, and the motives for adopting mixed research were described in the chapter. A mixed research methodological choice was adopted. Accordingly, the quantitative data were collected by using a structured questionnaire to gather data from respondents. The structured questionnaire was designed, primarily with closed-ended questions, to gather data to explain and explore the adequacy of the information for making environmental decisions within the NNPC. The quantifiable information from the questionnaires was coded into the Stata software for analysis.

Qualitative data were obtained through a focus group to enhance and validate the developed framework. Accordingly, the qualitative information obtained through a focus group was analysed through thematic analysis, and the findings were employed to validate and enhance the developed framework.

The next chapter presents the results and the discussion relating to the quantitative phase of the study.

CHAPTER 5: QUANTITATIVE DATA ANALYSIS AND RESEARCH RESULTS

5.1 INTRODUCTION

The previous chapter critically explained and presented the methodology applied and clarified the rationale for the methodological choice for this study. The present chapter discusses the analysis of the quantitative data. The quantitative research results are presented concerning the quantitative parts of the second and third research objectives. Data were analysed to examine if the current MAS in use at the NNPC provides a useful flow of environmental information required for greener decision-making and to investigate if the environmental regulations in place for the Nigerian petroleum industry are effective. As such, this chapter reports on the empirical research conducted through a questionnaire, thoroughly analyses the research results, and relates this to the research objectives.

5.1.1 The goal of the chapter

The chapter's goals are to present the research data analysis and research results from the questionnaire administered at the NNPC. Therefore, the results of the quantitative phase were presented in a way that addressed the first two research objectives.

5.1.2 The layout of the chapter

This chapter presents the results from the questionnaires administered to the participants at the NNPC. Section 5.1 provides an overview of the quantitative phase. Accordingly, Section 5.2 discusses the quantitative results. The discussion of the data analysis follows in Section 5.3. Subsequently, in Section 5.4, a summary of the chapter is presented. The layout is represented in Figure 5.1 below (p. 83).

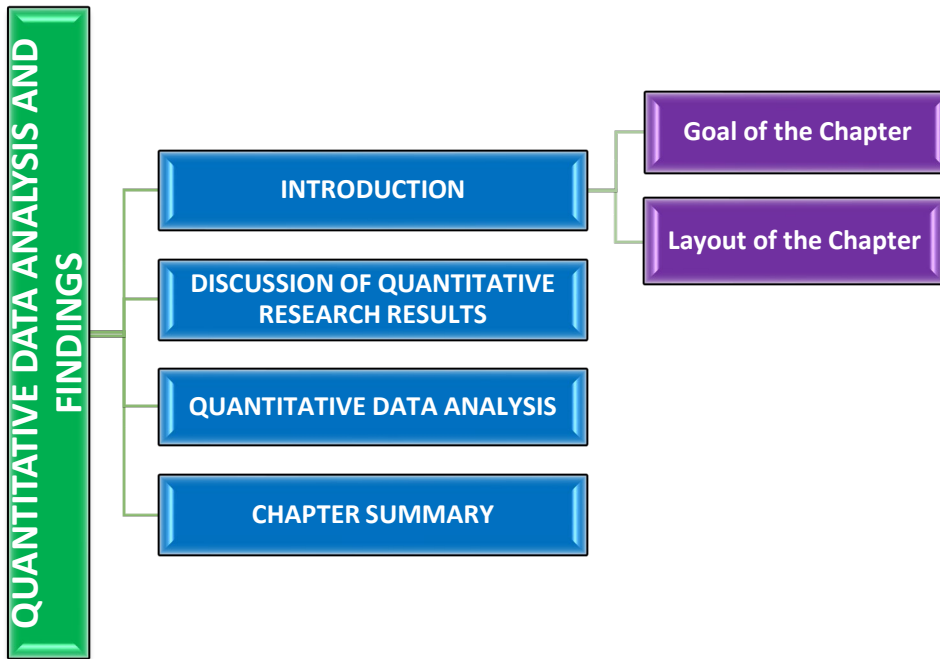


Figure 5.1: A visual representation of the layout of Chapter 5

5.2 DISCUSSION OF THE QUANTITATIVE RESULTS

The following sub-sections present a detailed presentation and discussion of the quantitative results, including data analysis.

5.2.1 Demographic profile of the sample

The demographic profile of the sample is presented under the following major headings: gender, qualifications, position in the company, and years of experience of the respondents.

5.2.1.1 *The gender profile of the respondents*

The respondent's gender was tabulated, and respondents were asked to tick the relevant option. Figure 5.2 below indicates the percentage proportions of all participants' gender.

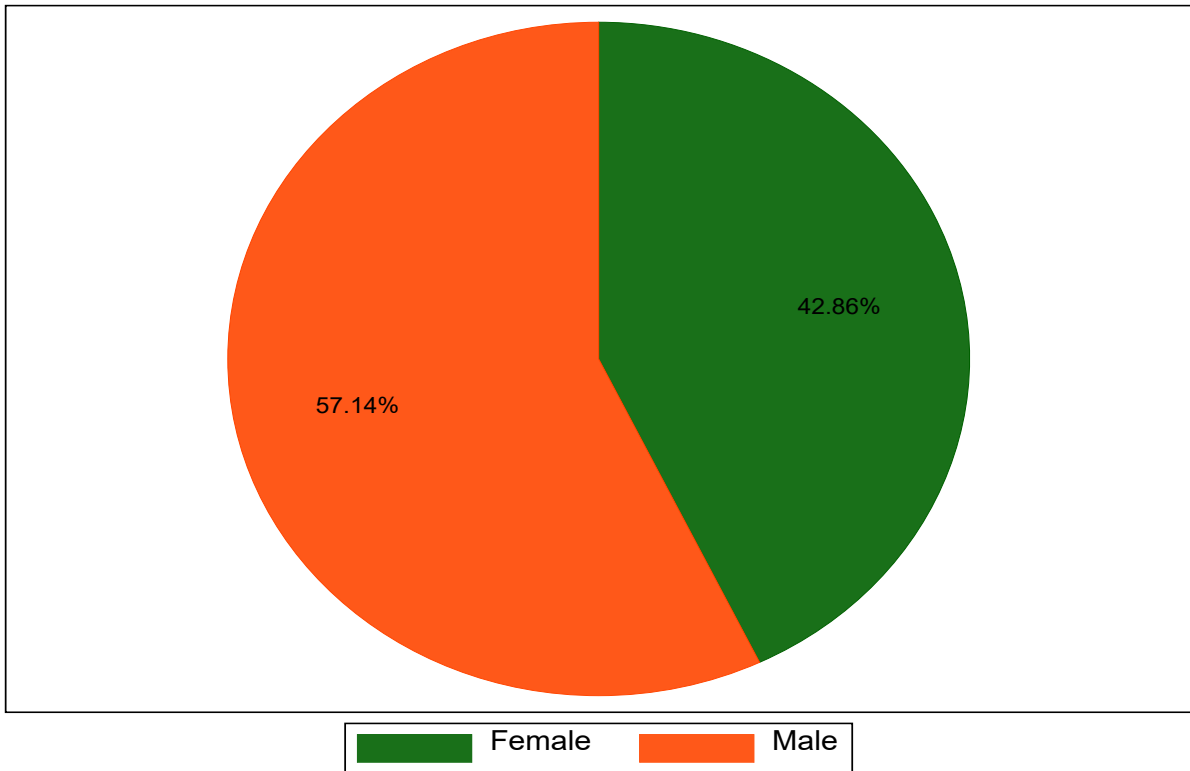


Figure 5.2: Gender of the respondents

Figure 5.2 demonstrates that more males (57.1%) than females (42.9%) participated in the questionnaire. The fact that more males than females participated in the study may be intrinsic to the petroleum industry, which more males than females tend to enter as a career. The above outcome is consistent with the view of Pounah (2019), who argued that few training and mentoring opportunities exist for women in petroleum companies, which limits their advancement to management positions. However, the result still shows a positive and significant balance between gender equality and the case study environment. This could indicate that the case study environment is well-balanced between gender groups. Hence, the effective participation of men and women is important for all aspects of any response to EMAPs. The percentage proportions of all participants are shown in Figure 5.2.

5.2.1.2 Qualifications of the respondents

The level of academic information was tabulated, and respondents were asked to tick the relevant option. Figure 5.3 indicates the percentage proportions of all participants' qualifications.

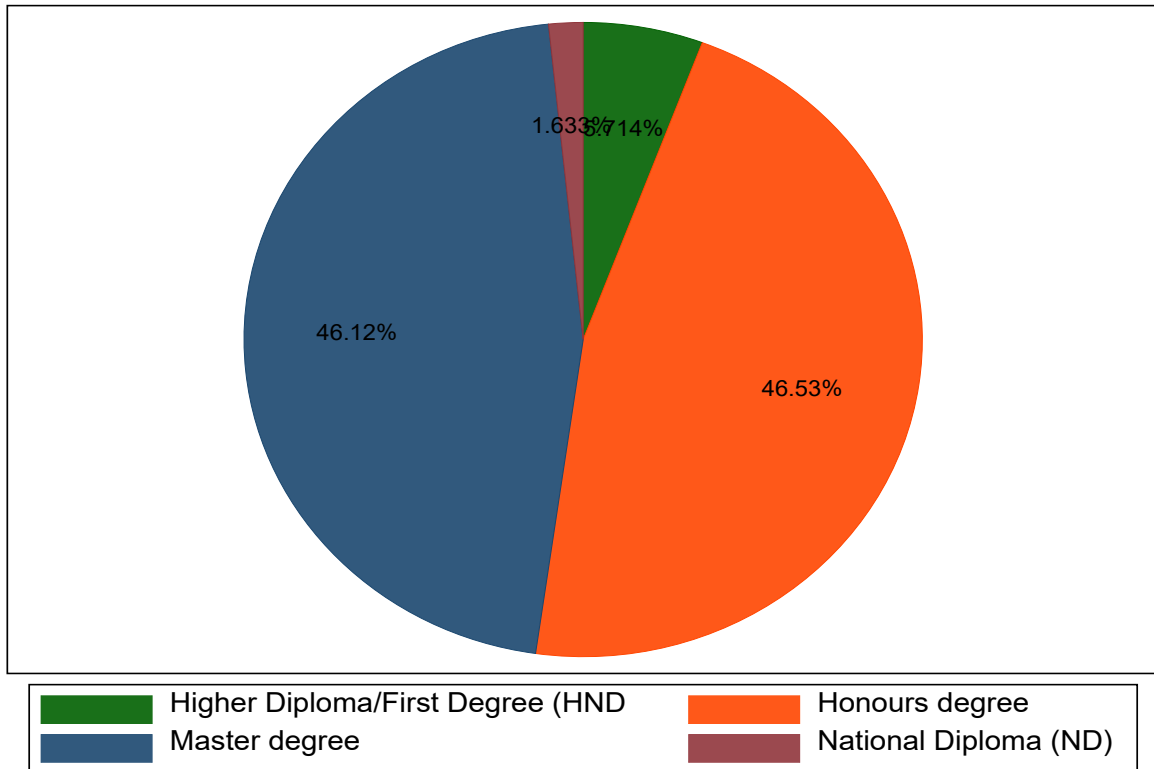


Figure 5.3: Qualifications of the respondents

Figure 5.3 indicates that most of the respondents, 45.12%, had the highest educational qualification (a master’s degree). Regarding undergraduate qualifications, 46.53% had an honours degree, and 9.14% had a higher diploma. Furthermore, only 1.63% obtained a national diploma. The mean and standard deviation of the educational qualification questions are 2.78 and 0.720, respectively. The results showed a significant contribution from respondents with higher qualifications (91.65% = Masters + Honours degree) over the minimum qualification respondents (10.77% = Higher diploma + National diploma). This indicates that respondents to these questionnaires are well-educated. Therefore, the information sourced is reliable and relevant.

5.2.1.3 The position of the respondents

Figure 5.4 below shows the positions of the respondents. The study targeted environmental managers, financial accountants, and management accountants from within the NNPC to ascertain participants' different views and address possible biases in the responses.

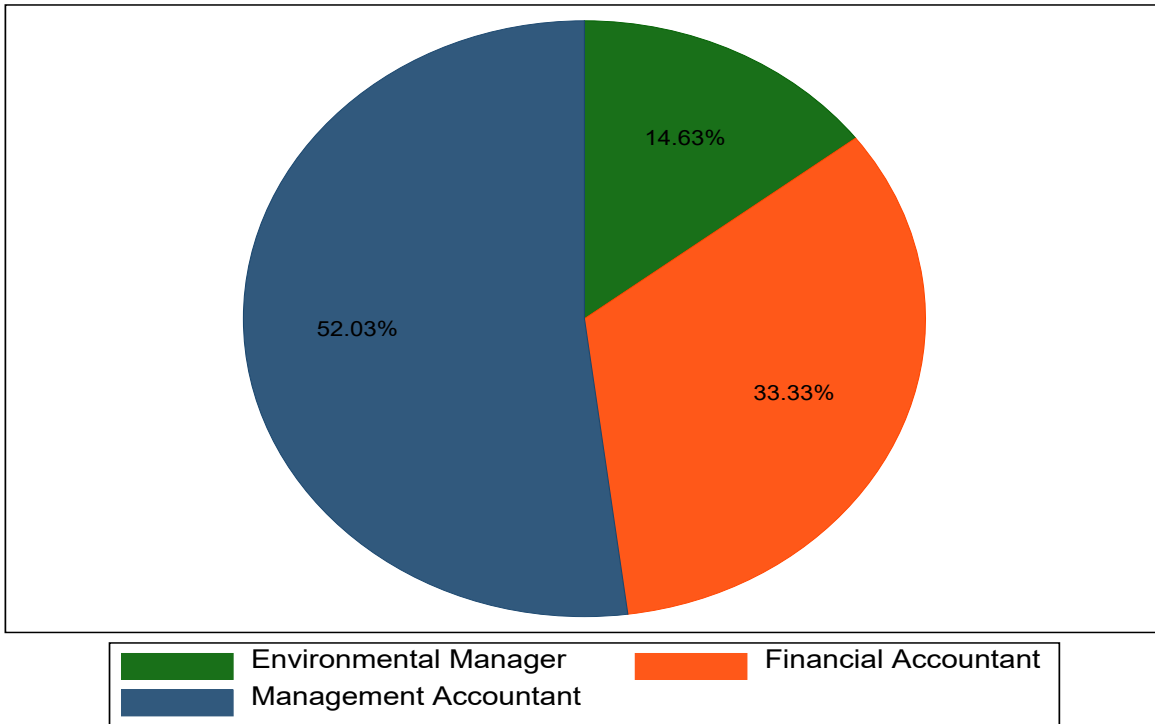


Figure 5.4: Position of the respondents

As depicted in Figure 5.4, the results from the current position revealed that 14.63% of respondents are environmental managers, 33.33% are financial accountants, and 52.03% are management accountants. The mean and standard deviation of the respondent's current position question are 2.26 and 0.755, respectively. The results showed that 100% of respondents comprised those with working experience and those participating in company decision-making. Hence, 100% of the respondents have sound knowledge of EMA information and its impact on operations and decision-making in the NNPC. Therefore, the participants' views on environmental information for decision-making were deemed valuable and relevant.

5.2.1.4 Years of experience of the respondents

Figure 5.5 below shows the years of experience of the participants. The length of service may present a yardstick to measure companies, representing the depth of knowledge and understanding of the petroleum industry.

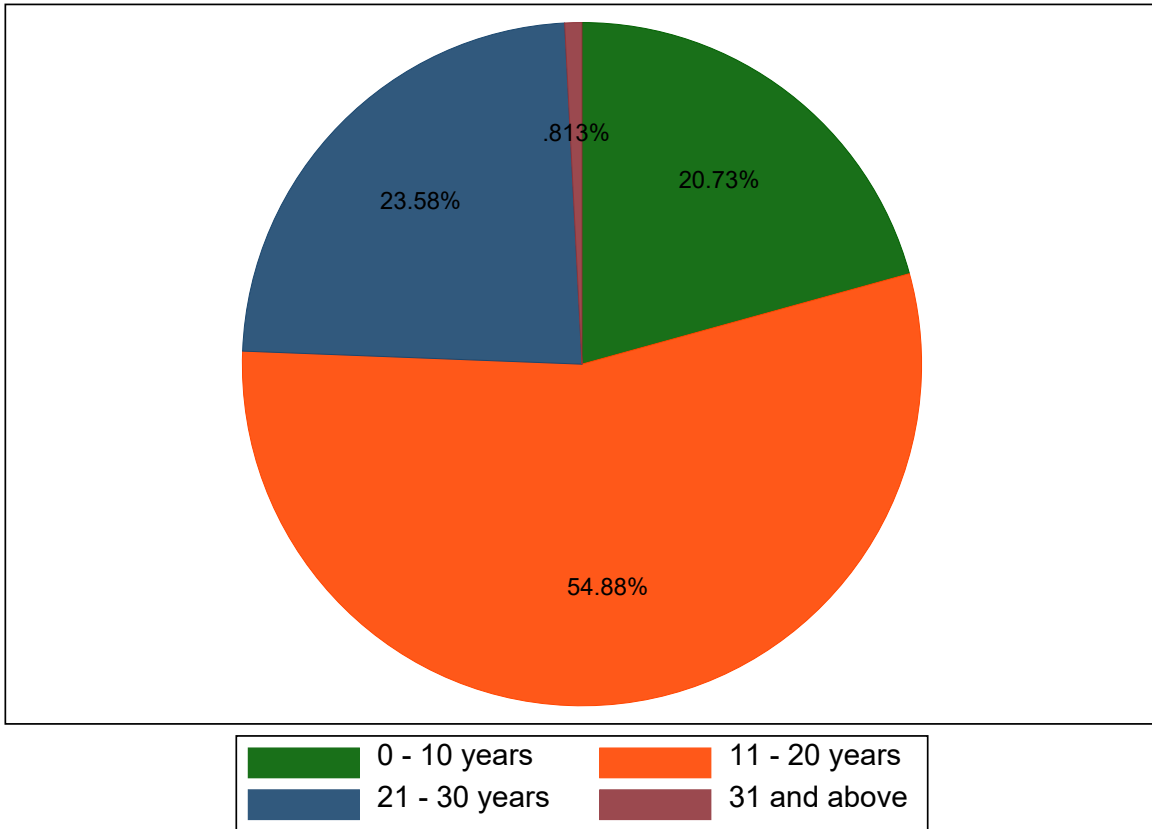


Figure 5.5: Years of experience of the respondents

Figure 5.5 indicates that most of the respondents (54.88%) had work experience ranging from 21 to 30 years, with 23.58% having work experience of 11 to 20 years. However, 20.73% of respondents had work experience ranging from 0 to 10 years, while 0.81% had work experience ranging from 31 and above years. The years of work experience reveal the level of knowledge and experience of the respondents in the petroleum industry. The study showed a significant contribution to the respondents' years of service to the company, demonstrating that the respondents who formed part of this research had ample knowledge and understanding of the industry. It is evident from the findings that the respondents have been in the petroleum industry for a period ranging from 1 year up to 31 years. Therefore, the information sourced is reliable and relevant.

5.2.2 Cronbach's alpha reliability test result

The study investigated the reliability of the administered questions, as it was known that various scales were used. The Cronbach's alpha coefficient was computed to

determine the scale's reliability based on internal consistency. The Cronbach's alpha is from 0 to 1, and the scale reliability coefficient is 0.9868.

Table 5.1: Cronbach's Alpha reliability test

Average interitem covariance:	0.6218
Number of items in the scale:	75
Scale reliability coefficient:	0.9868

Source: Author's computations (2023)

Table 5.1 presents Cronbach's alpha value for the questions administered. As presented in the table, being equal to 0.9868, being higher than 0,7 This value demonstrates very high reliability, which is considered reliable.

Table 5.2: Reliability test using Cronbach's Alpha Mean (standardised items)

Item	Obs	Item-test correlation	Item-rest correlation	Average interitem correlation	alpha
Gender	246	0.0766	0.0568	0.4544	0.9840
Education	245	0.2919	0.2736	0.4503	0.9838
Designation	246	0.1545	0.1350	0.4529	0.9839
Experience	246	-0.0094	-0.0293	0.4560	0.9841
Physical environment	246	0.9208	0.9177	0.4386	0.9830
Monetary environment	246	0.9171	0.9139	0.4387	0.9830
Measures environment	246	0.9068	0.9032	0.4389	0.9830
Identify environment	246	0.8988	0.8949	0.4390	0.9830
Generates environment	246	0.9243	0.9214	0.4386	0.9830
SupportInt~t	245	0.9012	0.8973	0.4390	0.9830
supportExt~t	246	0.9209	0.9178	0.4386	0.9830
Emissionle~s	245	0.5427	0.5284	0.4457	0.9835

Item	Obs	Item-test correlation	Item-rest correlation	Average interitem correlation	alpha
Pollution	246	0.4847	0.4692	0.4468	0.9835
EnergyCons~n	244	0.4865	0.4710	0.4467	0.9835
Noise levels	246	0.5427	0.5285	0.4457	0.9835
Wasteprodu~n	245	0.5513	0.5372	0.4455	0.9835
Recycling	244	0.6306	0.6184	0.4440	0.9834
OperatingE~e	245	0.8941	0.8900	0.4391	0.9830
CapitalExp~e	246	0.8566	0.8512	0.4398	0.9831
Reserves	246	0.4428	0.4266	0.4475	0.9836
Liabilities	245	0.4582	0.4423	0.4472	0.9836
Contingent~s	246	0.6020	0.5891	0.4446	0.9834
Materials	246	0.9400	0.9376	0.4383	0.9830
Water	246	0.9195	0.9163	0.4386	0.9830
Energy	246	0.9231	0.9201	0.4386	0.9830
Products	246	0.9022	0.8984	0.4390	0.9830
Byproducts	245	0.9237	0.9207	0.4386	0.9830
Waste	246	0.9216	0.9185	0.4386	0.9830
AirEmissions	245	0.8915	0.8873	0.4392	0.9830
Mat~fproduct	246	0.9313	0.9286	0.4384	0.9830
Mat~nproduct	246	0.9165	0.9133	0.4387	0.9830
WasteandEm~c	246	0.9157	0.9124	0.4387	0.9830
Prevention~t	246	0.9147	0.9114	0.4387	0.9830
Environme~st	245	0.8348	0.8286	0.4402	0.9831
Environ~gexp	245	0.9380	0.9355	0.4383	0.9830
Environ~lexp	245	0.9272	0.9243	0.4385	0.9830

Item	Obs	Item-test correlation	Item-rest correlation	Average interitem correlation	alpha
Accounting~t	246	0.9425	0.9402	0.4382	0.9830
energy2	246	0.9162	0.9130	0.4387	0.9830
water2	246	0.9090	0.9055	0.4388	0.9830
material2	246	0.9042	0.9005	0.4389	0.9830
Environmen~s	246	0.9296	0.9269	0.4384	0.9830
Earnings	246	0.8850	0.8805	0.4393	0.9830
Savings	246	0.9172	0.9140	0.4387	0.9830
Environ~tInf	245	0.9319	0.9292	0.4384	0.9830
Environ~kInf	245	0.2846	0.2661	0.4505	0.9838
FinancialE~o	245	0.9077	0.9041	0.4389	0.9830
Quantitati~r	244	0.2357	0.2168	0.4513	0.9838
Environmen~a	246	0.9288	0.9259	0.4385	0.9830
Environmen~g	246	0.9146	0.9112	0.4387	0.9830
Infouseful~i	246	0.9052	0.9015	0.4389	0.9830
E~nstatement	245	0.5434	0.5292	0.4457	0.9835
E~sstatement	246	0.3741	0.3568	0.4488	0.9837
Environmen~y	244	0.4320	0.4156	0.4477	0.9836
Environme~an	246	0.5172	0.5024	0.4462	0.9835
Environme~pt	246	0.7517	0.7429	0.4418	0.9832
Sustainabi~t	246	0.7315	0.7220	0.4422	0.9832
Legislation	246	0.5223	0.5076	0.4461	0.9835
Solidwaste	245	0.4351	0.4188	0.4477	0.9836
Energy3	243	0.3948	0.3778	0.4484	0.9836
Water3	244	0.5589	0.5450	0.4454	0.9834

Item	Obs	Item-test correlation	Item-rest correlation	Average interitem correlation	alpha
Land3	245	0.5020	0.4869	0.4464	0.9835
Resources~d	245	0.4049	0.3880	0.4482	0.9836
Wastewater~t	246	0.5426	0.5283	0.4457	0.9835
Hazardousw~t	245	0.4187	0.4021	0.4480	0.9836
Groundwater	245	0.2989	0.2806	0.4502	0.9838
Surfacewater	246	0.3347	0.3168	0.4496	0.9837
Landmgand~t	245	0.2404	0.2215	0.4513	0.9838
NonHazardous	246	0.3698	0.3524	0.4489	0.9837
Crudeoil	245	0.4816	0.4660	0.4468	0.9835
Newpollution	246	0.3948	0.3778	0.4484	0.9837
Regulatory~y	246	0.9134	0.9100	0.4388	0.9830
Adequatepo~y	246	0.9028	0.8990	0.4390	0.9830
Environme~vt	246	0.7862	0.7784	0.4411	0.9832
Degradatio~n	245	0.3946	0.3776	0.4484	0.9837
Environme~on	246	0.3782	0.3609	0.4488	0.9837
Test scale				0.4433	0.9835

Source: Author's computations (2023)

Table 5.2 presents the items from the responded questionnaires, which range between 0.9830 to 0.9840 and the overall alpha satisfied the reliability test.

5.3 DATA ANALYSIS OF THE QUESTIONNAIRES

This research employed correlation analysis and ordinary least squares (OLS). The research question and the objectives influenced the choice of data analysis. The objectives include investigating if the current MAS in use in the NNPC delivers a relevant flow of environmental information needed for decision-making and investigating the efficacy of the environmental regulations in the Nigerian petroleum industry.

According to Farahani et al. (2010); and Kilmer and Rodríguez (2017), the ordinary least squares regression estimate model is specified by determining the equation that minimises the sum of the squared distances between the values predicted by the equation and the data points in the sample. An OLS regression assumes that the regression coefficients are linear, all predictors are uncorrelated with the residuals, the residuals should not be correlated with each other (serial correlation), the residuals have a constant variance, the predictor variables must not be perfectly correlated with one another (avoiding multicollinearity), and that the residuals are normally distributed. The study required the construction of some variables by using multiple corresponding analyses (MCA). It is crucial to specify that these variables are categorical.

5.3.1 Application of multiple correspondence analysis

The researcher applied multiple correspondence analysis (MCA). The research creates an index of the environmental report from categorical variables of the major physical environmental activities being captured within current accounting systems and of the major monetary environmental activities being captured within current accounting systems by using MCA. The MCA is a data restructuring method for a battery or number of categorical variables (Greenacre, 2010). The first part displays the normalised principal inertia and percentage of dimension. The latter part displayed statistics for column categories in standard normalisation. The study constructed an index for some variables such as policy, sustainability, physical environmental accounting information for greener decision-making, monetary accounting information, management accounting practices and environmental accounting systems (a composition of monetary and physical environmental information).

Table 5.3: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
EGD	246	2.785	1.405	1	5
Phyenviron	246	-0.004	1.004	-1.574	0.659
Moenviron	246	0.001	1.002	-0.669	1.603
Phymon	246	-0.005	1.004	-1.597	0.662

Source: Author's computations (2023)

EGD denote environmental information required for greener decision-making;

Phyenviron denotes Management accounting system; Moenviron denotes Monetary environmental information; Phymon denotes Physical environmental information.

Table 5.3 presents the main key variables. Environmental information required for greener decision-making is the main outcome variable. The minimum is 1, and the maximum is 5, a ranked categorical variable with an average of 2.785, which suggests that, on average, the environmental information required for greener decision-making falls closer to the upper end of the scale. The Management Accounting System is an index constructed using Multiple Correspondence Analysis (MCA); the index has a mean of -0.004 (equivalent zero), and a standard deviation of 1.004 (approximately one). This implies that the mean being close to zero suggests that, on average, the index is centred around a neutral value, and the standard deviation of 1.004 indicates a moderate degree of variability in the index values. The index values range from -1.57 to 0.66.

The Monetary Environmental Information Index has a mean of 0.001 (equivalent to zero) and a standard deviation of 1.002 (equivalent to one). The index values range from -0.67 to 1.60, indicating a broad distribution of monetary environmental information. The mean being zero suggests that, on average, the Monetary Environmental Information Index is at the expected level, and the standard deviation of 1.002 indicates a moderate degree of variability in the index values.

Accordingly, the Physical Environmental Information Index has a mean of -0.005 (approximately zero) and a standard deviation of 1.004 (approximately one). The index values range from -1.60 to 0.66. The mean being close to zero suggests that, on average, the index is centred around a neutral value. The standard deviation of 1.004 indicates a moderate degree of variability in the index values.

Table 5.4: Matrix of correlations

Variables	(1)	(2)
(1) Environmental information required for greener decision-making	1.000	
(2) Management accounting system	-0.974	1.000

Source: Author's computations (2023)

Table 5.4 presents a correlation between the management accounting system and the environmental information required for greener decision-making. The correlation

shows that the management accounting system and environmental information required for greener decision-making are negatively correlated ($r = -0.97$).

Table 5.5: Variance inflation factor

	VIF	1/VIF
Management accounting system	1.048	.954
Mean VIF	1.048	.

Source: Author's computations (2023)

Table 5.5 presents the variance inflation factor (VIF) of the management accounting system. As presented in the table, the management accounting system VIF equals 1. The rule of thumb of the variance inflationary factors (VIF) is that if the VIFs are greater than 10, it will be treated as collinearity. Hence, VIFs show that there will be no multicollinearity in the estimation.

5.3.2 Investigate if the current MAS in use in the Nigeria Petroleum Industry provide a useful flow of environmental information needed for decision-making (Objective 2)

The researcher investigated if the current MAS in the Nigerian petroleum industry provides a useful flow of environmental information needed for making decisions. Hence, the independent variable is the company's accounting system that provides the required information for management use. The dependent variable is the useful flow of environmental information.

The research compared the difference between the Likert scale of the independent variable since the outcome variable (environmental reporting) was continuously measured. The researcher used Stata version 16 and examined whether environmental reporting significantly varies according to the categories of respondents (if the accounting system used by the company provides the required set of information for management use).

5.3.3 Ordinary least squares (OLS): Objective 2

To investigate if the Nigerian petroleum industry's current management accounting system (MAS) provides a valuable flow of environmental information required for greener decision-making.

Table 5.6 presents the associations between the composition of monetary and physical environmental information (or environmental reports) and environmental information for decision-making using ordinary least squares (OLS).

Table 5.6: Environmental information for decision-making and management accounting system (MAS) using OLS robust

Variables	(1) Environmental information required for greener decision- making	(2) Environmental information required for greener decision- making	(3) Environmental information required for greener decision- making
Management accounting system	-1.362*** (0.0179)		
Physical environmental information		-1.352*** (0.0256)	
Monetary environmental information			1.367*** (0.0174)
Constant	2.778*** (0.0203)	2.779*** (0.0231)	2.784*** (0.0199)
Observations	246	246	246
R-squared	0.949	0.934	0.951

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Source: Author's computations (2023)

Management accounting system is the composition of Physical environmental information and Monetary environmental information; environmental information required for greener decision-making is the accounting system which provides information for decision-making.

Table 5.6, column 1 presents the association between the management accounting system and environmental information for decision-making using ordinary least squares (OLS). A significant negative relationship exists between the Management accounting system and environmental information for decision-making in the NNPC.

Further, **Table 5.6, Column 2** presents the relationship between physical environmental information and environmental information on decision-making. Physical environmental information has a significant negative relationship with environmental information on decision-making. The outcome disagrees with the view of Abiola and Ashamu (2012), who claimed that NNPC identifies, collects, and

analyses physical information on the flows, use, and destinies of water, energy, and material for internal decision-making. Meanwhile, the follow-up focus group finding shows that the company's accounting system does generate information on the flows, use, and destinies of water, energy, waste, and products but recognises them as part of a general cost.

Table 5.6, Column 3 presents the association between monetary environmental information and environmental information on decision-making. Monetary environmental information has a significant positive relationship with environmental information on decision-making. The outcome is consistent with Abiola and Ashamu (2012), who claim that NNPC identifies, collects, and analyses monetary information on environment-related costs, savings and earnings for internal decision-making.

5.3.4 Examine the effectiveness of environmental regulations and sustainability in the Nigerian petroleum industry (Objective 3)

Examine the effectiveness of environmental regulations and sustainability in the Nigerian petroleum industry.

Table 5.7: Descriptive statistics for Objective 3

Variable	Obs	Mean	Std. Dev.	Min	Max
Sustainability	246	0	1.002	-1.89	1.004
Environmental mission statement	246	4.286	0.768	1	5
Environmental value statement	246	4.065	0.735	1	5
Sustainability report	246	3.799	0.996	1	5

Source: Author's computations (2023)

Table 5.7 presents the main key variables for objective 3. Sustainability is the dependent variable; the study creates an index using MCA. The sustainability variable has a mean value of 0 (zero). This suggests that, on average, the sustainability variable is centred around a neutral value. Sustainability ranges from -1.89 to 1.004.

Other variables are independent and categorical variables with a minimum of 1 and a maximum of 5. The Environmental Mission Statement Index has a mean of 4.286 and a standard deviation of 0.77. The index values range from 1 to 5, indicating the strength or quality of environmental mission statements. The mean being 4.286

suggests that, on average, the mission statements are relatively strong or positive.

Also, the Environmental Value Statement Index has a mean of 4.065 and a standard deviation of 0.74. The index values range from 1 to 5, indicating the strength or quality of environmental value statements. The mean being 4.065 suggests that, on average, the value statements are relatively strong or positive.

Similarly, the Sustainability Report Index has a mean of 3.799 and a standard deviation of 0.996. The index values range from 1 to 5, indicating the strength or quality of sustainability reports. The mean being 3.799 suggests that, on average, the sustainability reports are relatively strong or positive.

Table 5.8: Matrix of correlations for Objective 3

Variables	(1)	(2)	(3)	(4)
(1) Sustainability	1.000			
(2) Environmental mission statement	-0.458	1.000		
(3) Environmental values statement	-0.318	0.596	1.000	
(4) Environmental policy	-0.303	0.349	0.376	1.000

Source: Author's computations (2023)

Table 5.8 shows a correlation between the explanatory variables and the dependent variable. The correlation suggests that sustainability and Environmental mission statements are negatively correlated ($r = -0.458$). Also, environmental statements and sustainability are negatively correlated ($r = -0.32$). Similarly, environmental policy and sustainability are negatively correlated ($r = -0.30$).

Table 5.9: Variance inflation factor for Objective 3

	VIF	1/VIF
Environmental values statement	1.631	.613
Environmental mission statement	1.595	.627
Environmental policy	1.198	.835
Mean VIF	1.475	.

Source: Author's computations (2023)

Table 5.9 presents the variance inflation factor (VIF) of the environmental values statement, environmental mission statement, and environmental policy. The rule of thumb of the variance inflationary factors (VIF) states that if the VIFs are greater than 10, it will be treated as collinearity. Hence, VIFs show that there will be no multicollinearity in the estimation.

Table 5.10: Sustainability and environmental regulation: OLS

	(1)
	OLS
Variables	Sustainability
Environmental mission statement	-0.502*** (0.0930)
Environmental values statement	-0.0390 (0.0995)
Environmental policy	-0.158** (0.0621)
Constant	2.910*** (0.367)
Observations	243
R-squared	0.234

Standard errors in parentheses: *** p<0.01, ** p<0.05, *

Source: Author's computations (2023)

Table 5.10 presents the relationship between the Environmental mission statement and sustainability as being negatively correlated when using OLS. Environmental values statement has a negative relationship with sustainability. The results imply that environmental regulation inversely influences the environmental information report. Hence, Nigeria might have environmental regulations that do not influence environmental information reporting. This might also be because the regulatory body is compromising the standard if, perhaps, they are available to regulate environmental standards in the accounting system management in the NNPC. It is plausible that there is an absence of environmental regulatory policy in the environmental information system or operation of the main petroleum sector in Nigeria. There may also be an indication of insufficient or ineffective environmental policy regulation simply because

there is no willingness for regulatory policy implementation on the side of the management or the regulatory authority. The outcome is consistent with the view of Ogunkan (2022), who claims that Nigeria's environmental system lacks effectiveness, lacks public participation, regulations and policies are not enforceable and non-implementable, and the institutional framework is weak and uncoordinated. Furthermore, the author notes that sustainable environmental management remains an abstraction in Nigeria despite governance being widely recognized as a key attribute for effective environmental management (Ogunkan, 2022). This could indicate that Nigeria's environmental governance frameworks are inadequate to address the country's environmental concerns.

5.4 CHAPTER SUMMARY

This chapter provided an interpretation and analysis of the quantitative results from the questionnaire. The quantitative results present the impact of environmental information on decision-making on the distribution of physical and monetary environmental information (environmental reports index). The results show that monetary environmental information has a significant positive relationship with environmental information on decision-making, which in turn shows that the company's accounting system captures monetary environmental activity data. However, physical environmental information has a significant negative relationship with environmental information on decision-making, meaning that the company's accounting system does not fully capture the physical environmental activities of its operations, as it generates information on the flows, use, and destinies of water, energy, waste, and products but recognises them as part of a general cost. The quantitative results also present a significant negative relationship between the environmental regulation index and the environmental information report. The results imply that environmental regulation inversely influences the environmental information report, which demonstrates that there may be an indication of insufficient or ineffective environmental policy regulation in place that has led to regulators not attaining a standard level in encouraging and providing regulations, programmes, and policies that promote the use of an Environmental Management Strategy (EMS). The next chapter discusses the findings and discussion of the focus group (qualitative) data analysis, and research findings.

CHAPTER 6: FOCUS GROUP (QUALITATIVE DATA ANALYSIS AND RESEARCH FINDINGS)

6.1 INTRODUCTION

The previous chapter discussed the results of the quantitative phase. This chapter addresses the focus group (qualitative) phase. The focus group validated the conceptual environmental management accounting information framework for greener decision-making in the petroleum industry developed in the study. The feedback from the framework was then used as input to enhance the framework. The five steps involved in this focus group process are familiarisation, generating themes, coding, reviewing themes, and analysis and reporting.

6.1.1 The goal of this chapter

The chapter aims to present the focus group conducted at the NNPC as broadly as possible by quoting the participants' responses.

6.1.2 The layout of this chapter

This chapter presents the findings obtained from the focus group conducted with the participants at the NNPC. Section 6.1 presents the introduction, while Section 6.2 presents the focus group strategy. In Section 6.3, focus group data analysis and presentation are discussed. Subsequently, focus group findings related to the enhancement of the framework are presented in Section 6.4. Finally, Section 6.5 summarises the chapter. Figure 6.1 (p. 102) below represents the layout of the chapter.

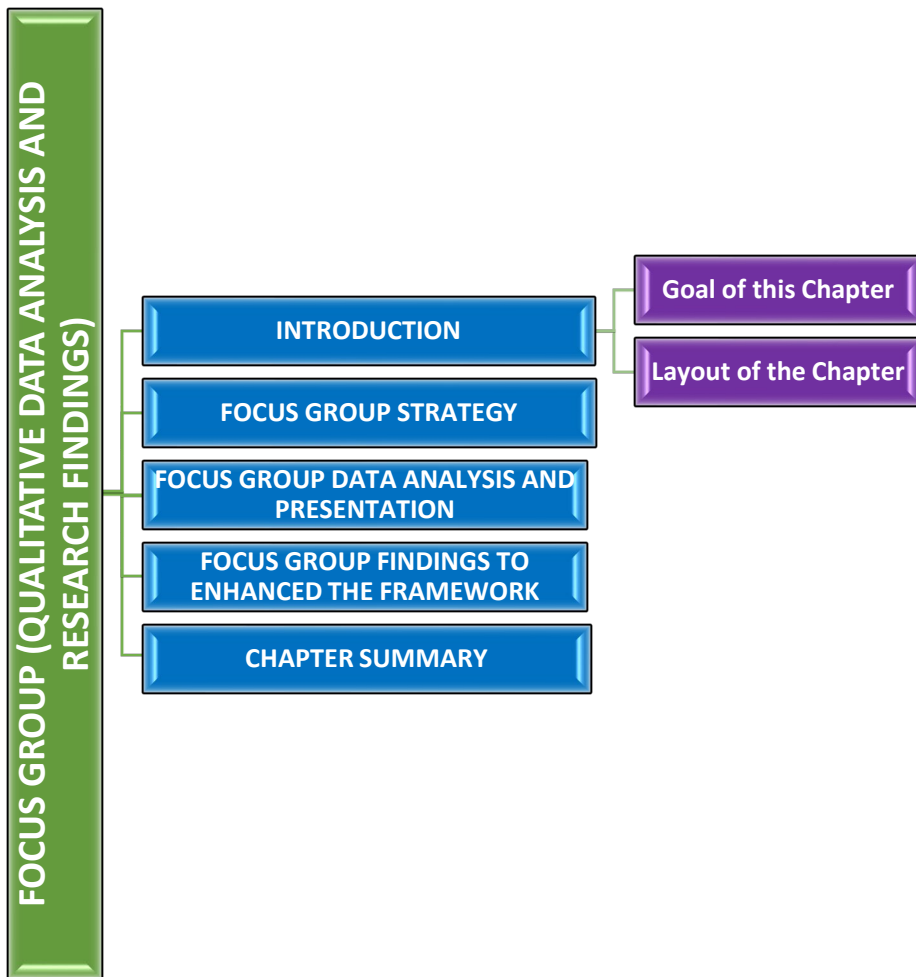


Figure 6.1: A visual representation of the layout of Chapter 6

6.2 FOCUS GROUP STRATEGY

Focus groups serve as well-known techniques for obtaining data across qualitative, quantitative, and mixed-method techniques (Pearson & Vossler, 2016). A focus group effectively gathers users' feelings, opinions, and suggestions about an issue, product, or topic (Krueger & Casey, 2015). Hence, a focus group is conducted by engaging in a group conversation with respondents who are of interest to the researcher. In conducting a focus group, the moderator or facilitator plays a crucial part in ensuring the success of the focus group (Blackburn & Stokes, 2000). Moderators serve as conversation controllers (Hutt, 1979), promoting open debate through open-ended questions and focusing on the statements' motivations (Gibbs, 1997). Focus groups are detailed, open-ended discussions within groups. Robinson (1999) indicates that focus groups are not highly structured. To this end, Blackburn and Stokes (2000)

suggests using an interview guide or a set of queries to be addressed during the focus group process.

A semi-structured design with open-ended questions was employed in the study. The participants were provided with information about the scope and purpose of the focus group before participating in the validation procedure of the conceptual environmental management accounting information framework for making greener decisions in the petroleum industry. The justification for the method is that while quantitative data and the results will present a broad overview of the study problem, the qualitative data, and analysis will amplify and clarify these statistical results by closely examining the respondents' opinions (Kokkinaki, 2010). Hence, the framework developed was validated through a follow-up focus group.

6.2.1 Details of the focus group

It is important to obtain input from the industry on the framework's utility. The sample size of the focus group is five (5) participants, which is in line with the ideal size of five (5) to eight (8) participants recommended by Krueger and Casey (2015) for a focus group on most non-commercial topics. The focus group includes managers (financial accountants, management accountants, and environmental managers) of the NNPC, representing a crucial focus point when using environmental information for decision-making. The focus group questions comprised five (5) open-ended questions.

6.2.2 Details of the themes developed in the study

Theme development, which involves the methodical search for outlines to generate detailed explanations that can provide additional insight into the events being researched, is a common factor in analysing qualitative data (Gale et al., 2013). Identifying relevant themes and their codes in the data collection may assist in discarding data that is irrelevant to the research questions that the respondent needs to answer. In the focus group process, themes are developed considering the focus group questions. The themes were identified to ensure coverage of important issues raised during feedback on the EMAI framework for greener decision-making in the petroleum industry to validate and enhance the framework that was developed in the study. Table 6.1 summarises the details of the themes identified in this research.

Table 6.1: Themes identified from focus group questions

FOCUS GROUP QUESTIONS	THEMES
Focus Group Question 1: What comes to mind when you hear ‘environmental information’ and ‘environmental management accounting’?	Theme 1: Environmental management accounting and information
Focus Group Question 2: What did you think of the framework in terms of providing adequate information for decision-making?	Theme 2: Relevant information and decision-making
Focus Group Question 3: What do you find valuable and significant about the framework in the context of the information provided for greener decision-making?	Theme 3: Information provision and greener decision-making
Focus Group Question 4: What are the improvements the NNPC can make to the existing management accounting system through this framework?	Theme 4: Accounting system improvement
Focus Group Question 5: Do you think that the framework has missing elements?	Theme 5: Missing elements

Source: Author's computations (2023)

6.3 FOCUS GROUP DATA ANALYSIS AND PRESENTATION

In the following section, the focus group data is analysed and presented in five (5) themes, each representing a focus group question and response. These themes are closely linked to enhance the EMAI framework for greener decision-making in the petroleum industry as developed in the study. Each theme identified from the focus group is discussed in detail in the next section, and data from the focus group process was interpreted and analysed using thematic analysis. As shown in Tables 6.2–6.6, the codes used were a broad view of the respondents’ responses to the focus group questions.

The tables consist of the following columns:

Overall answer from participants: This column is an overall view of the participants.

Codes: This column extracts specific things the participants have said that lend some detail to their answers.

NM1, NM2, NM3, NM4, and NM5: These columns contain the participant's answers. The first line of responses is the actual response provided by the participant in their own words. Where there are additional rows within the same question, these are extracts from the participant's response that have provided the code.

6.3.1 Theme 1: Environmental management accounting and information

During the conversation, the participants gave their views on what comes to mind when they hear 'environmental information' and 'environmental management accounting'. NM1 stated, "EMA responds to the company's information needs by providing the necessary environmental information". NM2 said, "EMA responds to the company's information needs for business decisions that have an environmental impact". Accordingly, NM3 contributed that "environmental information derived from EMA supports corporate managers in every business setting". While NM4 agreed that "EMA and its information have a major impact on the manager's view on costs, ultimately influencing its decision-making process." Extracts from the five (5) participants regarding theme 1 (EMA and information) are presented in Table 6.2.

Table 6.2: Question 1: What comes to mind when you hear ‘environmental information’ and ‘environmental management accounting’?

Overall Answer from Participants	Codes	NM1	NM2	NM3	NM4	NM5
Yes		EMA responds to the company's information needs by providing the necessary environmental information.	EMA responds to the company's information needs for business decisions that have an environmental impact.	Environmental information derived from EMA supports corporate managers in every business setting.	EMA and its information have a major impact on managers' views on costs, ultimately influencing their decision-making process.	The EMA provides information that drives greener decision-making.
	EMA offers environmental information	EMA offers environmental information				
	EMA supports environmental decisions.		EMA supports decisions that affect the environment.			
	EMA information supports managers			EMA information supports managers in all business domains.		
	EMA influences managers' views on costs and decision-making				EMA information impacts managers' views on costs, which influences decision-making.	
	EMA informs greener decisions					EMA information drives greener decision-making.

Table 6.2 presents the responses from the participants' conversations regarding focus group question one, showing a consensus among all that EMA offers information that influences managers' views on costs and supports greener decision-making. Hence, EMA information influences the company's management activities positively.

6.3.2 Theme 2: Relevant information and decision-making

The next theme to be discussed is the participants' views on the framework for providing adequate decision-making information (Focus Group Question 2). Provisions of adequate information for management use were discussed in the literature as they are pertinent for carrying out managerial duties effectively (Chimos et al., 2013).

According to NM1, "the framework will offer adequate environmental information needed to support decision-making". NM2 stated that "the framework will capture both physical and monetary information for external and internal decision-making". Meanwhile, NM3 contributed that "the framework will provide managers with the monetary information they require in making decisions". NM4 expressed that "the framework will provide comprehensive environmental information needed for management use". While NM5 concluded that "the framework will provide management with the necessary information they need to make decisions". Extracts from the five (5) participants regarding theme 2 (relevant information and decision-making) are presented in Table 6.3.

Table 6.3: Focus Group Question 2: What did you think of the framework in terms of providing adequate information for decision-making?

Overall Answer from Participants	Codes	NM1	NM2	NM3	NM4	NM5
Yes		The framework will offer adequate environmental information needed to support decision-making.	The framework will capture both physical and monetary information for external and internal decision-making.	The framework will provide managers with the monetary information they require in making decisions.	The framework will provide comprehensive environmental information needed for management use.	The framework will provide management with the necessary information they need to make decisions.
	The framework will support greener decision-making.	The framework will provide adequate environmental information for decision-making.				
	The framework will capture physical and monetary information.		The framework will capture physical and monetary information.			
	The framework will provide managers with monetary information.			The framework will provide managers with monetary information		
	The framework will provide comprehensive				The framework will provide comprehensive	

Overall Answer from Participants	Codes	NM1	NM2	NM3	NM4	NM5
	environmental information.				environmental information.	
	The framework will provide management with adequate information.					The framework will provide management with adequate information.

Table 6.3 presents the responses from the participants' conversations regarding focus group question two (2). The findings show a consensus among all that the EMAI framework will provide comprehensive and adequate EMAI by ensuring no significant environmental information is omitted in making greener decisions. Accordingly, the findings show that the framework will capture the monetary and physical information required for external and internal decision-making. Hence, EMAI influences the company's management activities positively.

6.3.3 Theme 3: Information provision and greener decision-making

The next theme to be discussed is what participants find valuable and significant about the framework in the context of the information provided for greener decision-making (Focus Group Question 3). According to NM1, "the framework is valuable as it will provide significant environmental information that facilitates greener decision-making". NM2 stated that "the framework is valuable as it captures and reports on the monetary and physical activities of business; both types of information provide useful input for making greener decisions". Meanwhile, NM3 contributed that "the framework is valuable because it will provide adequate environmental information that will support decision-makers in making greener decisions". NM4 expressed that "the framework is valuable because it will allow petroleum companies to shape their environmental-related strategies". While NM5 concluded that "the framework is valuable because it will allow petroleum companies to recognise and measure environmental costs for internal decision-making". Extracts from the five (5) participants regarding theme 3 (information provision and greener decision-making) are presented in Table 6.4.

Table 6.4: Focus Group Question 3: What do you find valuable and significant about the framework in the context of the information provided for greener decision-making?

Overall Answer from Participants	Codes	NM1	NM2	NM3	NM4	NM5
Yes		The framework is valuable as it will provide significant environmental information that facilitates greener decision-making.	The framework is valuable as it captures and reports on the monetary and physical activities of business; both types of information provide useful input for making greener decisions.	The framework is valuable because it will provide adequate environmental information that will support decision-makers in making greener decisions.	The framework is valuable because it will allow petroleum companies to shape their environmental-related strategies.	The framework is valuable because it will allow petroleum companies to recognise and measure environmental costs for internal decision-making.
	The framework will enhance greener decision-making.	The framework is valuable in providing environmental-related information for greener decision-making.				
	The framework will capture information that provides useful input for making greener decisions.		The framework is valuable in capturing and reporting on the physical and monetary sides of business activities.			

Overall Answer from Participants	Codes	NM1	NM2	NM3	NM4	NM5
	The framework will support greener decisions.			The framework will provide adequate environmental information that supports greener decisions.		
	The framework will assist in shaping environmental-related strategies.				The framework will allow petroleum companies to shape their environmental-related strategies.	
	The framework will provide improvements and support to reduce the increasing environmental costs.					The framework assists in recognising and measuring environmental costs.

Table 6.4 presents the responses from the participants' conversations regarding focus group question three (3). The findings show consensus among all that the EMAI framework will provide valuable and significant information as it captures and reports on businesses' monetary and physical activities. This environmental information facilitates greener decision-making. Accordingly, the findings show that the framework will assist petroleum companies in recognising and measuring environmental costs for internal decision-making and shaping their environmental-related strategies. Hence, the framework is valuable because it will provide adequate environmental information to support decision-makers in making greener decisions.

6.3.4 Theme 4: Accounting system improvement

The next theme to be discussed is the improvements that NNPC can make to its existing management accounting system through this framework (Focus Group Question 4). NM1 noted that "through this framework, NNPC can improve its existing management accounting system to fully capture both its physical and monetary environmental activities." Accordingly, NM2 stated that "through this framework, NNPC can generate the needed environmental cost information that will assist management in making strategic environmental decisions." Meanwhile, NM3 contributed that "through this framework, NNPC can improve its existing management accounting system to capture and measure environmental-related costs as an accurate measurement of a company's true environmental costs." NM4 expressed that "through this framework, the NNPC existing management accounting system can generate and record environmental information on the flows, use, and destinies of water, energy, waste, and products for greener decision-making." While NM5 concluded that "through this framework, regulatory authorities can provide suitable environmental regulations and policies, which NNPC can use to integrate environmental matters into their business decisions to improve environmental compliance and prevent pollution." Extracts from the five (5) participants regarding theme 4 (accounting system improvement) are presented in Table 6.5.

Table 6.5: Focus Group Question 4: What are the improvements the NNPC can make to the existing management accounting system through this framework?

Overall Answer from Participants	Codes	NM1	NM2	NM3	NM4	NM5
Mixed		Through this framework, NNPC can improve its existing management accounting system to fully capture both its physical and monetary environmental activities.	Through this framework, NNPC can generate the needed environmental cost information that will assist management in making strategic environmental decisions.	Through this framework, NNPC can improve its existing management accounting system to capture and measure environmental-related costs as an accurate measurement of a company's true environmental costs.	Through this framework, the NNPC's existing management accounting system can generate and record environmental information on the use, flows, and destinies of water, energy, waste, and products for greener decision-making.	Through this framework, regulatory authorities can provide suitable environmental regulations and policies, which NNPC can use to integrate environmental matters into their business decisions to improve environmental compliance and prevent pollution.
	NNPC can capture its monetary and physical environmental activities.	The framework can enhance NNPC's management accounting system to capture its monetary and physical environmental activities.				
	NNPC can generate environmental cost information for making strategic decisions.		The framework will enable NNPC to generate the environmental cost information required.			

Overall Answer from Participants	Codes	NM1	NM2	NM3	NM4	NM5
	NNPC can capture and measure its environmental-related costs accurately.			The framework can assist NNPC in capturing and measuring environmental-related costs as an accurate measurement of a company's true environmental costs.		
	NNPC can generate and record its environmental information for greener decision-making.				NNPC can generate and record environmental information on the use, flows, and destinies of water, energy, waste, and products for greener decision-making.	
	NNPC can incorporate environmental considerations into its business decisions.					This framework will allow regulatory bodies to offer NNPC appropriate environmental policies and regulations.

Table 6.5 presents the responses from the participants' conversations regarding focus group question 4. The findings show a mixed view among all on the improvements that NNPC can make to its existing management accounting system through this framework. The findings show that NNPC can improve its existing management accounting system to capture its physical and monetary environmental activities fully and to capture and measure environmental-related costs as an accurate measurement of a company's true environmental costs through the framework. Accordingly, the findings show that the framework will assist NNPC in generating and recording environmental cost information on the flows, use, and destinies of water, energy, waste, and products for greener decision-making and strategic environmental decisions. Finally, the findings show that through this framework, regulatory authorities can provide suitable environmental regulations and policies, which NNPC can use to integrate environmental matters into their business decisions to improve environmental compliance and prevent pollution.

6.3.5 Theme 5: Missing elements

The next theme to be discussed is the participant's view of the missing elements in the framework (Focus Group Question 5). NM1 advocates the need to “incorporate environmental management system concepts into environmental policy.” Accordingly, NM2 suggests the need to “incorporate policies and guidelines to address environmental matters.” Meanwhile, NM3 proposes “addressing the provision of an effective regulatory policy on environmental matters.” NM4 suggests “the provision of suitable environmental regulation and policy by regulatory authorities to assist companies in integrating environmental matters into their business decisions.” While NM5 suggests “provisions for environmental regulation and policy by regulatory authorities to improve environmental compliance and prevent pollution.” Extracts from the five (5) participants regarding theme 5 (missing elements) are presented in Table 6.6.

Table 6.6: Focus Group Question 5: Do you think that the framework has missing elements?

Overall Answer from Participants	Codes	NM1	NM2	NM3	NM4	NM5
Yes		Incorporating environmental management system concepts into environmental policy.	Incorporating policies and guidelines to address environmental matters.	Addressing the provision of an effective regulatory policy on environmental matters.	Suggest the need for the provision of suitable environmental regulation and policy by regulatory authorities to assist companies in integrating environmental matters into their business decisions.	Suggest the need for provisions of environmental regulation and policy by regulatory authorities to improve environmental compliance and prevent pollution.
	Incorporate EMS concepts into environmental policy.	EMS concepts need to be unified into environmental policy.				
	Incorporate policies and guidelines to address environmental matters.		Incorporate policies and guidelines to address environmental matters.			
	Provision of an effective regulatory policy on environmental matters.			Provision of an effective regulatory policy on environmental matters.		

Overall Answer from Participants	Codes	NM1	NM2	NM3	NM4	NM5
	Integrating environmental matters into their business decisions.				Provision of environmental regulation and policy by regulatory authorities to assist companies in integrating environmental matters into their business decisions.	
	Improving environmental compliance and preventing pollution.					Provisions of environmental regulation and policy by regulatory authorities to improve environmental compliance and prevent pollution.

Table 6.6 presents the responses from the participants' conversations regarding focus group question 5. The findings show consensus among all on whether the framework has missing elements. The need to incorporate environmental management system concepts into environmental policy surfaced. Likewise, an effective regulatory policy on environmental matters was also recommended. Finally, suggestions were made for suitable environmental regulation and policy by regulatory authorities to help in integrating environmental matters into their business decisions, improve environmental compliance, and prevent pollution.

6.4 FOCUS GROUP FINDINGS TO ENHANCE THE FRAMEWORK

Five (5) research themes were considered: environmental management accounting and information; relevant information and decision-making; information provision and greener decision-making; accounting system improvement; and missing elements. A summary of the themes derived from the focus group process is provided in Table 6.7, and the findings are employed to enhance the framework in Chapter.

Table 6.7: A summary of the themes from the findings of the focus group process

THEMES	FINDINGS
Environmental management accounting and information	<p>EMA responds to the company's information needs:</p> <ul style="list-style-type: none"> • by providing the necessary environmental information. • for business decisions that have an environmental impact. • Environmental information derived from EMA supports corporate managers in every business setting. • EMA and its information have a major impact on managers' views on costs, ultimately influencing their decision-making process. • EMA provides information that drives greener decision-making.
Relevant information and decision-making	<p>The framework will:</p> <ul style="list-style-type: none"> • offer adequate environmental information needed to support decision-making. • capture both physical and monetary information for external and internal decision-making. • provide managers with the monetary information they require to make decisions. • provide comprehensive environmental information needed for management use. • provide management with the necessary information they need to make decisions.
Information provision and greener decision-making	<p>The framework is valuable as it will:</p> <ul style="list-style-type: none"> • provide significant environmental information that facilitates greener decision-making. • capture and report on the monetary and physical activities of business; both types of information provide useful input for making greener decisions. • provide adequate environmental information that will support decision-makers in making greener decisions.

THEMES	FINDINGS
	<ul style="list-style-type: none"> • allow petroleum companies to shape their environmental-related strategies. • allow petroleum companies to recognise and measure environmental costs for internal decision-making.
Accounting system improvement	<p>Through this framework, NNPC can:</p> <ul style="list-style-type: none"> • improve its existing management accounting system to fully capture both its physical and monetary environmental activities. • generate the needed environmental cost information that will assist management in making strategic environmental decisions. • improve its existing management accounting system to capture and measure environmental-related costs as an accurate measurement of a company's true environmental costs. <p>Through this framework:</p> <ul style="list-style-type: none"> • the NNPC's existing management accounting system can generate and record environmental information on the use, flows, and destinies of water, energy, waste, and products for greener decision-making. • regulatory authorities can provide suitable environmental regulations and policies, which NNPC can use to integrate environmental matters into their business decisions to improve environmental compliance and prevent pollution.
Missing elements	<ul style="list-style-type: none"> • Incorporating environmental management system concepts into environmental policy. • Incorporating policies and guidelines to address environmental matters.

Source: Author's computations (2023)

A summary of the five (5) themes derived from the findings of the focus group process is presented in Table 6.7 above.

6.5 CHAPTER SUMMARY

This chapter reports the focus group (qualitative) findings used to validate the conceptual environmental management accounting information framework for greener decision-making in the petroleum industry developed in the study. All the participants expressed varied opinions during the focus group process. The feedback from the framework was then used as input to enhance the framework. The focus group findings reveal that the EMAPs framework provides businesses with valuable and helpful information as it captures and reports their monetary and physical activities. Hence, monetary and physical environmental cost information can be fully captured. Furthermore, the findings reveal that the framework will help petroleum companies identify and measure environmental costs for internal decision-making and to shape their environmental strategies. Hence, the framework is valuable because it will provide adequate environmental information to support decision-makers in making greener decisions.

The next chapter presents the enhanced framework of environmental management accounting for greener decision-making in the petroleum industry.

CHAPTER 7: AN ENHANCED FRAMEWORK OF ENVIRONMENTAL MANAGEMENT ACCOUNTING FOR GREENER DECISION-MAKING IN THE PETROLEUM INDUSTRY

7.1 INTRODUCTION

In the previous chapter, the results of the qualitative phase of the study were presented. This chapter aims to enhance the EMAI framework for greener decision-making in the Nigerian petroleum industry that was developed at the end of Chapter 3. From an MA standpoint, adequate information may be essential to making appropriate decisions within the company. The NNPC focus group findings were employed to enhance the framework.

7.1.1 The goal of the chapter

The chapter enhances the framework of environmental management accounting information for greener decision-making developed in the study.

7.1.2 The layout of the chapter

The chapter begins with the introduction, purpose, and major research findings in Sections 7.1 and 7.2, respectively. Then, the framework enhancement background is presented in Section 7.3. Additionally, Section 7.4 presents the enhancement of the environmental management accounting information framework for greener decision-making in the petroleum industry. Furthermore, Section 7.5 presents the enhanced framework analysis. The purpose of an enhanced framework of environmental management accounting information is discussed in Section 7.6. Accordingly, Section 7.7 presents the framework validation. Finally, Section 7.8 provides a summary of the chapter. Figure 7.1 (p. 124) shows the chapter layout..

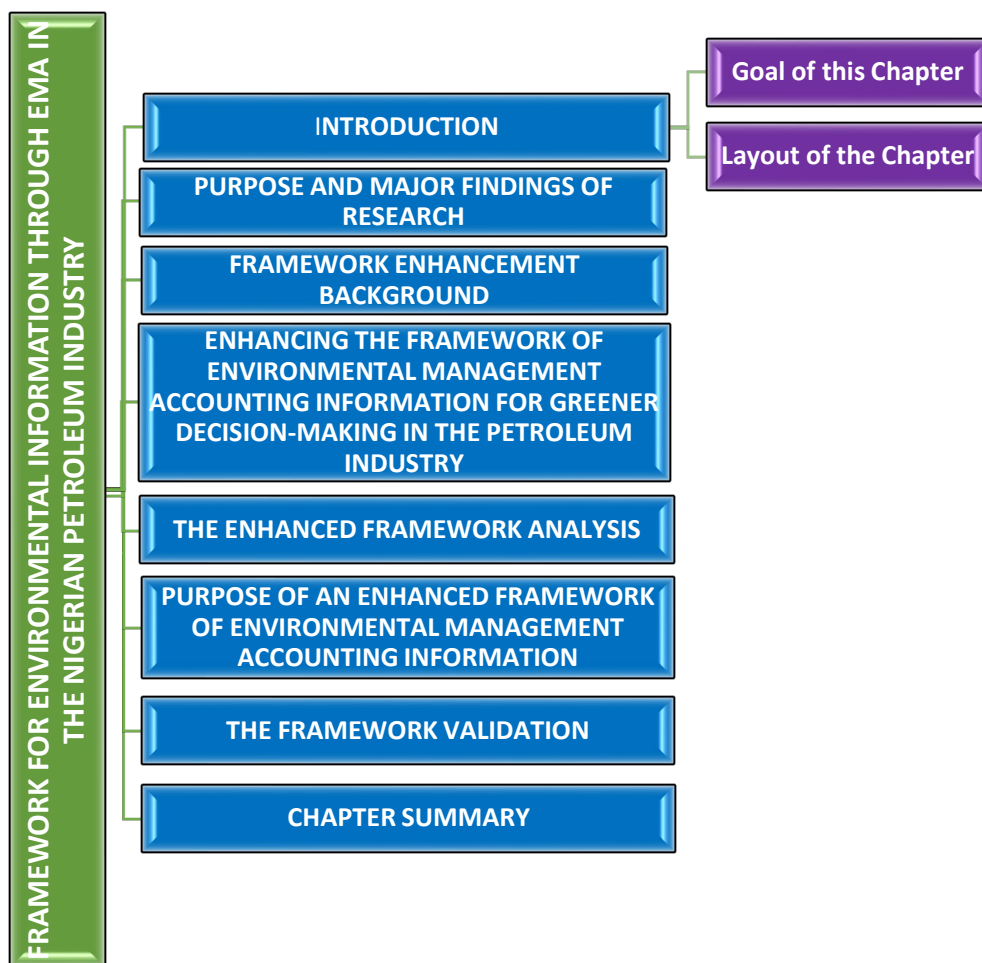


Figure 7.1: A visual representation of the layout of Chapter 7

7.2 PURPOSE AND MAJOR FINDINGS OF THE RESEARCH

The main objective of this study was to develop a framework that provides adequate environmental information through EMAPs to enrich the greener decision-making process in the Nigerian petroleum industry. Burritt and Christ (2016) noted that meeting the future's environmental requirements requires adequate information. Hence, improving decision-making processes within the petroleum industry requires adequate information, as it is pertinent to facilitating improved decision-making. Therefore, researchers such as Mohd Fuzi et al. (2019), Mohamed and Muhammad-Jamil (2020), and Yang et al. (2020) have increased their efforts to address environmental issues through the development of EMAPs in the field of MA to support company decision-makers, mostly in the manufacturing industry. However, this research study seeks to expand the existing knowledge beyond the current service and manufacturing industries to the petroleum industries. Therefore, extending EMA concepts to the petroleum industry might contribute significantly by proposing an

adequate framework for the environmental information required to enhance a decision-making process in this industry.

In recent years, various inadequate management accounting data problems have been recognised (Burritt & Christ, 2016), and the problems of EMA in guiding corporate decisions mainly relate to the absence and inadequateness of data (Kokubu & Kitada, 2010). If environmental data are absent, inadequate, or of poor quality, decision-makers are less likely to adopt EMA, as decisions on such data will be unreliable (Burritt & Christ, 2016). Meanwhile, the accuracy of environmental accounting data available for making decisions can be improved with government initiatives or programmes that promote EMA concepts, leading to higher productivity. Therefore, the potential environmental gains resulting from the broad use of EMAPs call for proactive governmental intervention in enhancing corporate environmental performance.

Furthermore, incorporating government environmental policies and guidelines into a MAS to enhance the quality of environmental accounting data for decision-making processes may produce more precise cost accounting information about the environment, assisting decision-makers in making sound environmental-related decisions. Therefore, the information framework developed in this study intends to contribute to practice and theory by addressing the major gap in enriching greener decision-making processes in the petroleum industry by providing adequate environmental information.

7.3 FRAMEWORK ENHANCEMENT BACKGROUND

To enhance the environmental information framework through EMAPs, it is necessary to consider the background characteristics under which EMAI should exist. In light of the focus group's findings, both EMA and government regulations' characteristics are identified and used in enhancing the framework. EMAPs generate both monetary and physical information, which could promote greener decision-making in the Nigerian petroleum industry. Hence, the enhanced framework systematically integrates the two (2) important components of EMA: 'PEMA' and 'MEMA'. In addition, this section identifies and discusses the third background of the enhanced framework. The three (3) enhanced framework background characteristics are PEMA, MEMA, and Government Regulations. Both PEMA and MEMA are assessed in terms of their roles

in providing environmental (greener) information for decision-makers; likewise, government regulations are assessed in terms of their roles in providing environmental policies and guidelines for promoting the standard of environmental information available for making a decision. Therefore, this enhanced framework is intended to ensure that relevant environmental-related information is fully captured by incorporating government environmental policies and guidelines into a MAS to enhance the decision-making processes within the petroleum industry. Table 7.1 summarises the focus group findings and framework enhancement background characteristics.

Table 7.1: A summary of the focus group findings and framework enhancement background characteristics

SUMMARY OF FOCUS GROUP FINDINGS	FRAMEWORK ENHANCEMENT BACKGROUND CHARACTERISTICS
<p>The findings from the focus group show that EMA responds to the petroleum company's information needs by providing the necessary environmental information for business decisions that have an environmental impact. The need for a management accounting system to generate and record environmental information on the use, flows, and destinies of water, energy, waste, and products for greener decision-making was reflected in the feedback from the focus group. Therefore, it can be concluded that it is appropriate to enhance management accounting systems to capture and measure environmental-related costs as an accurate measurement of a company's true environmental costs to assist management in making strategic environmental decisions. Accordingly, the environmental information derived from EMA supports corporate managers in every business setting and drives greener decision-making. Therefore, it can be concluded that EMA and its information have a major impact on managers' views on environmental matters, ultimately influencing their decision-making process.</p>	<p>ENVIRONMENTAL MANAGEMENT ACCOUNTING (EMA)</p>
<p>The findings from the focus group also show that the framework offers managers and decision-makers adequate environmental information needed to support decision-making. Accordingly, both physical and monetary environmental information is pertinent to external and internal decision-making. The two types of information (physical and monetary) provide significant environmental information that facilitates greener decision-making and hence serves as a useful input for making greener decisions. Therefore, enhancing the management accounting system to fully capture and report on petroleum companies' physical and monetary activities to provide managers with the monetary and physical environmental information needed for</p>	<p>PHYSICAL ENVIRONMENTAL MANAGEMENT ACCOUNTING (PEMA)</p> <ul style="list-style-type: none"> • Physical environmental information (PEI) <p>MONETARY ENVIRONMENTAL MANAGEMENT ACCOUNTING (MEMA)</p>

SUMMARY OF FOCUS GROUP FINDINGS	FRAMEWORK ENHANCEMENT BACKGROUND CHARACTERISTICS
greener decision-making may be pertinent to shaping environmental-related strategies.	<ul style="list-style-type: none"> • Monetary environmental information (MEI)
The findings from the focus group also show that the regulatory authorities can provide suitable environmental regulations and policies, which petroleum companies can use to integrate environmental matters into their business decisions to improve environmental compliance and prevent pollution. It is evident from the focus group feedback that incorporating environmental management system concepts into environmental policy is recommended. Therefore, it can be concluded that incorporating policies and guidelines to address environmental matters may be pertinent to fostering greener decision-making in the petroleum industry.	<p style="text-align: center;">GOVERNMENT REGULATORY TOOLS</p> <ul style="list-style-type: none"> • Guidelines and Policies

Source: Author's computations (2023)

Table 7.1 summarises the focus group findings and framework enhancement background characteristics. Three (3) background characteristics were identified to enhance the framework developed in the study. The three enhanced framework background characteristics are discussed next.

7.3.1 Enhanced framework background one: PEMA

Enhanced framework background one – PEMA, enhances the physical side of EMAPs concerning the type of information generated. A systematic analysis of this side (physical) of EMAPs would offer a basis for enhancing the effective provision of physical environmental information for greener decision-making. PEMA is a subset of EMA that tracks physical information (Dutta, 2014). In simple terms, PEMA collects information on a company's environmental impact, stated in physical units (for example, joules and kilograms), and used for management's internal decisions.

In addition, PEMA functions as an analytical instrument that can identify environmental weaknesses and strengths, direct or indirect control of environmental consequences, a measurement tool, a decision support tool, and an accountability tool (Namakonzi & Inanga, 2014). Accordingly, Christophor (2017) argues that PEMA is an important tool in EMA: it permits companies to analyse and manage their environmental accomplishments. Therefore, every company's physical accounting side (PEMA) should be designed to track all the physical outputs and inputs and ensure that all

physical activities are accounted for, delivering the physical environmental information needed for decision-making.

7.3.2 Physical environmental information

PEMA focuses on the physical information associated with the flow of water, materials, wastes, and energy and produces information for internal purposes, focusing on companies' effects on the natural environment (Uljas, 2017). This physical information gathered through EMA is essential for identifying environmental costs and allowing companies to evaluate and report on the physical aspects of their environmental performance. Hence, resources like water, energy, and other materials support a company's operations and activities. Tracing and minimising the quantities of resources used and waste produced is essential to setting measurable environmental goals and managing environmental influences effectively.

The information generated within PEMA is called Physical Environmental Information (PEI). This collected PEI (with the addition of the monetary side) can be used to generate environmental performance indicators that assist companies in reporting on their environmental performance and making sound business decisions (Chang, 2007). Figure 7.2 reflects the interrelationship between enhanced framework background one: EMA, PEMA, and PEI.

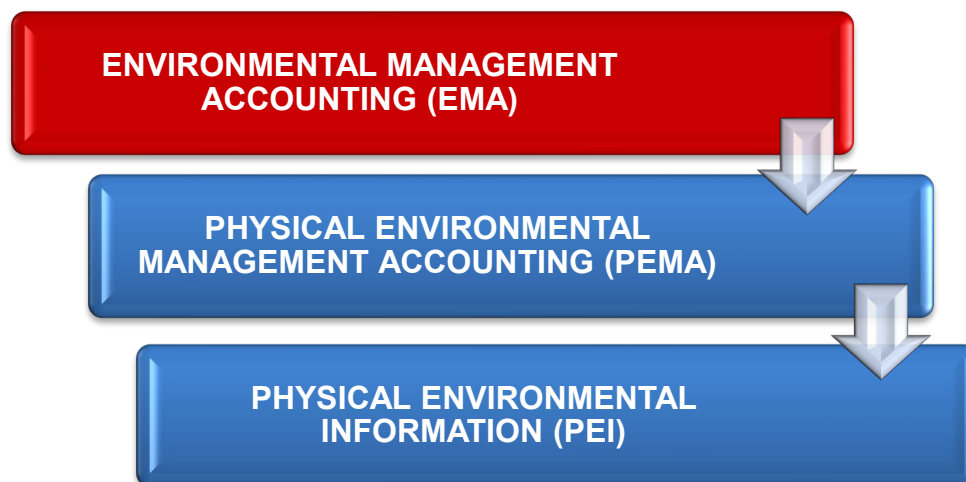


Figure 7.2: Enhanced framework background one: PEMA

7.3.3 Enhanced framework background two: MEMA

The enhanced framework background two – MEMA, enhances the monetary side of EMAPs concerning the type of information generated. A systematic analysis of this

side (monetary) of EMA provides a basis to enhance the effective provision of monetary environmental information for corporate decision-making. MEMA is a portion of EMA that primarily focuses on the financial (monetary) effects of environmental performance (Ambe, 2011) and enables business management to accurately estimate the monetary parts of projects and products when making a company decision (Ambe, 2011). Hence, MEMA may be a central tool that generates information to enhance internal management decision-making.

Accordingly, Schaltegger and Burrit (2000) refer to MEMA as a method of accounting for the monetary effects of environmental-related operations, which helps with operational and strategic planning and acts as a tool for accountability and control. The authors acknowledge further that MEMA provides the basis for internal management decisions while also tracking, tracing, and treating costs associated with the environment. Hence, MEMA provides information for managerial use and handles the environmental aspects of company operations, which are stated in monetary units. Therefore, every company's monetary accounting side (MEMA) should be designed to capture all monetary inputs and outputs to ensure that all monetary activities are accounted for and, in return, deliver the monetary environmental information needed for decision-making purposes.

7.3.3.1 Monetary environmental information

Depending on how the information will be used, monetary environmental data may also be gathered for a company or a specific spot, service lines, or product lines. Monetary environmental information relates to all company activities that impact its past, present, and future financial flows and stocks, which are reported in monetary units. Hence, monetary environmental information reflects the impacts of the environment on economic systems (Hargroves & Smith, 2013). The information created within EMA's monetary perspective (MEMA) is called Monetary Environmental Information (MEI). The monetary environmental-related information collected (along with the physical information) can be used for decision-making purposes. This monetary information includes the cost incurred on environmental assets, the cost of fines, and the cost of cleaner production. Figure 7.3 reflects the interrelationship between Enhanced framework background two: EMA, MEMA and MEI.

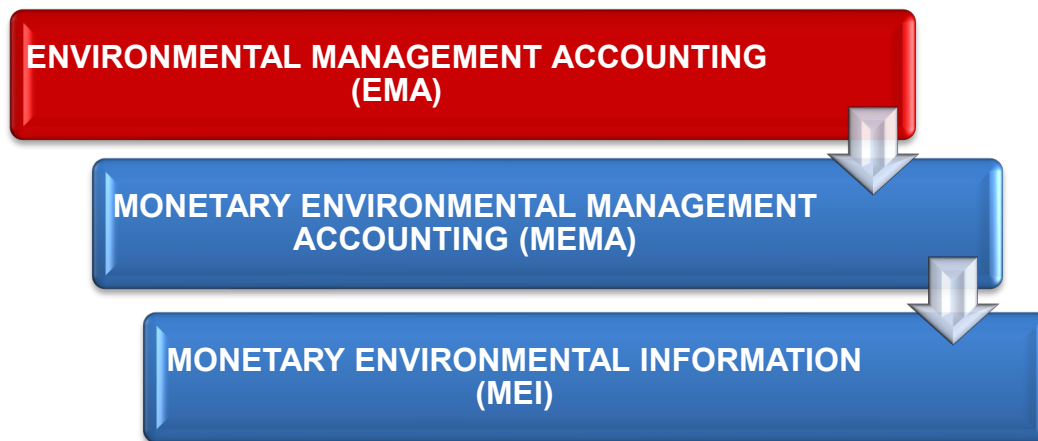


Figure 7.3: Enhanced framework background two: MEMA

7.3.4 Enhanced framework background three: Government regulatory tools

Enhanced framework background three (Government Regulatory Tools) of the current study is to examine the effectiveness of environmental regulations in the Nigerian petroleum industry and to form a connection between government regulatory tools on environmental matters and EMA. A systematic investigation of this connection offers a basis for improving the effective provision of EMA information for corporate decision-making through government policies and guidelines.

EMA has attracted increasing attention, leading to the enactment of environmental regulations that require petroleum companies to become more conscious of the environmental consequences of every single decision facing their companies. In reference to the enhanced framework for adequate environmental information provision illustrated in Figure 7.5 below (p. 134), governments can inspire the delivery of environmental information directly or indirectly by enacting environmental regulations. Effective government policies and guidelines can inspire the industry's stakeholders to provide adequate EMA data. The data can now be used to improve decision-making within government operations and to report and estimate financial and environmental performance on corporate activities.

7.3.4.1 Government and the Petroleum Industry in Nigeria

With the growing concerns over environmental problems, the costs of environmental protection, monitoring, waste management, pollution reduction, legal fees, regulatory reporting, and insurance have increased rapidly in the business environment (Jasch, 2009). These environmental issues are contributing to growing business pressures all

over the world. In response to the growing severity of environmental problems across the entire environment, the Nigerian government has passed several laws and instituted many environmentally friendly activities on both an international and national level, in addition to enacting several laws that ensure a healthy environment (Okafor, 2011). Environmental-friendly activities are directed to improve environmental matters, supervise economic activities, and establish a safe environment (Okafor, 2011). However, despite government participation in the NNPC's environmental awareness initiative, no forward-thinking measures have yet been taken to confront rising environmental costs in the petroleum industry. Hence, a progressive measure of continuous government environmental policy and regulation updates to address rising environmental costs is still needed.

In this regard, the government's role and that of the petroleum industry have also become highly significant due to the increasing concerns over environmental challenges. In the direction of integrating environmental performance into business strategy, it has become imperative for governments to play a major part in promoting effective policies and guidelines, which may force the petroleum industries to make environmentally friendly decisions. As access to adequate environmental information has long gained recognition as a tool for making environmental-related decisions within the petroleum industry, the need for the government's involvement in improving policies, laws, and regulations has become pertinent. This may force the petroleum industry to make environmentally friendly decisions.

7.3.4.2 Government guidelines and policies

The growing concern about companies' environmental consequences has created a need for further government guidelines and policies in the petroleum industry. The government's major role is to set regulations, policies, standards, and laws to improve environmental development. Meanwhile, the government's regulatory policy is an instrument that directly regulates and encourages EMA adoption (Rikhardsson et al., 2005). In view of this, the government may enact policies to improve environmental data and other associated environmental operations in the petroleum industry. Therefore, governments may enhance environmental information for decision-making in the area of environmental development in the petroleum industry.

Apart from formulating policies, the government may also set regulations to encourage the implementation of EMA. The detailed guidelines and mechanisms developed can be used to control environment-related activities, in which environmental factors are considered in formulating guidelines and designing and executing corporate EMA strategies in the petroleum industry. The potential environmental gains of the widespread use of EMA tools have called for active government participation in stimulating EMA usage through government regulatory tools. Therefore, effective government policies and guidelines may motivate and encourage petroleum companies to adopt EMA to justify a business's managerial accounting practice and ensure that decision costs are fully inventoried and properly allocated.

Indeed, the government may play a vital role in the effective implementation of EMA by issuing accounting policies and guidelines (UNSD, 2002). Thereby giving petroleum companies, a more active role in developing effective environmental data for making sound business decisions. This power of the government can compel companies to switch from strategies driven by economics to those driven by the environment. In return, compliance with the set rules, legislation, and industry standards is another way for companies to support environmental protection. Figure 7.4 reflects the interrelationship between enhanced framework background three: Government Regulatory Tools and EMA data.



Figure 7.4: Enhanced framework background three: Government regulatory tools

7.4 ENHANCING THE FRAMEWORK OF ENVIRONMENTAL MANAGEMENT ACCOUNTING INFORMATION FOR GREENER DECISION-MAKING IN THE PETROLEUM INDUSTRY

From an MA perspective, the availability of adequate information is essential and crucial to decision-making. Accordingly, dependable information is essential to all facets of the business. Ribiere and Worasinchai (2013) acknowledge that relevant and

credible information assists companies in strategic planning and decision-making to maintain business viability. Indeed, reliable information is the keystone for building the expertise and practical strategies necessary to improve business activities. To fulfil the overall objectives of this study, the enhanced framework provided in this chapter is designed to integrate the two main components of EMA and government regulations to enhance the framework suggested at the end of Chapter 3 of this study. The enhanced framework ensures that all adequate environmental-related information is fully captured in decision-making processes.

7.4.1 An enhanced framework for environmental information provision

In the financial world, a range of diverse accounting frameworks have been proposed and developed to address various facets of a company's financial performance. These consist of financial accounting and MA, and correspondingly, EMA information needs to reflect sound EMA principles around PEMA and MEMA and Government regulations so that business decision-makers can access adequate information that will support greener decision-making. Having reported the findings and the background characteristics identified from the results and findings (focus group), the background characteristics are employed in enhancing the framework of environmental management accounting for greener decision-making in the petroleum industry as illustrated in Figure 7.5, which is the combination of Figures 7.2, 7.3, and 7.4.

Sustainable Petroleum Industry (Enhanced Environmental Information Framework for Decision-Making)

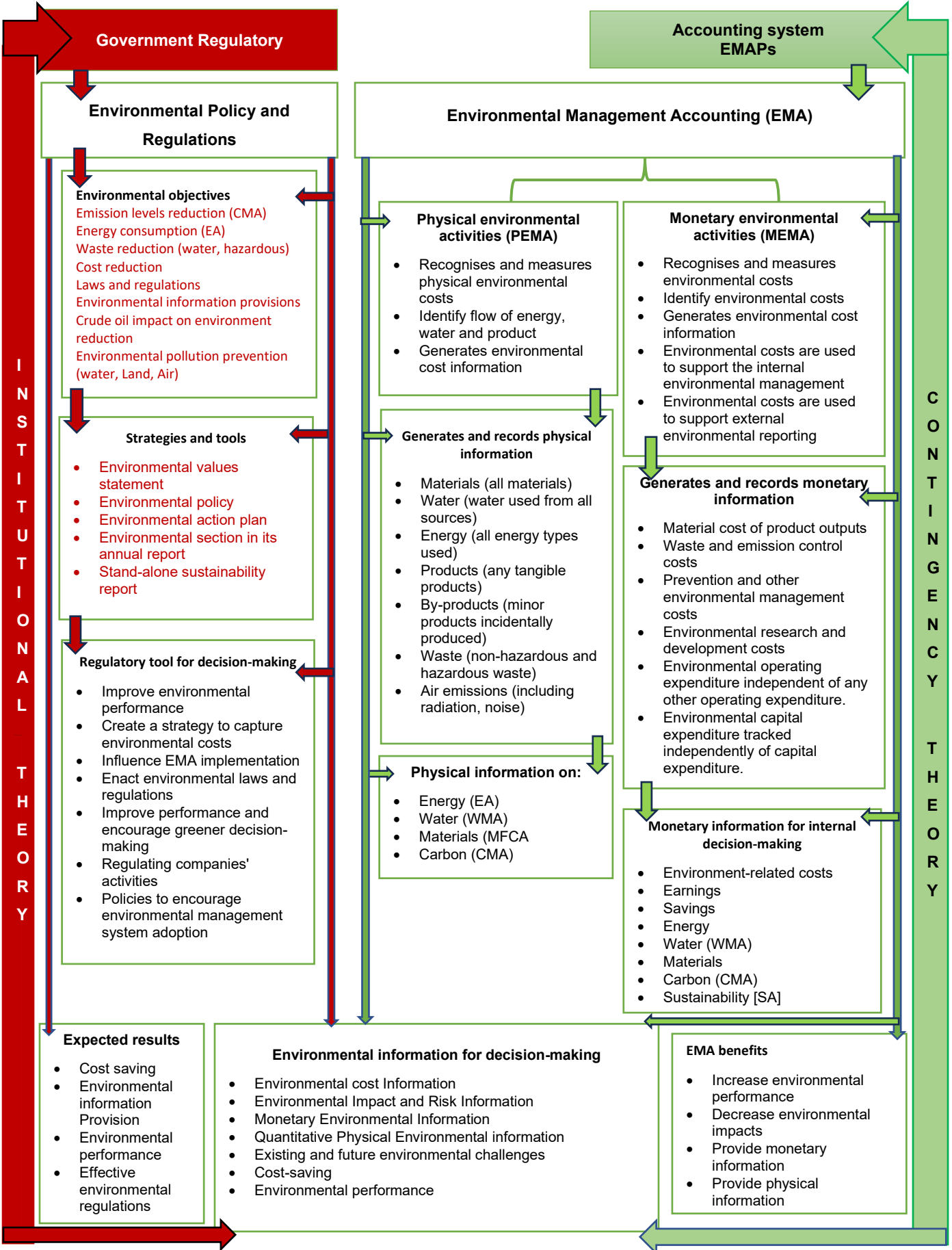


Figure 7.5: An enhanced framework of environmental management accounting information for greener decision-making in the Petroleum Industry

7.5 THE ENHANCED FRAMEWORK ANALYSIS

In implementing EMA, government regulations play an important part by issuing policies and guidelines that offer a more active part in developing effective environmental data, which is used for making efficient business decisions within the petroleum industry. Therefore, government regulations can force business strategies to shift to environmental-driven from economic-driven.

The enhanced framework reflects the interrelationship between EMA and Government Regulatory Tools. As shown in the enhanced framework (Figure 7.5 above), the combination of both EMA and Government Regulatory tools may enable integration across economic and environmental performance through measures like adequate information provision, with the prime motive of supporting the information requirements of the several stakeholders in the petroleum industry. Access to adequate environmental information has long gained recognition as a tool for making environmental-related decisions within the petroleum industry. Indeed, only businesses that strongly desire to incorporate environmental data into their regular business data are likely to make a successful investment decision. Hence, environmental data can produce information that decision-makers would not otherwise have access to. While data may comprise non-financial measures or be cost-based, in either respect, the data provide evidence for the decision that needs to be made. Therefore, the enhanced framework may generate adequate data, creating better information supporting greener decision-making in the petroleum industry.

7.6 PURPOSE OF AN ENHANCED FRAMEWORK OF ENVIRONMENTAL MANAGEMENT ACCOUNTING INFORMATION

The enhanced framework specifically aims to achieve the following:

- support petroleum companies by providing adequate EMA information for greener decision-making. EMA data can be employed for corporate and government operations management decisions. Hence, providing adequate EMA data will aid managers and decision-makers at all levels in making greener decisions.

- ensure no important environmental data is neglected when designing a workable environmental policy. To satisfy the information needs of the managers, EMA data should estimate and report on the environmental and financial performance of corporate and government activities.
- improve the effectiveness of regulations and policies in the petroleum industry by revealing the full environmental benefits and costs resulting from those regulations and policies.
- integrate both EMA and government regulatory tools to enhance the provision of environmental information. Thus, all adequate environmental-related information is fully captured in the decision-making processes.
- act as a guide that provides improvements and support to reduce the increasing environmental costs existing within the petroleum industry.
- be beneficial in assisting government policymakers in designing regulations and policies that optimise EMA's potential in the petroleum industry.

7.7 THE FRAMEWORK VALIDATION

The importance of the framework of adequate environmental information through EMAPs for greener decision-making is reflected in the feedback from the focus groups. Hence, a focus group at the NNPC validated the proposed conceptual framework. From a validation perspective, the framework feedback was found valuable and significant in the context of the information captured for greener decision-making. Consequently, this enhanced framework can serve as a support tool for developing and using environmental information for greener decision-making for the NNPC. The feedback from the framework validation showed that the following improvements can be made to the existing MAS at the NNPC through the EMAPs framework:

- A waste record will be generated to capture the input material quantities, such as water volume and energy consumed. This process will assist the NNPC decision-makers in capturing the physical and monetary activities involved. The information generated will result in cost savings.
- The EMAPs framework will
 - capture NNPC's physical and monetary information for external and internal decision-making.

- provide improvements and support to reduce the increasing environmental costs within the NNPC.
- provide comprehensive and adequate EMA information by ensuring no significant environmental information is omitted or disregarded in arriving at a practical environmental policy at the NNPC.
- The framework incorporates regulatory tools and EMA to enhance the environmental information accessible for management in the NNPC.

7.8 CHAPTER SUMMARY

This chapter validates an environmental management accounting information framework for greener decision-making in the petroleum industry. As noted in this chapter, relevant and credible information supports companies in making strategic plans and decisions to maintain business viability. Hence, the enhanced framework is developed to ensure that all required environmental-related information is fully captured in the decision processes within the Nigerian petroleum industry.

This enhanced framework represents the researcher's contribution to the field of MA through the extension of contemporary EMAPs to ensure that decision-makers within the petroleum industries are provided with adequate information needed to enhance greener decision-making processes. This study also contributes to practice and the body of knowledge by expanding the literature and the categories of EMA.

CHAPTER 8: SUMMARY AND CONCLUSIONS

8.1 INTRODUCTION

The preceding chapter presented the enhanced framework of EMAI for greener decision-making in the petroleum industry. This chapter presents what has been accomplished in the study and provides pointers for future studies in the research area. The study's overall objective was to develop an EMAI framework for greener decision-making in the petroleum industry. In addressing the study problem and achieving the study objective, a detailed review of the theoretical literature and relevant theories was conducted. Likewise, all relevant factors towards developing a conceptual framework were consolidated in Chapter 2. Accordingly, related literature on sustainable development and relevant literature on various EMAPs were reviewed in Chapter 3. Chapter 4 discusses the research methodology used in this study. The discussion and presentation of the quantitative results are discussed in Chapter 5, and the analysis, discussion, and presentation of the qualitative (focus group) findings are discussed in Chapter 6. The key results and findings from Chapters 5 and 6 were employed in Chapter 7 to present an enhanced framework of EMAI for greener decision-making in the petroleum industry. This chapter concludes by presenting the general findings of the study in response to the research questions, objectives, limitations, and recommendations for further research.

The contingency theory and institutional theory perspectives on MA were adopted. Based on the evidence from the relevant literature, a conceptual preliminary framework was presented at the end of Chapter 3 of the study. Likewise, based on the evidence from the data obtained from the questionnaire administered and the follow-up focus group data gathered, an enhanced framework of EMAI for greener decision-making in the petroleum industry was developed and presented in Chapter 7. The enhanced framework developed aims to ensure adequate environmental-related information is fully captured in decision-making. In the next section, an overall summary of this chapter is presented through a visual representation in Figure 8.1 (p. 140).

8.1.1 The goal of the chapter

The chapter aims to summarise the key results and findings and presents the study conclusions. The chapter considers the degree to which the study objectives outlined

at the start of the study, have been accomplished. The study's research questions are revisited, and the chapter provides the contributions, discusses the limitations, and offers suggestions for further research.

8.1.2 Layout of the chapter

The chapter begins with a summary of the motivations for this research in Section 8.2. Section 8.3 proceeds with a restatement of the research objectives and problems, as detailed in Chapter 1. Section 8.4 presents a summary and conclusion of the research design and methodology employed and presented in Chapter 4, and Section 8.5 presents the study's research questions, results, and findings. The research contribution is provided in Section 8.6. Subsequently, the study's recommendations and limitations are presented in Sections 8.7 and 8.8, respectively. The research journey is described in Section 8.9. Section 8.10 provides opportunities for future study, and the final concluding remarks are presented in Section 8.11. Figure 8.1 (p. 140) presents the above layout.

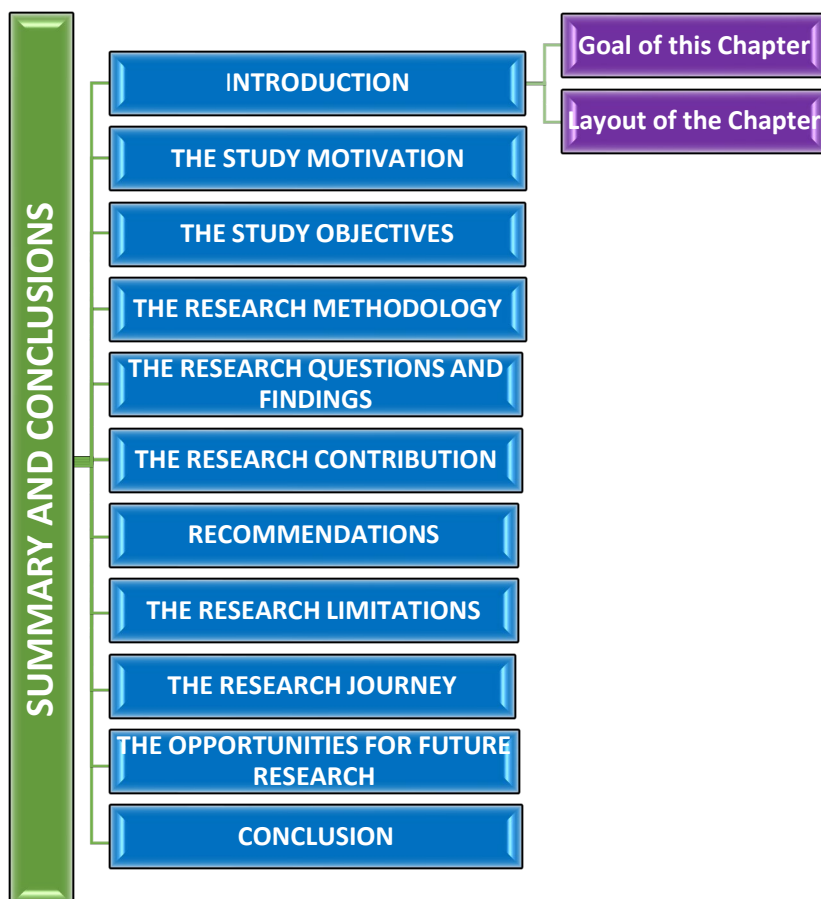


Figure 8.1: A visual representation of the layout of Chapter 8

8.2 THE MOTIVATION

The quest for adequate environmental information provision has gained momentum in recent years. Adequate information is a prerequisite for consistently sound decision-making. Relevant environmental information can assist in improving the quality of the information available to make decisions. Therefore, environmental information may be relevant for making decisions about product development, investment projects, and accurate product costing.

In the field of MA, there has been an increased effort to address the adequacy of environmental data, as the need to meet the environmental requirements of the future requires the provision of adequate information. Relevant information is a critical component of efficient business decisions. In light of this, the MA function is essential in producing non-financial and financial information that supports sound decisions. However, TMA has provided insufficient information as most cost information is concealed in overhead accounts. In response, a framework for environmental information was developed to enrich corporate decision-making processes. Hence,

the focus of EMA as a MAT is to inform greener decisions, particularly for proactive environmental management initiatives. This study developed an EMAI framework for greener decision-making in the petroleum industry. The next section describes how this was achieved by revisiting the study objectives.

8.3 THE OBJECTIVES

The objectives are developed from the problem statement in Chapter One, which hinted that adequate environmental information is required to make sound decisions and is vital to the success of any company. Therefore, the objectives of the research are to:

- RO1:** Identify the relevant environmental management accounting practices (EMAPs) that can provide environmental information to the petroleum industry for greener decision-making.
- RO2:** Investigate if the Nigerian petroleum industry's current management accounting system (MAS) provides a valuable flow of environmental information required for greener decision-making.
- RO3:** Examine the effectiveness of environmental regulations and sustainability in the Nigerian petroleum industry.
- RO4:** Develop a framework that will provide adequate environmental information through environmental management accounting practices (EMAPs) for greener decision-making in the Nigerian petroleum industry.

8.4 RESEARCH METHODOLOGY

The methodological choice was mixed methods with a triangulation design strategy, using qualitative and quantitative data collection methods. These included a thorough literature review, a structured questionnaire with closed-ended questions, and a focus group interview to test the theoretical framework developed. The structured questionnaire from the quantitative data was analysed with correlation analysis and the ordinary least squares (OLS) method. The qualitative data from the focus group question was analysed using thematic analysis. The research target population comprises managers/decision-makers in the financial, environmental, and management disciplines (departments) in the NNPC. The next step was to answer the research questions (Section 1.5).

8.5 RESEARCH QUESTIONS, THE RESULTS AND FINDINGS

This section uses the study results and findings to answer the research questions developed at the beginning of the study (Section 1.5). Table 8.1 outlines the research questions, results, and findings.

Table 8.1: Research questions, results, and findings

Research Questions	Research Findings	Achieved
Which environmental management accounting practices (EMAPs) can provide environmental information to the petroleum industry for greener decision-making?	The study revealed that EMAPs (EMA, SA, CMA, WMA, EA, and MFCA) generate, analyse, and use physical and monetary data about the environment to improve corporate performance and greener decision-making within the petroleum industry.	The first research question was answered through inferences from the scholarly literature reviewed in Chapters Two and Three.
Does the Nigerian petroleum industry's current management accounting system (MAS) provide a valuable flow of environmental information required for greener decision-making?	The study revealed that monetary environmental information has a significant positive relationship with environmental information on decision-making, which shows that the company's accounting system captures monetary environmental activity data. However, physical environmental information has a significant negative relationship with environmental information on decision-making, meaning that the company's accounting system does not fully capture the physical environmental activities of its operations, as it generates information on the use, flows, and destinies of water, energy, waste, and products but recognises them as part of a general cost.	The second research question was answered through the results of Sections B, C, and D of the questionnaires administered at the NNPC.
Are the environmental regulations in place for the Nigerian petroleum industry effective?	The study results also present a significant negative relationship between the environmental regulation index and the environmental information report. This implies that environmental regulation inversely influences the environmental information report, which demonstrates that there may be an	The third research question was answered through the results of Section E of the questionnaires

Research Questions	Research Findings	Achieved
	indication of insufficient or ineffective environmental policy regulation in place that led to regulators not attaining a standard level in encouraging and providing regulations, programmes, and policies that promote the use of an Environmental Management Strategy (EMS).	administered at the NNPC.

Source: Author's computations (2023)

Therefore, it can be inferred from the literature review, the research results, and the findings that there is a need for a framework that offers adequate environmental information to improve greener decision-making in Nigeria's petroleum industry, as the environmental cost of the industry is still on the rise. Incorporating government environmental policy and guidelines into a MAS to enhance the quality of EMAI for decision-making processes may generate more accurate environmental cost accounting data, assisting decision-makers in making greener environmental-related decisions. Therefore, the enhanced framework developed aims to contribute to theory and practice by addressing the major gap in enriching the petroleum industry's decision-making process by providing adequate environmental information.

The inferences from the scholarly literature reviewed were used to answer the first research objective, whereas the results of the questionnaire administered at the NNPC were used to answer both the second and third research objectives, and the findings from the focus group were used to answer the fourth research objective.

8.6 THE RESEARCH CONTRIBUTION

This study makes various valuable contributions to the earlier literature. Firstly, this study is expected to contribute to the body of knowledge (literature) by evidencing that EMAPs may offer the information required in the petroleum industry. Secondly, the research also seeks to extend the present knowledge beyond the present manufacturing and service industries to include the petroleum industry. Extending the concepts of EMA to this industry may present a major contribution by developing a framework to enhance greener decision-making processes in the petroleum industry. Finally, a key contribution of the study to practices and knowledge is an extension of the concept of EMA to stakeholders in developing nations. As mentioned, prior

research has concentrated mainly on developed nations, while EMA may still be in its early stages in underdeveloped nations.

8.7 RECOMMENDATIONS

Many recommendations emerged from the literature review, questionnaire, and focus group. The study's recommendations for the petroleum industry will be presented next.

In establishing that adequate information is made available to the petroleum company, it is recommended that:

- its management accounting system generates and records environmental information on the flows, use, and destinies of water, energy, waste, and products to make greener decisions.
- the petroleum companies' MAS should capture and measure environmental-related costs as an accurate measurement of a company's true environmental costs to assist management in making strategic environmental decisions.
- they enhance their MAS to capture and report on their physical and monetary activities to ensure managers have access to monetary and physical environmental information for making greener decisions and shaping their environmental policies.

To improve corporate performance and make better green decisions, it is recommended that petroleum companies develop environmental policies that are aligned with the company's corporate strategies.

To prevent pollution and improve environmental compliance, it is recommended that regulatory authorities ensure that adequate environmental regulations and policies are in place that allow petroleum companies to integrate environmental matters into their business decision.

In addressing environmental matters, it is recommended that petroleum companies incorporate environmental management system concepts into their environmental policy to foster greener decision-making in the petroleum industry.

To improve the effectiveness of regulations and policies in the petroleum industry, it is recommended that regular research be conducted to reveal the full environmental benefits and costs resulting from those regulations and policies.

Petroleum companies should integrate EMA and government regulatory tools to fully capture all adequate environmental-related information needed for greener decision-making processes.

To reduce the increasing environmental costs in the petroleum industry, it is recommended that petroleum companies incorporate environmental accountability into their corporate strategy.

Government authorities or policymakers should continuously engage petroleum industry stakeholders:

- to promote the adoption and implementation of EMA and to design regulations and policies that optimise the EMA's potential in the industry.
- in designing regulations and policies that optimise the EMA's potential in the industry.

To improve corporate performance and greener decision-making within the petroleum industry, it is recommended that petroleum companies adopt and implement the enhanced EMAPs framework to generate physical and monetary data about the environment.

8.7.1 Practical Implications of Implementing an Environmental Management Accounting (EMA) Information Framework in the Petroleum Industry

By implementing the proposed environmental management accounting information framework, petroleum companies can effectively integrate EMA into their operations and generate adequate environmental information to make greener decisions that drive both their environmental and economic benefits. The proposed framework may have specific practical implications for petroleum companies, as listed below.

- **Enhanced Regulatory Compliance:** Implementing the proposed EMA framework will ensure compliance with environmental regulations by systematically tracking and reporting environmental costs and impacts. This proactive approach can help petroleum companies avoid legal penalties and build a reputation for regulatory compliance.
- **Improved Cost Management:** EMA provides detailed insights into environmental costs, enabling companies to identify and eliminate inefficiencies. Implementing the proposed EMA framework will ensure that

costs are appropriately allocated. This proactive approach can help petroleum companies reduce waste, optimise resource usage, and lower operational expenses.

- **Strategic Decision-Making:** An EMA framework integrates environmental data into financial decision-making processes, facilitating informed strategic planning. Implementing the proposed EMA framework will ensure that petroleum companies can evaluate the long-term financial implications of environmental initiatives, aligning them with corporate sustainability goals.
- **Risk Management:** EMA helps identify and mitigate environmental risks by providing comprehensive data on environmental impacts. Implementing the proposed EMA framework will enable petroleum companies to develop risk management strategies that address potential environmental liabilities and enhance overall resilience

8.8 THE RESEARCH LIMITATIONS

This research may have sustained some innate shortcomings like generalisation and subjectivity. Hence, since every study is unique and different, the results and findings gathered from NNPC might not be transferable to other petroleum companies; however, each study may also include various shared characteristics. Generalisability is a questionable matter in exploratory study. Despite that, the researcher made an effort to overcome these impediments through the process of conducting a follow-up focus group to validate the framework developed, but this may not automatically have overcome these limitations.

8.9 THE RESEARCH JOURNEY

The study assisted me in understanding the significance of the research procedure from different perspectives that differed from the experiences i had during my bachelor's and master's degree research. I have gained insight into the fundamentals of doctoral research by persistently studying and altering draft chapters with the help of my supervisor.

At the start of the research, I had a diverse range of interests outlined in the research proposal. Be that as it may, as I advanced, the research title was altered before agreeing to this final title. Likewise, the methodological approach changed until I opted

for mixed methods, which is an appropriate method for the topic of inquiry. I visited the NNPC several times, followed up with several emails, and finally, the company consented to participate.

8.10 THE OPPORTUNITIES FOR FUTURE RESEARCH

Through further study, the knowledge attained from this study could be used in developing new or refining the current EMA concepts to ensure that the quality of environmental accounting data/information available for decision-making can be improved with government programmes or policies that support EMA concepts, leading to higher productivity. Interest is growing in the government's ability to encourage positive environmental performance by companies through environmental policies and guidelines. Future research may include topics like:

- The scope for governments in implementing environmental guidelines and policy, for which EMA is a suitable tool for providing adequate information for decision-making.

8.11 CONCLUSION

The petroleum industry should minimise environmental effects by providing relevant information to improve decision-making. As a function, MA ensures that decision-makers/managers in a company are equipped with adequate information to make informed decisions. The study's findings revealed the necessity for government initiatives or regulations that support EMA concepts to enhance the quality of environmental accounting information available for making greener decision. Hence, this calls for active intervention in improving corporate environmental performance, which leads to the possible environmental gains that could result from the broader use of EMA concepts. The thesis recommends and develops an EMAI framework for greener decision-making in the petroleum industry.

Promoting relevant information for decision-making, environmental policies, and guideline implementation depicts government and industry roles. The study's results and findings highlighted the potential utility of the EMA information to stakeholders. Firstly, the government needs information on physical measures of the environmental impact to minimise the environmental cost and enhance the environmental positions within the petroleum industry. Likewise, the government needs monetary and physical information to improve regulation enforcement and compliance within the petroleum

industry. Therefore, the government needs information on physical and monetary measures of business environmental performance to create a suitable structure for business accountability and transparency and motivate petroleum companies to operate in the public's interest.

In addition, the availability of EMA data gives the company's management the capacity to precisely manage and track the flows and uses of materials and energy in the petroleum industry. Accordingly, EMA data may be employed for any form of management operation and decision-making in the petroleum industry. Hence, monetary and physical data on a company's environmental activities are needed to make decisions relating to profitability (identifying new opportunities for cost savings) and the company's survival (solving existing and future environmental problems). Therefore, companies considering improving their decision-making processes may find this study valuable.

REFERENCES

- A4S (2023). *Open letter to world leaders from the global accountancy bodies urging concerted climate action - The Prince's Accounting for Sustainability Project* [accountingforsustainability.org](https://www.accountingforsustainability.org). Available at: <https://www.accountingforsustainability.org/content/dam/a4s/corporate/home/aboutus/abnmember/A4S%20Accounting%20Bodies%20Network%20COP21%20letter.pdf> (Accessed: June 05, 2023).
- Abiola, J. and Ashamu, S. (2012). Environmental management accounting practice in Nigeria: National Petroleum Corporation (NNPC). *European Scientific Journal*, 8(9), 76-93.
- ACCA (2022a). Environmental Management Accounting | ACCA Qualification | Students | ACCA Global. Available at: <https://www.accaglobal.com/us/en/student/exam-support-resources/professional-exams-study-resources/p5/technical-articles/environmenta-management.html> (Accessed: January 02, 2022).
- ACCA (2022b). Environmental Management Accounting | F5 Performance Management | ACCA Qualification | Students | ACCA | ACCA Global. Available at: <https://www.accaglobal.com/gb/en/student/exam-support-resources/fundamentals-exams-study-resources/f5/technical-articles/Env-MA.html> (Accessed: January 22, 2023).
- ACCA (2023). Environmental Management Accounting, ACCA Qualification | Students | ACCA Global. Available at: <https://www.accaglobal.com/in/en/student/exam-support-resources/professional-exams-study-resources/p5/technical-articles/environmenta-management.html> (Accessed: December 23, 2023).
- ACCA (2024). Environmental Management Accounting, ACCA Qualification | Students | ACCA Global. Available at: <https://www.accaglobal.com/uk/en/student/exam-support-resources/professional-exams-study-resources/p5/technical-articles/environmenta-management.html#:~:text=EMA%20is%20the%20generation%20and,support%20internal%20environmental%20management%20processes>. (Accessed: 04 June 2024).
- Adegbite, A., Amiolemen, S., Ologeh, I. and Oyefuga, I. (2012). Sustainable Development Policy and Corporate Social Responsibility in Business Organisations in

Nigeria. *Journal of Sustainable Development*, 5(6), 83-89.
<https://doi.org/10.5539/jsd.v5n6p83>

Adelegan, J. (2004). Environmental Policy Reform and Pollution by Slaughterhouse Waste in Nigeria, a paper presented at ISEE, Montreal, 11-14 July.

Afinotan, L. and Ojakorotu, V. (2009). The Niger Delta crisis: Issues, challenges and prospects. *African Journal of Political Science and International Relations*, 3(5), 191-198.

Agwu, M. (2013). Community Participation and Sustainable Development in the Niger Delta. *British Journal of Education, Society & Behavioural Science*, 3(1), 33-46.
<http://dx.doi.org/10.9734/BJESBS/2013/2392>

AICPA (2015). *The State of Sustainability Assurance and Related Advisory Services in the U.S.*, AICPA. Available at: <https://us.aicpa.org/content/dam/aicpa/interestareas/businessindustryandgovernment/resources/sustainability/downloadabledocuments/sustainability-twomarket.pdf> (Accessed: February 09, 2022).

Ajayi, A. (2021). *Petroleum Industry Bill (PIB) 2020 - A Game Changer? KPMG*. Available at: <[https://assets.kpmg/content/dam/kpmg/ng/pdf/tax/petroleum-industry-bill-\(pib\)-2020-%20a-game-changer.pdf](https://assets.kpmg/content/dam/kpmg/ng/pdf/tax/petroleum-industry-bill-(pib)-2020-%20a-game-changer.pdf)> (Accessed: July 08, 2022).

Ajayi, O., Owolabi, T., Esan, W. and Ajayi, O. (2014). Oil and Gas Regulation in Nigeria: Overview. In: *Energy and Natural Resources Multi-Jurisdictional Guide*. Thomson Reuters.

Ajiboye, O., Jawande, J. and Adisa, W. (2009). Poverty, Oil Exploration and Niger Delta Crisis. *Africa Journal of Political Science and International Relations*, 3(5), 224-232.

Akrani, G. (2010). *Decision making process in management - problem solving*, Kalyan City Life Blog. Available at: <https://kalyan-city.blogspot.com/2010/06/decision-making-process-in-management.html> (Accessed: May 25, 2018).

Al Kindy, A., Shah, I. and Jusoh, A. (2016). Consideration and Methodological Approaches in Studying Transformational Leadership Impact on Work Performance Behaviors. *International Journal of Advanced Research*, 4(1), 889-907.

- Alewine, H. and Stone, D. (2013). How does environmental accounting information influence attention and investment? *International Journal of Accounting and Information Management*, 21(1), 22-52. <https://doi.org/10.1108/18347641311299731>
- Alkisher, A. (2018). Overview of Drivers behind Environmental Management Accounting (EMA). *Journal of Economics and Political Science*, 12, 232 - 269.
- Almagtome, A. and Abdlazez, M. (2021). Energy Accounting and Performance: A theoretical perspective, *Akkad Journal of Contemporary Accounting Studies*, 1(4), 232–245. Available at: <https://doi.org/10.55202/ajcas.v1i4.88>.
- Almagtome, A. et al. (2019). The integration between financial sustainability and accountability in higher education institutions: an exploratory case study. *International Journal of Innovation, Creativity and Change*, 8(2), 202-221.
- Almagtome, A. et al.. (2020a). Circular economy initiatives through energy accounting and Sustainable Energy Performance Under Integrated Reporting Framework, *International Journal of Mathematical, Engineering and Management Sciences*, 5(6), 1032–1045. Available at: <https://doi.org/10.33889/ijmems.2020.5.6.079>.
- Almagtome, A., Khaghaany, M. and Önce, S. (2020b). Corporate governance quality, stakeholders' pressure, and sustainable development: An integrated approach. *International Journal of Mathematical, Engineering and Management Sciences*, 5(6), 1077. <http://dx.doi.org/10.33889/IJMEMS.2020.5.6.082>
- Alsharari, N. (2018). Multilevel institutional analysis of accounting change in public management. *International Journal of Organizational Analysis*, 26(1), 91-106.
- Al-Tamimi, S. (2022). Towards Integrated Management Accounting System for Measuring Environmental Performance, *The Journal of Agrobiotechnology Management & Economics*, 24(2), 149–161. <https://hdl.handle.net/10355/93853>
- Ambe, M. (2007). *Environmental Management Accounting in South Africa. Status, challenges and implementation framework*. D. Tech. Tshwane University of Technology.
- Ambe, Q. (2011). *Assessment of Environmental Management Accounting at Tshwane University of Technology*. MBA. Tshwane University of Technology.
- Anifowose, B. (2011). *Assessing water and environmental impacts of oil and gas projects in Nigeria*. Ph.D. University of Birmingham.

Anyanwu, C. (2012). The oil industry and the Nigerian environment. In: *Energy Future the Role of Impact Assessment 32nd Annual Meeting of the International Association for Impact Assessment*. Centro de Congresso da Alfândega: IAIA12 Conference Proceedings, 1-6.

Arieftiara, D., Theresa, R. and Sari, R. (2021). Sustainability in Health Service Industry: The implementation of material flow cost accounting (MFCA) as an eco-efficient analysis, *Journal of Southeast Asian Research*, 1–15. Available at: <https://doi.org/10.5171/2021.747009>.

Arts, K., et al. (2019). Towards more effective online environmental information provision through tailored Natural Language Generation: Profiles of Scottish river user groups and an evaluative online experiment. *Science of The Total Environment*, 673, 643-655. <https://doi.org/10.1016/j.scitotenv.2019.03.440>

Arvai, J., Campbell-Arvai, V. and Steel, P. (2012). *Decision-making for sustainability*. Network for Business Sustainability. Available at: <https://nbs.net/executive-report-decision-making-for-sustainability/> (Accessed: June 20, 2023).

Ashton, W., Russell, S. and Futch, E. (2017). The adoption of green business practices among small US Midwestern Manufacturing Enterprises, *Journal of Environmental Planning and Management*, 60(12), 2133–2149. <https://doi.org/10.1080/09640568.2017.1281107>.

Asika, N. (2002). *Research Methodology in the Behavioral Science*. Lagos, Nigeria: Longman (Nig) Plc.

Asokoroogaji, C. (2011). *The rationale for the adoption of the EIA as a policy in environmental management in Nigeria*. Comfortasokoroogaji. Available at: <http://comfortasokoroogaji.wordpress.com/2011/09/19/the-rational-for-the-adoption-of-the-eia-as-a-policy-in-environmental-management-in-nigeria/> (Accessed: February 05, 2022).

Aziza (2020). Functions of DPR in Nigerian Oil and Gas, *Aziza Nigeria*. Available at: <https://www.aziza.com.ng/functions-of-dpr-in-nigerian-oil-and-gas/> (Accessed: December 11, 2022).

Aznar, J. and Estruch, V. (2015). *Valoración de activos ambientales*. 2nd edn. Universitat Poletecnica de Valencia.

- Bananuka, J. et al. (2021). Institutional pressures, environmental management practices, firm characteristics and environmental performance, *Accounting Research Journal*, 34(6), 637–665. Available at: <https://doi.org/10.1108/arj-06-2020-0143>.
- Beck, C. et al. (2020). *The future is now: How oil and gas companies can decarbonize*, McKinsey & Company. McKinsey & Company. Available at: <https://www.mckinsey.com/industries/oil-and-gas/our-insights/the-future-is-now-how-oil-and-gas-companies-can-decarbonize> (Accessed: March 10, 2023).
- Bello, T. and Nwaeke, T. (2020). Environmental impacts of oil exploration (oil and conflicts: Niger Delta as a case study), *SSRN Electronic Journal*, 1–12. Available at: <https://doi.org/10.2139/ssrn.3720659>.
- Benebo, J. (2011). Using enforcement cooperation to promote environmental governance: the case of the national environmental standards and regulations enforcement agency of Nigeria. In: *Ninth International Conference on Environmental Compliance and Enforcement*. Whistler, British Columbia, Canada.
- Bennett, M. and James, P. (1998). *The Green Bottom Line: Environmental Accounting for Management - current practice and future trends*. Sheffield: Greenleaf Publishing.
- Bennett, M., Schaltegger, S. and Zvezdov, D. (2013). *Exploring corporate practices in management accounting for sustainability*. London: ICAEW.
- Benson, N. et al. (2021). Effect of green accounting on financial performance of oil and gas companies in Nigeria, *Journal of University of Shanghai for Science and Technology*, 23(12): 166-190. <http://doi.org/10.51201/JUSST/21/11974>
- Bhattacharyya, S.C. (2019). *Energy economics: concepts, issues, markets and governance*: Springer Nature. <https://doi.org/10.1007/978-1-4471-7468-4>
- Bierer, A. and Götze, U. (2012). Energy Cost Accounting: Conventional and flow-oriented approaches, *Journal of Competitiveness*, 4(2): 128-144. <https://doi.org/10.7441/joc.2012.02.09>.
- Blackburn, R. and Stokes, D. (2000). Breaking down the barriers: Using focus groups to research small medium-sized enterprises, *International Small Business Journal: Researching Entrepreneurship*, 19(1), 44–67. <https://doi.org/10.1177/0266242600191003>

- Blumberg, B., Cooper, D. and Schindler, P. (2014). *Business research methods*. 4th edition. London: McGraw-Hill Education.
- Bonvoisin, N. (2009). Decision Making for Sustainable Development: How Assessment Can Help. *United Nations ECE 2009 Annual Report*, 52-59.
- Bouma, J. (2000). Environmental Management Systems and Audits as Alternative Policy Instruments. In: Knill, C., Lenschow, A. (Eds.), *Implementing EU Environmental Policy*. Manchester University Press, Manchester, UK.
- Bouma, J. and van der Veen, M. (2002). Wanted: A Theory for Environmental Management Accounting, in M Bennett, JJ Bouma & T Wolters (eds), *Environmental Management Accounting: Informational and Institutional Development*, Kluwer Academic Publisher, Dordrecht. https://doi.org/10.1007/0-306-48022-0_22
- BP, (2019). *Statistical Review of World Energy | Energy Economics | Home*. bp global. Available at: <<https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>> (Accessed: November 20, 2020).
- Brink, H., Walt, V. der and Hildegard, V. (2018). *Fundamentals of Research Methodology for Health Care Professionals*. Cape Town, South Africa: Juta and Company (Pty) Ltd.
- Bryman, A. (2016). *Social research methods*. 5th edition. Oxford: Oxford University Press.
- Budnukaeku, A. and Hyginus, O. (2021). Environmental laws and management agencies in Nigeria– what hope for desecrated landscape, *Biodiversity International Journal*, 5(1), 1–6. <https://doi.org/10.15406/bij.2021.05.00190>
- Burja, V. (2012). Reporting the Companies' Sustainable Performance in Agriculture. *Annales Universitatis Apulensis Series Oeconomica*, 2(14), 599-606. <http://dx.doi.org/10.29302/oeconomica.2012.14.2.26>
- Burritt, R. and Christ, K. (2016). Industry 4.0 and environmental accounting: a new revolution? *Asian Journal of Sustainability and Social Responsibility*, 1(1), 23-38. <https://doi.org/10.1186/s41180-016-0007-y>
- Burritt, R. and Christ, K. (2017). The need for monetary information within Corporate Water Accounting, *Journal of Environmental Management*, 201, 72–81. Available at: <https://doi.org/10.1016/j.jenvman.2017.06.035>.

Burritt, R., Christ, K. and Schaltegger, S. (2021a). Materials and energy accounting, *Routledge Handbook of Environmental Accounting*, 207–223. <https://doi.org/10.4324/9780367152369-18>

Burritt, R., Hahn, T. and Schaltegger, S. (2003). An Integrative Framework of Environmental Management Accounting: Consolidating the Different Approaches of EMA into a Common Framework and Terminology. In M Bennett & JJ Bouma (eds), *Environmental Management Accounting: Informational and Institutional Developments. Eco-Efficiency in Industry and Science*, 9(1), 21-35. https://doi.org/10.1007/0-306-48022-0_2

Burritt, R. et al. (2019). Diffusion of environmental management accounting for cleaner production: Evidence from some case studies. *Journal of Cleaner Production*, 224, 479-491. <https://doi.org/10.1016/j.jclepro.2019.03.227>

Burritt, R., Schaltegger, S. and Zvezdov, D. (2011). Carbon Management Accounting: Explaining practice in leading German companies, *Australian Accounting Review*, 21(1), 80–98. <https://doi.org/10.1111/j.1835-2561.2010.00121.x>

Cai, Y. and Mehari, Y. (2015). The use of institutional theory in Higher Education Research, *Theory and Method in Higher Education Research*, 1–25. <http://dx.doi.org/10.1108/S2056-375220150000001001>

Callado, A. and de Oliveira, A. (2019). External contingency factors and performance measuring: a study in Brazilian NGOs, *REPeCRevista de Educação e Pesquisa em Contabilidade (REPeC)*, 13(2), 228–341. <http://dx.doi.org/10.17524/repec.v13i2.1928>

Campbell, R. (2022). *Net zero: What challenges will my business face?*, <https://www.em-solutions.co.uk/>. Environmental Monitoring Solutions. Available at: <https://www.em-solutions.co.uk/insights/net-zero-what-challenges-will-my-business-face/> (Accessed: March 14, 2023).

Carlin, D., Arshad, M. and Baker, K. (2023). *Climate risks in the oil and Gas Sector , Sectoral Risk Briefings: Insights for Financial Institutions*. Available at: <https://www.unepfi.org/wordpress/wp-content/uploads/2023/04/Oil-and-Gas-Sector-Risks.pdf> (Accessed: December 25, 2023).

CFI (2023). Oil and gas company Balance Sheets, Corporate Finance Institute. *CFI Education Inc.* Available at:

<https://corporatefinanceinstitute.com/resources/accounting/oil-and-gas-company-balance-sheets/> (Accessed: April 05, 2023).

CGMA (2022). *Environmental Management Accounting*. CGMA. Available at: <<https://www.cgma.org/resources/tools/cost-transformation-model/environmental-management-accounting.html>> (Accessed: January 01, 2022).

Chang, H. (2007). *Environmental management accounting within universities: current state and future potential*. Ph.D. RMIT University.

Chathurangani, H. and Madhusanka, K. (2019). Environmental Management Accounting (EMA) Adoption Level among Listed Manufacturing Companies in Sri Lanka: Institutional Theory Perspective. *Research in Social Sciences*, 2(1), 1-12. <http://dx.doi.org/10.53935/2641-5305.v2i1.11>

Chaudhry, N. and Amir, M. (2020). From institutional pressure to the sustainable development of firm: Role of environmental management accounting implementation and environmental proactivity. *Business Strategy and the Environment*, 29(8), 3542-3554. <https://doi.org/10.1002/bse.2595>

Chimos, K. et al.. (2013). E-learning on geographic education in higher education. *INTED2013 Proceedings*, 3107-3112.

Christ, K. (2014). Water Management Accounting and the wine supply chain: Empirical evidence from Australia, *The British Accounting Review*, 46(4), 379–396. <https://doi.org/10.1016/j.bar.2014.10.003>

Christ, K. and Burritt, R. (2015). Material flow cost accounting: a review and agenda for future research. *Journal of Cleaner Production*, 108, 1378-1389. <https://doi.org/10.1016/j.jclepro.2014.09.005>

Christ, K. and Burritt, R. (2016). ISO 14051: A new era for MFCA implementation and research', *Revista de Contabilidad*, 19(1), 1–9. <https://doi.org/10.1016/j.rcsar.2015.01.006>

Christ, K. and Burritt, R. (2017). Water management accounting: A Framework for Corporate Practice," *Journal of Cleaner Production*, 152, 379–386. <https://doi.org/10.1016/j.jclepro.2017.03.147>.

Christ, K., Schaltegger, S. and Burritt, R. (2021). *Putting the Focus on Environmental Management Accounting*. IFAC. Available at: <<https://www.ifac.org/knowledge->

gateway/contributing-global-economy/discussion/putting-focus-environmental-management-accounting> (Accessed: June 04, 2024).

Christensen, B. and Himme, A. (2016). Improving Environmental Management Accounting: How to use statistics to better determine energy consumption, *Journal of Management Control*, 28(2), 227–243. <https://doi.org/10.1007/s00187-016-0239-0>.

Christenson, T. and Platko, J. (2014). *Monetizing Sustainability Investments for Business Decision Making*. Environmental Management & Energy News. Available at: <http://www.environmentalleader.com/2014/05/27/monetizing-sustainability-investments-for-business-decision-making/> (Accessed: January 05, 2022).

Christophor, S. (2017). A Literature Review on Environmental Management Accounting (EMA) Adoption. *Web Journal of Chinese Management Review*, 17(3): 1-19.

CIA (2022). The world factbook: Nigeria, Central Intelligence Agency. *Central Intelligence Agency*. Available at: <https://www.cia.gov/the-world-factbook/countries/nigeria/> (Accessed: December 22, 2022).

CIMA (2022). Management accounting in support of the strategic management process, *CIMA. Chartered Institute of Management Accountants*. Available at: <https://www.cimaglobal.com/Research--Insight/Management-accounting-in-support-of-the-strategic-management-process/> (Accessed: December 11, 2022).

CIPFA (2004). *Advancing Sustainability Accounting and Reporting: An Agenda for Public Service Organisations*. The Chartered Institute of Public Finance and Accountancy, London.

ClimateChangeCommittee, (2022). COP27: Key outcomes and next steps for the UK, Climate Change Committee. Available at: <https://www.theccc.org.uk/publication/cop27-key-outcomes-and-next-steps-for-the-uk/> (Accessed: December 05, 2022).

Cop21paris (2015) *UNFCCC COP 21 Paris France - 2015 Paris Climate Conference*, *Cop21paris.org*. Available at: <http://www.cop21paris.org/about/cop21> (Accessed: January 15, 2019).

Copas (2022). *Environmental sustainability in the O&G industry: Copas*, *www.copas.org*. Council of Petroleum Accountants Societies. Available at:

<https://copas.org/environmental-sustainability-oil-gas-industry/> (Accessed: March 18, 2023).

Cordes, E. et al. (2016). *Environmental Impacts of The Deep-Water Oil and Gas Industry: A Review to Guide Management Strategies*. <https://doi.org/10.3389/fenvs.2016.00058>

Cox, E., and Sura, K. (2022). COP27 Outcomes: Progress and pitfalls in the race to net zero, PwC. Available at: <https://www.pwc.com/gx/en/services/sustainability/publications/cop27-the-end-games.html> (Accessed: December 05, 2022).

Creswell, J. and Poth, C. (2017). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*. 4th ed. Thousand Oaks, CA: Sage Publications.

Crossman, A. (2014). *Why Sociologists Use Purposive Sampling*. *Sociology. About*. Available at: <http://sociology.about.com/od/Types-of-Samples/a/Purposive-Sample.htm> (Accessed: January 15, 2021).

Daft, R. (2020). *Organization Theory and Design*. 13th edition. Boston, United States: Cengage Learning, Inc.

Debnath, S., Bose, S. and Dhalla, R. (2011). Environmental Management Accounting: An overview of its Methodological Development, *International Journal of Business Insights and Transformation*, 5(1), 44-57.

DiMaggio, P. and Powell, W. (1983). The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. *American Sociological Review*, 48(2), 147-160.

Dissanayake, K. and Rajapakse, B. (2020). Environmental Management Accounting for Corporate Sustainability: A Case from a Sri Lankan Automobile Company. *International Journal of Auditing and Accounting Studies*, 2(1), 41-65.

Doody, H. (2010). *Environmental sustainability*. Mississauga, ON: Published by the Society of Management Accountants of Canada, the American Institute of Certified Public Accountants and the Chartered Institute of Management Accountants.

Douglas, F. (2023). *NNPC Limited: Monumental Asset for Bright Future*, *NNPC Limited: Monumental asset for Bright Future*. Available at:

<https://www.energyfocusreport.com/nnpc-limited-monumental-asset-for-bright-future/> (Accessed: 03 June 2024).

Drexhage, J. and Murphy, D. (2010). *Sustainable Development: From Brundtland to Rio 2012*. Background Paper Prepared for Consideration by the High Level Panel on Global Sustainability at Its First Meeting, 19 September 2010, UN Headquarters, New York.

Drury, C. and Tayles, M. (2020). *Management and Cost Accounting*. 11th ed. Cengage Learning EMEA.

DSD (2021). *Information for Decision-Making & Participation*. Sustainabledevelopment.un.org. Available at: <https://sustainabledevelopment.un.org/content/dsd/agenda21/res_agenda21_40.shtml> (Accessed: January 05, 2023).

Duman, H., Yılmaz İçerli, M., Yücenurşen, M. and Apak, I. (2013). Environmental cost management within the sustainable business. *The Online Journal of Science and Technology*, 3(2), 86-96.

Dutta, A. (2014). An Overview of Impacting Factors on Environment Cost in the Area of Environment Accounting. *The International Journal of Business & Management*, 2(12), 66-72. <https://www.internationaljournalcorner.com/index.php/theijbm/article/view/137960>

EC (2021). *EMAS – Environment - European Commission*. Ec.europa.eu. Available at: <https://ec.europa.eu/environment/emas/index_en.htm> (Accessed: July 05, 2021).

EIA (2021). *International - U.S. Energy Information Administration (EIA)*. Eia.gov. Available at: <<https://www.eia.gov/international/analysis/country/NGA>> (Accessed: January 05, 2023).

EITI (2024). *Nigerian National Petroleum Corporation, EITI*. Available at: <https://eiti.org/supporters/nigerian-national-petroleum-corporation> (Accessed: 03 June 2024).

Eitrem, A., Meidell, A. and Modell, S. (2024). The use of institutional theory in social and Environmental Accounting Research: A critical review, *Accounting and Business Research*, 1–36. <https://doi.org/10.1080/00014788.2024.2328934>

Ejibunu, H. (2007). Nigeria's Niger Delta Crisis: Root Causes of Peacelessness. *EPU Research Papers*, 7(7), 1-41.

Elborai, S. et al. (2022). *Green finance in the Middle East: A \$2 trillion opportunity*. www.arabianbusiness.com. Available at: <<https://www.arabianbusiness.com/opinion/comment/459297-green-finance-in-the-region-2-trillion-opportunity>> (Accessed: January 25, 2023).

Elhossade, S., Abdo, H. and Mas'ud, A. (2021). Impact of institutional and contingent factors on adopting environmental management accounting systems: the case of manufacturing companies in Libya. *Journal of Financial Reporting and Accounting*, 19(4), 497-539. <https://doi.org/10.1108/JFRA-08-2020-0224>

Elmahdi, A. (2019). Road maps for water accounting designing and institutionalizing for sustainable water management in MENA region, *International Journal of Environmental Sciences & Natural Resources*, 22(4), 8–11. <https://doi.org/10.19080/ijesnr.2019.22.556092>

EPA (2012). *Sustainability-Based Decision Making | Science Inventory*. US EPA. Available at: http://www.https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NRMRL&dirEntryId=237923 (Accessed: January 02, 2023).

EPA (2019). *EPA's Report on The Environment (ROE) | Sustainability*. US EPA. Available at: <<https://www.epa.gov/report-environment/sustainability-and-roe>> (Accessed: January 05, 2021).

Epstein, M. (2008). *Making sustainability work*. Sheffield, UK: Greenleaf Pub.

Epstein-Reeves, J. (2012). *The 'Pain' of Sustainability*. Forbes. Available at: <http://www.forbes.com/sites/csr/2012/01/18/the-pain-of-sustainability/> (Accessed: May 15, 2019).

Eregha, P. and Irughe, I. (2009). Oil induced environmental degradation in the Nigeria's Niger Delta: the Multiplier effects. *Journal of Sustainable Development in Africa*, 11(4), 160-175.

Ernst & Young (2023). Oil & Gas, Our latest thinking | EY UK. EY. Available at: https://www.ey.com/en_uk/oil-gas (Accessed: April 05, 2023).

- Escriva-Bou, A., et al. (2020). Water accounting in western US, Australia, and Spain: Comparative analysis, *Journal of Water Resources Planning and Management*, 146(3), 1–15. [https://doi.org/10.1061/\(asce\)wr.1943-5452.0001157](https://doi.org/10.1061/(asce)wr.1943-5452.0001157)
- FAO (2016). *Water accounting and auditing: A source book. Water report 43*. Rome, Italy: The Food and Agriculture Organisation.
- FAO (2018). *Water accounting for water governance and sustainable development*. Rome, Italy: The Food and Agriculture Organisation.
- Farahani, H. et al. (2010). A comparison of partial least squares (pls) and ordinary least squares (OLS) regressions in predicting of couple's mental health based on their communicational patterns', *Procedia - Social and Behavioral Sciences*, 5, 1459–1463. <http://dx.doi.org/10.1016/j.sbspro.2010.07.437>
- Farajzadeh, R. et al. (2022). Improved oil recovery techniques and their role in energy efficiency and reducing CO₂ footprint of oil production, *Journal of Cleaner Production*, 369, pp. 1–10. Available at: <https://doi.org/10.1016/j.jclepro.2022.133308>.
- Farbstein, E. and Buggie, M. (2022). The business benefits of Carbon Accounting, Normative. Available at: <https://normative.io/insight/carbon-accounting-business-benefits/> (Accessed: January 07, 2023).
- Farhood, A., Abd Ali, A. and Abdulkareem, S. (2023). The impact of the application of environmental management accounting on the strategic planning of budgets in the economic entity: Case Study in Wassit Co.in Iraq, *European Journal of Military Studies*, 13(1), 1978–2002. <https://resmilitaris.net/index.php/resmilitaris/article/view/1618>
- Ferdous, M., Adams, C. and Boyce, G. (2019). Institutional drivers of environmental management accounting adoption in public sector water organisations. *Accounting, Auditing & Accountability Journal*, 32(4), 984-1012. <https://doi.org/10.1108/AAAJ-09-2017-3145>
- Ferreira, A., Moulang, C. and Hendro, B. (2010). Environmental management accounting and innovation: an exploratory analysis. *Accounting, Auditing & Accountability Journal*, 23(7), 920-948. <https://doi.org/10.1108/09513571011080180>
- Foddy, W. (1993). *Constructing questions for interviews and questionnaires*. Cambridge, UK: Cambridge University Press.

Foulon, J., Lanoie, P. and Laplante, B. (2002). Incentives for pollution control: regulation or information? *Journal of Environmental Economics and Management*, 44(1), 169-187. <https://doi.org/10.1006/jeem.2001.1196>

Frankfort-Nachmias, C., Nachmias, D. and DeWaard, J. (2014). *Research Methods in the Social Sciences*. 8th edition. Worth, New York: Macmillan Learning.

Frini, A., Benamor, S. and Urli, B. (2020). *Temporal MCDA Methods for Decision-Making in Sustainable Development Context, Sustainability Concept in Developing Countries*. *IntechOpen*, DOI: 10.5772/intechopen.90698. Available at: <<https://www.intechopen.com/books/sustainability-concept-in-developing-countries/temporal-mcda-methods-for-decision-making-in-sustainable-development-context>> (Accessed: July 05, 2022).

Fuadah, L. and Arisman, A. (2013). Adopting Environmental Management Accounting (EMA) in Indonesia. *Forum Bisnis Dan Kewirausahaan Jurnal Ilmiah STIE MDP Hal - 16*, 3(1), 16–25.

Gale, N. et al. (2013). Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Medical Research Methodology*, 13(1), 1-8. <https://doi.org/10.1186/1471-2288-13-117>

Gardes-Landolfini, C. and Natalucci, F. (2022). Achieving net-zero emissions requires closing a data deficit, www.imf.org. IMF. Available at: <https://www.imf.org/en/Blogs/Articles/2022/08/23/achieving-net-zero-emissions-requires-closing-a-data-deficit> (Accessed: March 14, 2023).

Gerdin, J. (2005). Management accounting system design in manufacturing departments: an empirical investigation using a multiple contingencies approach. *Accounting, Organizations and Society*, 30, 99-126. <https://doi.org/10.1016/j.aos.2003.11.003>

Ghuri, P. and Grønhaug, K. (2003). *Research methods in business studies*. Harlow, England: Financial Times Prentice Hall.

Ghorbel, J. (2017). A Study of Contingency Factors of Accounting Information System Design in Tunisian SMLs. *Journal of the Knowledge Economy*, 10(1), 74-103. <https://doi.org/10.1007/s13132-016-0439-8>

- Gibassier, D. and Schaltegger, S. (2015). "Carbon Management Accounting and reporting in practice," *Sustainability Accounting, Management and Policy Journal*, 6(3), 340–365. Available at: <https://doi.org/10.1108/sampj-02-2015-0014>.
- Gibbs, A. (1977). Focus Groups, *Social Research Update*, 19, 1–7.
- Glynn, M.A. and D'Aunno, T. (2023). An intellectual history of institutional theory: Looking back to move forward, *Academy of Management Annals*, 17(1), 301–330. <https://doi.org/10.5465/annals.2020.0341>
- Gonzalez, C. and Peña-Vinces, J. (2022). A framework for a Green Accounting System-exploratory study in a developing country context, Colombia, *Environment, Development and Sustainability*, 25(9), 9517–9541. <https://doi.org/10.1007/s10668-022-02445-w>
- Grassian, D. and Olsen, D. (2019). Lifecycle energy accounting of three small offshore oil fields, *Energies*, 12(14), 1–23. Available at: <https://doi.org/10.3390/en12142731>.
- Gray, J. and Grove, S. (2021). *Burns and Grove's the practice of nursing research appraisal, synthesis, and generation of evidence*. 9th edn. St. Louis, MO: Elsevier.
- Greenacre, M. (2010). Correspondence analysis. *Wiley Interdisciplinary Reviews: Computational Statistics*, 2(5), 613-619. <https://doi.org/10.1002/wics.114>
- Greenwood, R. et al. (2017). Introduction: into the fourth decade. In: R. Greenwood, C. Oliver, T.B. Lawrence, and R.E. Meyer, eds. *The SAGE Handbook of Organizational Institutionalism*. Thousand Oaks: Sage, 1–24.
- Gunarathne, A., Lee, K. and Hitigala Kaluarachchilage, P. (2020). Institutional pressures, environmental management strategy, and organizational performance: The Role of Environmental Management Accounting, *Business Strategy and the Environment*, 30(2), 825-839. <https://doi.org/10.1002/bse.2656>.
- Gunarathne, N. and Alahakoon, Y. (2016). Environmental Management Accounting Practices and their Diffusion: The Sri Lankan Experience. *NSBM Journal of Management*, 2(1), 1-26. <https://nspace.nsbm.ac.lk/handle/123456789/477>
- Gunarathne, N. and Lee, K. (2019). An exploration of the implementation and usefulness of environmental management accounting: A comparative study between Australia and Sri Lanka. *CIMA Research Executive Summary*, 15(3), 1-23.

- Gunarathne, N. and Lee, K. (2021). Corporate cleaner production strategy development and environmental management accounting: A contingency theory perspective, *Journal of Cleaner Production*, 308, 127402. <https://doi.org/10.1016/j.jclepro.2021.127402>
- Gunarathne, N., Lee, K. and Hitigala Kaluarachchilage, P. (2021). Institutional pressures, environmental management strategy, and organizational performance: The role of environmental management accounting, *Business Strategy and the Environment*, Wiley Blackwell, 30(2), 825-839. <https://doi.org/10.1002/bse.2656>
- Habibi Rad, M., Mojtahedi, M., Ostwald, M. and Wilkinson, S. (2022). A Conceptual Framework for Implementing Lean Construction in Infrastructure Recovery Projects. *Buildings*, 12(3), 272.
- Hague, P. (2002). *Market research*. 3rd edition. London: Kogan Page.
- Hahn, W., Seaman, S. and Bikel, R. (2012). Making Decisions with Multiple Attributes: A Case in Sustainability Planning. *Graziadio Business Review*, 15(2), 1-11.
- Hájek, M., Pulkrab, K. and Hyršlová, J. (2012). Forestry externalities in the environmental management accounting system. *Problems of Management in the 21st Century*, 5: 31-45. <http://dx.doi.org/10.33225/pmc/12.05.31>
- Hall, J., Daneke, G. and Lenox, M. (2010). Sustainable development and entrepreneurship: Past contributions and future directions. *Journal of Business Venturing*, 25(5), 439-448. <https://doi.org/10.1016/j.jbusvent.2010.01.002>
- Hamid, S. and Behrad, N. (2013). Role of Management Accounting in Managerial the Decision Making of Enterprises. *Elixir Financial Management*, 65(B), 19859-19866.
- Hargroves, K. and Smith, M. (2005). *The Natural Advantage of Nations* (Vol. I): *Business Opportunities, Innovation and Governance in the 21st Century*. Earthscan, London: The Natural Edge Project.
- Hargroves, K. and Smith, M. (2013). *The Natural Advantage of Nations: Business Opportunities, Innovation and Governance in the 21st Century*. London: Earthscan.
- Harrison, K. (2002). Ideas and environment standard-settings: a comparative study of regulation of the pulp and paper industry. *Governance: An International Journal of Policy, Administration, and Institutions*, 15(1), 65-96. <https://doi.org/10.1111/1468-0491.00180>

Hassan, M. (2014). *Research Population*. Academia.edu. Available at: https://www.academia.edu/5563491/Research_Population (Accessed: October 04, 2018).

He, R., Luo, L. and Tang, Q. (2021). Usefulness of corporate carbon information for decision-making, in *Information for Efficient Decision Making: Big Data, blockchain and relevance*. Singapore: World Scientific, 451–476. https://doi.org/10.1142/9789811220470_0015

Heidari, I. (2012). Environmental management accounting with an emphasis on its cost. *Life Science Journal*, 9(4), 511-517.

Herawati, S., Octavia, E. and Rachmawati, R. (2020). Analysis of the Implementation of Environmental Accounting in Assessing Environmental Performance. *International Journal of Psychosocial Rehabilitation*, 24(7), 7021-7021. <http://dx.doi.org/10.37200/IJPR/V24I7/PR270666>

Herzig, C. (2012). *Environmental management accounting*. London: Routledge.

Hittleman, D. and Simon, A. (1997). *Interpreting educational research: An introduction for consumers of research*. Upper Saddle River, NJ: Merrill.

Huang, S. et al. (2019). The Application of Material Flow Cost Accounting in Waste Reduction. *Sustainability*, 11(5), 1270. <https://doi.org/10.3390/su11051270>

Hundertmark, T., Lueck, K. and Packer, B. (2020). *Water: A human and business priority*, www.mckinsey.com. McKinsey & Company. Available at: <https://www.mckinsey.com/capabilities/sustainability/our-insights/water-a-human-and-business-priority> (Accessed: March 16, 2023).

Hutt, R. (1979). The focus group interview: a technique for counselling small business clients, *Journal of Small Business Management*, 17(1), 15–18.

Hyršlová, J., Bednaříková, M. and Hájek, M. (2008). Material Flow Cost Accounting. “Only” a Tool of Environmental Management or a Tool for the Optimization of Corporate Production Processes? *Scientific Papers of the University of Pardubice. Series A. Faculty of Chemical Technology*, 14, 131-145.

IBM (2021). Reliability analysis, *IBM*. Available at: <https://www.ibm.com/docs/en/spss-statistics/25.0.0?topic=features-reliability-analysis> (Accessed: November 23, 2023).

IBM (2023). What is Carbon Accounting? *IBM*. Available at: <https://www.ibm.com/topics/carbon-accounting> (Accessed: May 29, 2023).

IEA (2020). Oil and gas industry needs to step up climate efforts now - news, *IEA. International Energy Agency*. Available at: <https://www.iea.org/news/oil-and-gas-industry-needs-to-step-up-climate-efforts-now> (Accessed: March 09, 2023).

IFAC (2005). *International guidelines on Environmental Management Accounting (EMA)*. New York, USA: Exposure Draft, International Federation of Accountants.

IFAC (2011). *Sustainability Framework 2.0*. www.ifac.org. Available at: http://incp.org.co/Site/2011/info/archivos/Sustainability_Framework2.pdf (Accessed: July 23, 2019).

Ighalo, J. and Adeniyi, A. (2020) A comprehensive review of water quality monitoring and assessment in Nigeria, *Chemosphere*, 260, 127569. <https://doi.org/10.1016/j.chemosphere.2020.127569>

IISD (2022). *Sustainable Development*. International Institute for Sustainable Development. Available at: <https://www.iisd.org/mission-and-goals/sustainable-development> (Accessed: August 14, 2022).

Imtiaz-Ferdous, M., Adams, C. and Boyce, G. (2019). Institutional drivers of environmental management accounting adoption in public sector water organisations. *Accounting, Auditing & Accountability Journal*, 32(4), 984-1012. <https://doi.org/10.1108/AAAJ-09-2017-3145>

Iniaghe, P., Tesi, G. and Iniaghe, P. (2013). Environmental Degradation and Sustainable Development in Nigeria's Niger Delta Region. *Journal of Sustainable Development in Africa*, 15(3), 61-75. <https://doi.org/10.1016/j.resourpol.2022.103274>

IPCC (2014). *The Intergovernmental Panel on Climate Change, Climate Change 2014 Mitigation of Climate Chang*. Available at: <https://www.ipcc.ch/> (Accessed: January 28, 2022).

Iredele, O., Tankiso, M. and Adelowotan, M. (2019). The influence of institutional isomorphism and organisational factors on environmental management accounting practices of listed Nigerian and South African firms. *South African Journal of Accounting Research*, 34(3), 183-204. <https://doi.org/10.1080/10291954.2019.1675254>

Ismail, A. (2017). Environmental Accounting and Reporting Oil and Gas Companies Adopting Policies Aimed at Balancing Economic Performance with Social Responsibilities, *Oil & Gas Journal*. 14. 52-55.

ISO (2011). ISO 14051:2011: Environmental Management - Material Flow Cost Accounting - General Framework; *International Organization for Standardization*: Geneva, Switzerland, 2011; 1–38.

Jahagirdar, K. and Balasubramanya, A. (2010). A study on communication behaviour of extension personnel. *Karnataka Journal of Agricultural Sciences*, 23(2), 384-385.

Jalaludin, D., Sulaiman, M. and Ahmad, N. (2010). Environmental Management Accounting: An Empirical Investigation of Manufacturing Companies in Malaysia. *Journal of Asia-Pacific Centre for Environmental Accountability*, 16(3), 31-44.

Jasch, C. (2009). *Environmental and Material Flow Cost Accounting: Principles and Procedures*. New York: Springer.

Jeremiah, K. (2022). Idle refineries workers earn N136b amid \$3b upgrade cost, <https://guardian.ng>, 25 August. Available at: <https://guardian.ng/news/idle-refineries-workers-earn-n136b-amid-3b-upgrade-cost/> (Accessed: November 22, 2023).

Jonkers, L. (2022). *Carbon accounting: Why your company should start doing it*, www.weforum.org. World Economic Forum. Available at: <https://www.weforum.org/agenda/2022/12/carbon-accounting-what-it-is-and-why-your-company-should-start-doing-it/> (Accessed: March 11, 2023).

Jovanović, D. and Janković, M. (2012). Management accounting aspect of environmental costs. *Contemporary Issues in Economics, Business and Management*, 2012, 525-538.

Kampmark, B. (2015). *The COP21 Climate Summit: The Ambitions and Flaws of the Paris Agreement. Outcome of Deception and Bullying*. Global Research. Available at: <http://www.globalresearch.ca/the-cop21-climate-summit-the-ambitions-and-flaws-of-the-paris-agreement-outcome-of-deception-and-bullying/5495512> (Accessed: January 16, 2019).

Kamruzzaman, Md. (2012). Framework of Environmental Management Accounting: An overview, *SSRN Electronic Journal* [Preprint]. <https://dx.doi.org/10.2139/ssrn.2179031>

- Kaplan, R. and Ramanna, K. (2021). Accounting for climate change, *www.hbr.org. Harvard Business Review*. Available at: <https://hbr.org/2021/11/accounting-for-climate-change> (Accessed: March 13, 2023).
- Karim, S., Carroll, T.N. and Long, C.P. (2016). Delaying change: Examining how industry and managerial turbulence impact structural realignment', *Academy of Management Journal*, 59(3), 791–817. <https://doi.org/10.5465/amj.2012.0409>
- Kelsall, C. (2020). Ecological Management Accounting—Taking into Account Sustainability, Does Accounting Have Far to Travel? *Sustainability*, 12(21), 1-20. <https://doi.org/10.3390/su12218854>
- Kenno, S., Lau, M. and Sainty, B. (2018). In Search of a Theory of Budgeting: A Literature Review, *Accounting Perspectives*, 17(4), 507–553. <https://doi.org/10.1111/1911-3838.12186>
- Kiger, M. and Varpio, L. (2020). Thematic analysis of qualitative data: Ameer Guide no. 131, *Medical Teacher*, 42(8), 846–854. <https://doi.org/10.1080/0142159x.2020.1755030>.
- Kilmer, J. and Rodríguez, R. (2017). Ordinary least squares regression is indicated for studies of Allometry, *Journal of Evolutionary Biology*, 30(1), 4–12. doi:10.1111/jeb.12986. <https://doi.org/10.1111/jeb.12986>
- Kim, K. et al. (2012). Increasing customer equity of luxury fashion brands through nurturing consumer attitude. *Journal of Business Research*, 65(10), 1495-1499. <https://doi.org/10.1016/j.jbusres.2011.10.016>
- Kitada, H. et al. (2022). Management practice of material flow cost accounting and its discontinuance, *Cleaner Environmental Systems*, 6, 1–9. <https://doi.org/10.1016/j.cesys.2022.100089>
- Kokkinaki, A. (2010). *Obstacles to the integration of ICTs in Primary Education in Greece*. Hasselt, Belgium: Conference ICL2010.
- Kokubu, K. and Kitada, H. (2010). *Conflicts and Solutions between Material Flow Cost Accounting and Conventional Management Thinking*, paper presented at the 6th Asia-Pacific Interdisciplinary Perspectives on Accounting Research (APIRA), University of Sydney, 12-13 July.

Kokubu, K. and Tachikawa, H. (2013). Material flow cost accounting: Significance and practical approach*, *Handbook of Sustainable Engineering*, 351–369. https://doi.org/10.1007/978-1-4020-8939-8_96

Kolaczkowski, M. et al. (2021). *How the oil and gas industry can take a lifecycle approach to reducing emissions*, www.weforum.org. World Economic Forum. Available at: <https://www.weforum.org/agenda/2021/08/oil-gas-industry-lifecycle-approach-reducing-emissions/> (Accessed: March 10, 2023).

Kollar, L. (2015). *Consider Nuclear as Sustainable Energy: IAEA Deputy Director General at COP21*. IAEA. Available at: <https://www.iaea.org/newscenter/news/consider-nuclear-sustainable-energy-iaea-deputy-director-general-cop21> (Accessed: January 05, 2023).

Krishnaswamy, K., Sivakumar, A. and Mathirajan, M. (2009). *Management Research Methodology: Integration of Principles, Methods and Techniques*. India: Pearson Education.

Krueger, R. and Casey, M. (2015). *Focus Groups a Practical Guide for Applied Research*. 5th edn. Thousand Oaks: Sage Publications.

Laguir, I. et al. (2023). Performance effects of analytics capability, disruption orientation, and resilience in the supply chain under environmental uncertainty. *Annals of Operations Research*, 324: 1269-1293. <https://doi.org/10.1007/s10479-021-04484-4>

Lamberton, G. (2005). Sustainability accounting: a brief history and conceptual framework. *Accounting Forum*, 7(26), 4-13. <https://doi.org/10.1016/j.accfor.2004.11.001>

Larson, W. et al. (2012). Mitigating corporate water risk: Financial market tools and Supply Management Strategies. *Ross School of Business*, 1178. <https://doi.org/10.2139/ssrn.2159370>

Latif, B. et al. (2020). Coercive, Normative and Mimetic Pressures as Drivers of Environmental Management Accounting Adoption. *Sustainability*, 12(11), 1-14. <https://doi.org/10.3390/su12114506>

Le, T. and Nguyen, T. (2018). Factors affecting to ECMA application in Vietnamese brick manufacturing enterprises. *Research Journal of Finance and Accounting*, 9(7), 136.

Le, T., Dang, L. and Le, T. (2020). Factors affecting the environmental management accounting implementation and the quality of environmental information for making decisions of fishery processing enterprises in Vietnam. *Accounting*, 6(4), 401-412.

Le, T., Nguyen, T. and Phan, T. (2019). Environmental Management Accounting and Performance Efficiency in the Vietnamese Construction Material Industry—A Managerial Implication for Sustainable Development. *Sustainability*, 11(19), 5152. <https://doi.org/10.3390/su11195152>

Li, Y., Simunic, D. and Ye, M. (2018). Do auditors care about clients' compliance with environmental regulations? Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2961998 (Accessed: December 07, 2022).

Lim, C. (2014). *Why businesses should put sustainability at the heart of decision-making*. Eco-Business. Available at: <http://www.eco-business.com/news/why-businesses-should-put-sustainability-heart-decision-making/> (Accessed: July 11, 2023).

Lincoln, Y. and Guba, E. (1985). *Naturalistic Inquiry*. Beverly Hills, California: Sage Publications.

Lohmann, L. (2009). Toward a different debate in environmental accounting: the cases of carbon and cost-benefit. *Accounting, Organisations and Society*, 34(3/4), 499-534. <https://doi.org/10.1016/j.aos.2008.03.002>

Lu, J. et al. (2020). Sustainability of enterprise export expansion from the perspective of environmental information disclosure. *Journal of Cleaner Production*, 252, 119839. <https://doi.org/10.1016/j.jclepro.2019.119839>

Ma, Y., Wang, J. and Lv, X. (2022). Institutional pressures and firms' environmental management behavior: The moderating role of Slack Resources, *Journal of Environmental Planning and Management*, 1–23. <https://doi.org/10.1080/09640568.2022.2079077>

- Mady, K. et al. (2022). Institutional pressure and eco-innovation: The mediating role of green absorptive capacity and strategically environmental orientation among manufacturing SMES in Egypt, *Cogent Business & Management*, 9(1). <https://doi.org/10.1080/23311975.2022.2064259>
- Mahmoudian, F. et al. (2021). Inter-and intra-organizational stakeholder arrangements in Carbon Management Accounting, *The British Accounting Review*, 53(1), 100933. <https://doi.org/10.1016/j.bar.2020.100933>
- Mahmud, A. et al. (2022). Does water accounting support sustainable water management? A Review, *IOP Conference Series: Earth and Environmental Science*, 1098(1), 1–17. <https://doi.org/10.1088/1755-1315/1098/1/012037>
- Mazahrih, B. (2019). Integration of Environmental Costs into Accounting Information System, *Academy of Accounting and Financial Studies Journal*, 23(4), 1–20.
- Mensah, J. (2019). Sustainable development: Meaning, history, principles, pillars, and implications for human action: Literature review. *Cogent Social Sciences*, 5(1), 1-21. <https://doi.org/10.1080/23311886.2019.1653531>
- Miles, M., Huberman, A. and Saldaña, J. (2014). *Qualitative Data Analysis: A Methods Sourcebook*. 3rd edition. Los Angeles, California: Sage Publications, Inc.
- Milosevic, I., Bass, A. and Schulte, B. (2023). The interplay of conflicting and complementing institutional logics in sustainability practices, *Management International Review*, 63(3), 469–506. <https://doi.org/10.1007/s11575-023-00503-7>
- Mitchell, M. and Jolley, J. (2007). *Research Design Explained*. 6th edition. Belmont, CA: Thomson Wadsworth.
- Mohamed, R. and Muhammad-Jamil, C. (2017). Antecedent Factors of Environmental Management Accounting Practice. *International Journal of Economic Research*, 14(16(2)), 543-553.
- Mohamed, R. and Muhammad-Jamil, C. (2020). The influence of environmental management accounting practices on environmental performance in small-medium manufacturing in Malaysia. *International Journal of Environment and Sustainable Development*, 19(4). 378-392. <https://doi.org/10.1504/IJESD.2020.110643>

- Mohd Fuzi, N. et al. (2019). Critical success factors of environmental management accounting practices: Findings from Malaysian Manufacturing Industry, *Measuring Business Excellence*, 23(1), 1–14. <https://doi.org/10.1108/MBE-03-2018-0015>
- Mokhtar, N., Jusoh, R. and Zulkifli, N. (2016). Corporate characteristics and environmental management accounting (EMA) implementation: Evidence from Malaysian Public Listed Companies (Plcs), *Journal of Cleaner Production*, 136, 111–122. <https://doi.org/10.1016/j.jclepro.2016.01.085>
- Morrison, J. and Schulte, P. (2010). *Corporate Water Accounting: An analysis of methods and tools for measuring water use and its impacts*. Geneva: UNEP.
- Morrison, J., Schulte, P. and Schenck, R. (2023). *Corporate Water Accounting: Accounting basics, Corporate Water Accounting*. The CEO Water Mandate. Available at: <https://ceowatermandate.org/accounting/accounting-basics/> (Accessed: March 19, 2023).
- Munteanu, A. (2013). Environmental Management Accounting (EMA) Implementation: Motivation and Expected Results from a Business Perspective, *Romanian Journal of Economics, Institute of National Economy*, 37(2), 164-173.
- Namakonzi, R. and Inanga, E. (2014). Environmental management accounting and environmental management in manufacturing industries in Uganda. *African Journal of Economic and Sustainable Development*, 3(4), 288-329. <https://doi.org/10.1504/AJESD.2014.065578>
- Nartey, E. (2018). Determinants of carbon management accounting adoption in Ghanaian firms, *Meditari Accountancy Research*, 26(1), 88–121. <https://doi.org/10.1108/medar-03-2017-0133>
- Ndinwa, C. (2013). Understanding the Environmental Impact Assessment (EIA) for Bitumen Exploitation: The Case of Southwestern Nigeria. *Journal of Environmental Sciences and Policy Evaluation*, 3(1), 48-59.
- Nerini, F. et al. (2019). Connecting climate action with other sustainable development goals, *Nature Sustainability*, 2(8), 674–680. <https://doi.org/10.1038/s41893-019-0334-y>
- Nesrea (2023). *Welcome to Nesrea*. NESREA. Available at: <https://www.nesrea.gov.ng/about-us/> (Accessed: June 12, 2023).

- Newman, A. and Bach, D. (2004). Self-Regulatory Trajectories in the Shadow of Public Power: Resolving Digital Dilemmas in Europe and the United States, *Governance*, 17(3), 387. <https://doi.org/10.1111/j.0952-1895.2004.00251.x>
- Newsbatch (2022). *Environment*. NEWSBATCH. Available at: <<http://www.newsbatch.com/environment.htm>> (Accessed: August 21, 2022).
- Nga, T. and Dao, H. (2020). Environmental management accounting: the case of the rubber tire manufacturing company in Vietnam. *Journal of Tourism, Hospitality and Environment Management*, 5(21), 89-108.
- Nilashi, M. et al. (2023). Critical data challenges in measuring the performance of Sustainable Development Goals: Solutions and the role of big-Data Analytics, *Harvard Data Science Review*, 5(3), 1–36. <https://doi.org/10.1162/99608f92.545db2cf>
- Noor, A. (2012). *Response Strategies Adopted by Hass Petroleum (K) Ltd to Environmental Challenges*. MBA. University of Nairobi.
- Nunnally, J.C. (1978). *Psychometric theory*. 2nd edn. New York: McGraw-Hill.
- Nyakuwanika, M., van der Poll, H.M. and van der Poll, J.A. (2021). A conceptual framework for greener goldmining through environmental management accounting practices (EMAPs): The case of Zimbabwe, *Sustainability*, 13(18), 10466. <https://doi.org/10.3390/su131810466>
- Nzama, S. et al. (2022). Environmental Management Accounting (EMA) practices and plastic pollution control in selected food and beverage firms, *Cogent Business & Management*, 9(1), 1–32. <https://doi.org/10.1080/23311975.2022.2085368>
- Ogunkan, D.V. (2022). Achieving Sustainable Environmental Governance in Nigeria: A review for policy consideration, *Urban Governance* [Preprint]. Available at: <https://doi.org/10.1016/j.ugj.2022.04.004>
- Okafor, O. (2011). *Environmental Laws and Factors Affecting Them in Nigeria Case Study of Gas Flaring Laws in Niger Delta Nigeria*. MSc. Wageningen University.
- Olaifa, E. et al. (2022). Oil spillages and captured fish production in the Niger Delta of Nigeria, *International Journal of Energy Economics and Policy*, 12(3), pp. 175–183. <http://dx.doi.org/10.32479/ijeep.12890>

- Olusanmi, O. et al. (2021). A bibliometric study on Water Management Accounting Research from 2000 to 2018 in Scopus Database, *Cogent Social Sciences*, 7(1), 1–10. <https://doi.org/10.1080/23311886.2021.1886645>.
- Omodan, B.I. (2023). Causes and institutional Responses of social unrest in South African universities, *SAGE Open*, 13(4), 1–11. <https://doi.org/10.1177/21582440231218775>
- Omonmwan, S. and Odia, L. (2009). Oil exploitation and conflict in the Niger-delta region of Nigeria', *Journal of Human Ecology*, 26(1), 25–30. <https://doi.org/10.1080/09709274.2009.11906161>
- Omojemite, B. (2012). Sustainable Development, Peace and Security in the Niger Delta Region. *European Journal of Social Sciences*, 28(4), 549-558.
- OPEC (2021). *OPEC: Nigeria facts and figures*. OPEC. Available at: http://www.opec.org/opec_web/en/about_us/167.htm (Accessed: July 24, 2023).
- Ori (2021). *Data Analysis*. Ori.hhs.gov. Available at: http://ori.hhs.gov/education/products/n_illinois_u/datamanagement/datopic.html (Accessed: October 27, 2023).
- Ori (2022). Responsible Conduct in Data Management: Data collection. *Ori.hhs.gov*. Available at: https://ori.hhs.gov/education/products/n_illinois_u/datamanagement/dctopic.html (Accessed: December 08, 2022).
- Oti, P. and Mbu-Ogar, G. (2018). Analysis of environmental and social disclosure and financial performance of selected quoted Oil and Gas Companies in Nigeria (2012-2016). *Journal of Accounting and Financial Management*, 4(2), 1-12.
- Otley, D. (2016). The contingency theory of management accounting and control: 1980–2014. *Management Accounting Research*, 31, 45-62. <https://doi.org/10.1016/j.mar.2016.02.001>
- Pacas, J. (2021). *The Value of Sustainability to Business*. The CEO Magazine. Available at: <https://www.theceomagazine.com/business/management-leadership/the-value-of-sustainability-to-business/> (Accessed: January 05, 2022).
- Packer, M. (2011). *The science of qualitative research*. New York: Cambridge University Press.

- Papaspyropoulos, K. et al. (2012). Challenges in implementing environmental management accounting tools: the case of a nonprofit forestry organisation. *Journal of Cleaner Production*, 29(30), 132-143. <https://doi.org/10.1016/j.jclepro.2012.02.004>
- Pearson, D. and Vossler, A. (2016). Methodological issues in focus group research: The example of investigating counsellors' experiences of working with same-sex couples., *Counselling Psychology Review*, 31(1), 8–16. <https://oro.open.ac.uk/45615>
- Pember, A., Lemon, M. and Gould, S. (2014). *Using management accounting to drive environmental performance*. IFAC. Available at: <https://www.ifac.org/knowledge-gateway/preparing-future-ready-professionals/discussion/using-management-accounting-drive-environmental-performance> (Accessed: July 20, 2023).
- Peters, B. (2021). *Institutional theory in political science: The new institutionalism*. London, England: Zed Books.
- Pham, D., Dao, T. and Bui, T. (2020). The Impact of Contingency Factors on Management Accounting Practices in Vietnam. *The Journal of Asian Finance, Economics and Business*, 7(8), 77-85. The Impact of Contingency Factors on Management Accounting Practices in Vietnam. *The Journal of Asian Finance, Economics and Business*, 7(8), 77-85. <https://doi.org/10.13106/jafeb.2020.vol7.no8.077>
- Piscitelli, A. and D'Uggento, A. (2022). Do young people really engage in sustainable behaviors in their lifestyles?, *Social Indicators Research*, 163(3), 1467–1485. <https://doi.org/10.1007/s11205-022-02955-0>
- Polit, D. and Beck, C. (2021). *Nursing Research: Generating and Assessing Evidence for Nursing Practice*. 11th edn. Philadelphia: Wolters Kluwer.
- Polit, D. and Hungler, B. (1993). *Essentials of Nursing Research: Methods, Appraisal and Utilisation*. 3rd edn. Philadelphia: JP Lippincott Company.
- Polycarp, S. (2019). Environmental Accounting and Financial Performance of Oil and Gas Companies in Nigeria. *Research Journal of Finance and Accounting*, 10(10), 1-11.
- Poplavets, S. et al. (2024). Integration of environmental indicators into the management decision-making system, *Revista Amazonia Investiga*, 13(73), pp. 231–240. <https://doi.org/10.34069/AI/2024.73.01.19>

Pounah, G. (2019). *Factors affecting the representation of women in management positions in the petroleum sector in Gabon*. Dissertation. Cape Peninsula University of Technology.

Prajogo, B., Murwaningsari, E. and Mayangsari, S. (2023). The Role of Functional Imperatives in Stimulating Carbon Management Accounting by Mediating Management Accounting in Waste Management, *International Journal of Social and Management Studies (IJOSMAS)*, 4(2), 86–97. <https://doi.org/10.1111/acfi.12789>

Prayag, G. (2007). Assessing international tourists' perceptions of service quality at Air Mauritius. *International Journal of Quality & Reliability Management*, 24(5), 492-514. <https://doi.org/10.1108/02656710710748367>

Punch, K. (2014). *Introduction to Social Research: Quantitative & Qualitative Approaches*. 3rd edition. Los Angeles, California: Sage.

PwC (2013). *Regulation*. PricewaterhouseCoopers. Available at: <http://www.pwc.com/gx/en/issues/regulation.jhtml> (Accessed: December 17, 2021).

PwC (2021). The Petroleum Industry Act: Redefining the Nigerian oil and gas landscape, <https://www.pwc.com/ng>. PricewaterhouseCoopers. Available at: <https://www.pwc.com/ng/en/publications/nigeria-petroleum-industry-act.html> (Accessed: December 07, 2022).

PwC (2023). ESG pressures, geopolitics will drive wholesale transformation, www.pwc.com. PricewaterhouseCoopers. Available at: <https://www.pwc.com/gx/en/industries/energy-utilities-resources/oil-gas-energy.html> (Accessed: March 13, 2023).

Qian, W., Hörisch, J. and Schaltegger, S. (2018). Environmental management accounting and its effects on carbon management and disclosure quality. *Journal of Cleaner Production*, 174, 1609. <https://doi.org/10.1016/j.jclepro.2017.11.092>

Qu, L. et al. (2022). Application of ABB in Environmental Management Accounting: Incorporating MFCA into the budget process, *Frontiers in Environmental Science*, 10, 1–19. Available at: <https://doi.org/10.3389/fenvs.2022.963903>

Quintos, K. (2020). *Why Sustainability Isn't Just for Green Companies*. World Economic Forum. Available at:

<<https://www.weforum.org/agenda/2020/01/sustainability-green-companies-business-partnership/>> (Accessed: January 03, 2021).

Ramli, A. and Ismail, M. (2013). Environmental Management Accounting Practices: A Survey of ISO 14001 Certified Malaysian Organisations. *Journal of Energy Technologies & Policy*, 3(11), 415-432.

Ratiu, C. and Anderson, B. (2014). The identity crisis of sustainable development. *World Journal of Science, Technology and Sustainable Development*, 11(1), 4-15. <http://dx.doi.org/10.1108/WJSTSD-08-2013-0033>

Razmjoo, A.A., Sumper, A. and Davarpanah, A. (2019). Developing sustainable energy indexes by utilizing new indicators: A comparative study. *Energy reports*, 5, 375-383. <https://doi.org/10.1016/j.egy.2019.03.006>

Ribiere, V. and Worasinchai, L. (2013). Proceedings of the International Conference on Management, Leadership and Governance: ICMLG 2013. Bangkok, Thailand: Academic Conferences Limited, 316.

Rikhardsson, P. et al. (2005). Environmental Management Accounting: Innovation or Managerial Fad? In P Rikhardsson, M Bennett, JJ Bouma & S Schaltegger (eds), *Implementing Environmental Management Accounting: Status and Challenges*. Dordrecht: Springer.

Robson, K. and Ezzamel, M. (2023). The cultural fields of accounting practices: Institutionalization and accounting changes beyond the organization, *Accounting, Organizations and Society*, 104, 101379. <https://doi.org/10.1016/j.aos.2022.101379>

Robinson, N. (1999). The use of focus group methodology — with selected examples from Sexual Health Research, *Journal of Advanced Nursing*, 29(4), 905–913. <https://doi.org/10.1046/j.1365-2648.1999.00966.x>

Ryan, B., Scapens, R. and Theobald, M. (2002). *Research Methods and Methodology in Finance and Accounting*. 2nd edition. London: Thomson Learning.

Sadhukhan, J. et al. (2020). Perspectives on “Game changer” global challenges for sustainable 21st Century: Plant-based diet, unavoidable food waste biorefining, and circular economy, *Sustainability*, 12(5), 213–227. <https://doi.org/10.3390/su12051976>

- Sahin, O., Stewart, R. and Porter, M. (2015). Water security through scarcity pricing and reverse osmosis: A System Dynamics Approach, *Journal of Cleaner Production*, 88, 160–171. <https://doi.org/10.1016/j.jclepro.2014.05.009>
- Sari, R. et al. (2020). Effect of environmental management accounting practices on organizational performance: role of process innovation as a mediating variable. *Business Process Management Journal*, 27(4), 1296-1314. <https://doi.org/10.1108/BPMJ-06-2020-0264>
- Sarker, T. and Burritt, R. (2008). *An empirical examination of the role of environmental accounting information in environmental investment decision-making*. Dordrecht, Netherlands: Springer.
- Sarker, T. and Monroe, G. (2012). Influence of regulation and information on environmental investment decision-making: An experimental study. *Asia Pacific Work in Progress Research Paper Series*, (7), 1-32.
- Satyendra, K. (2020). *Effective Decision Making for Organizational Performance*. Ispatguru.com. Available at: <<https://www.ispatguru.com/effective-decision-making-for-organizational-performance/>> (Accessed: August 02, 2022).
- Saunders, M., Lewis, P. and Thornhill, A. (2023). *Research Methods for Business Students*. 9th edn. Harlow: Pearson Education.
- Schaltegger, S. and Burritt, R. (2000). *Contemporary Environmental Accounting – Issues, Concepts and Practice*. Sheffield: Greenleaf Publishing.
- Schaltegger, S. and Burritt, R. (2010). Sustainability accounting for companies: catchphrase or decision support for business leaders? *Journal of World Business*, 45(4), 375-384. <https://doi.org/10.1016/j.jwb.2009.08.002>
- Schaltegger, S. and Wagner, M. (2006). Integrative management of sustainability performance, measurement and reporting. *International Journal of Accounting, Auditing and Performance Evaluation*, 3(1), 1-19. <https://doi.org/10.1504/IJAPE.2006.010098>
- Schwarz, J., Beloff, B. and Beaver, E. (2002). Use sustainability metrics to guide decision-making. *Chemical Engineering Progress*, 98(7), 58-63.
- Scott, W. (1995). *Institutions and Organizations*. 3rd ed. Thousand Oaks, CA: Sage.

Scott, W. (2013). *Institutions and organizations: Ideas, Interests & Identities*. 4th edition. Thousand Oaks, United States: SAGE Publications Inc.

Sekaran, U. and Bougie, R. (2020). *Research Methods for Business: A Skill Building Approach*. 8th edn. Hoboken, NJ: John Wiley & Sons, Inc.

SEC (2022). *SEC Proposes Rules to Enhance and Standardize Climate-Related Disclosures for Investors*, SEC. Available at: <https://www.sec.gov/news/press-release/2022-46> (Accessed: February 05, 2023).

Setiawan, E. and Izzaty, K. (2021). Analysis of Management Accounting Systems Affecting Energy Efficiency, environmental uncertainty and environmental performance of small and Medium Enterprises, *Journal of Applied Sciences in Accounting, Finance, and Tax*, 4(1), 77–89. <https://doi.org/10.31940/jasafint.v4i1.2432>

Shah, H., Malik, A. and Malik, M. (2011). Strategic management accounting: A messiah for management accounting. *Australian Journal of Business and Management Research*, 1(4), 1-7. <http://dx.doi.org/10.52283/NSWRCA.AJBMR.20110104A01>

Shahzadi, S. et al. (2018). Impact of external and internal factors on management accounting practices: a study of Pakistan. *Asian Journal of Accounting Research*, 3(2), 211-223. <https://doi.org/10.1108/AJAR-08-2018-0023>

Shenton, A. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information*, 22, 63-75. <http://dx.doi.org/10.3233/EFI-2004-22201>

Shonhadji, N. and Maulidi, A. (2022). Is it suitable for your local governments? A contingency theory-based analysis on the use of internal control in thwarting white-collar crime. *Journal of Financial Crime*, 29(2), 770-786. <https://doi.org/10.1108/JFC-10-2019-0128>

Shuttleworth, M. (2008). *Survey Research Design - How to Conduct Surveys*. Explorable.com. Available at: <https://explorable.com/survey-research-design> (Accessed October 03, 2023).

Sidik, M. et al. (2019). The Dynamic Association of Energy, Environmental Management Accounting and Green Intellectual Capital with corporate environmental

performance and competitive, *International Journal of Energy Economics and Policy*, 9(5), 379–386. <https://doi.org/10.32479/ijeep.8283>

Sigma (2003). *The Sigma Guidelines - Toolkit: Sustainability Accounting Guide*, the UK Department of Trade and Industry (DTI), London.

Siskawati, E. et al. (2019). Environmental Management Accounting and Environmental Performance Assessment (Institutional Analysis). *Journal of Environmental Accounting and Management*, 7(3), 253-262.

Siva, A. (2023). *Maximizing Energy Efficiency: A Guide to Energy Accounting Concepts and Workflows*, Facilio Blog. Facilio. Available at: <https://facilio.com/blog/energy-accounting/> (Accessed: April 07, 2023).

Spencer, S., Adams, C. and Yapa, P. (2013). The mediating effects of the adoption of an environmental information system on top management's commitment and environmental performance. *Sustainability Accounting, Management and Policy Journal*, 4(1), 75-102. <https://doi.org/10.1108/SAMPJ-10-2011-0030>

Sphera (2021). *What is Carbon Accounting?*, www.citethisforme.com. Sphera. Available at: <https://sphera.com/glossary/what-is-carbon-accounting/> (Accessed: March 14, 2023).

Stevanović, T. and Petrović-Ranđelović, M. (2012). Sustainability Balanced Scorecard and eco-efficiency analysis. *Economics and Organization*, 9(2), 257-270.

Streubert, H. and Carpenter, D. (1999). *Qualitative Research in Nursing: Advancing the Humanistic Imperative*. 2nd edition. Philadelphia: Lippincott.

Su, R. (2019). *Research on energy accounting under energy conservation and emission reduction policies*. In *IOP Conference Series: Materials Science and Engineering*. 3 (677), 032113. IOP Publishing. Melbourne, Australia.

Sulaiman, M. and Mokhtar, N. (2010). Environmental Management Accounting: Some Empirical Evidence from Malaysia. *Malaysian Institute of Accountants*, Articles of Merit Award ON Paib, 15-51.

Sulanjaku, M. (2013). Environmental Management Accounting and Albanian Perspectives. *Research Journal of Finance and Accounting*, 4(18), 41-49.

Suleiman, N., Yahaya, L. and Abba, M. (2018). Explored and Critique of Contingency Theory for Management Accounting Research. *Journal of Accounting and Financial Management*, 4(5), 40-50.

Tachikawa, H. (2015). Material Flow Cost Accounting (MFCA): Concepts, Practices, and Impacts. Workshop on Material Flow of Cost Accounting as Part of Accounting and Productivity. Jakarta: ASEAN Productivity Organization and Directorate General of Training and Productivity Ministry of Manpower.

Taplin, J., Bent, D. and Aeron-Thomas, D. (2006). Developing a sustainability accounting framework to inform strategic business decisions: A case study from the chemicals industry. *Business Strategy and the Environment*, 15(5), 347-360. <http://dx.doi.org/10.1002/bse.542>

Timothy, K. (2011). *The Application of Environmental Management Accounting Amongst KwaZulu-Natal's Top Businesses*. MBA. University of KwaZulu-Natal.

Tingey-Holyoak, J. and Pisaniello, J. (2019). Water accounting knowledge pathways,” *Pacific Accounting Review*, 31(2), 258–274. <https://doi.org/10.1108/par-01-2018-0004>

Torkzadeh, G. and Dhillon, G. (2002). Measuring factors that influence the success of internet commerce, *Information Systems Research*, 13(2), 187–204. <https://doi.org/10.1287/isre.13.2.187.87>

Tran, T. and Herzig, C. (2020). Material Flow Cost Accounting in Developing Countries: A Systematic Review. *Sustainability*, 12(13), 1-18. <https://doi.org/10.3390/su12135413>

Trochim, W. (2021). *Research Methods Knowledge Base*. CONJOINTLY. Available at: <<https://conjointly.com/kb/survey-research/>> (Accessed: January 15, 2021).

Tsai, W. et al. (2012). Integrating information about the cost of carbon through activity-based costing. *Journal of Cleaner Production*, 36, 102–111. <https://doi.org/10.1016/j.jclepro.2012.02.024>

Tuanmat, T. and Smith, M. (2011). Changes in management accounting practices in Malaysia. *Asian Review of Accounting*, 19(3), 221-242. <https://doi.org/10.1108/13217341111185146>

Ukhurebor, K. et al. (2021). Environmental implications of petroleum spillages in the Niger Delta region of Nigeria: A Review, *Journal of Environmental Management*, 293, 1–21. <https://doi.org/10.1016/j.jenvman.2021.112872>

Uljas, P. (2017). *Environmental Management Accounting (EMA) Practices: A Case study of a Finnish manufacturing company*. Masters. University of VAASA.

UN (1987). *Report of the World Commission on Environment and Development: Our common future*, United Nation.

UNCC (2015). *Historic Paris Agreement on Climate Change: 195 Nations Set Path to Keep Temperature Rise Well Below 2 Degrees Celsius*, Cop23.unfccc.int. Available at: <https://cop23.unfccc.int/news/finale-cop21> (Accessed: May 27, 2023).

UNCC (2022). *COP27: Leaders Boost Sustainable Forest Management*, Unfccc. int. UN Climate Change. Available at: <https://unfccc.int/news/cop27-leaders-boost-sustainable-forest-management> (Accessed: December 06, 2022).

UNSD (2002). *Environmental Management Accounting: Policies and Linkages*. New York: United Nations Division for Sustainable Development.

UNEP (2015). *Businesses and Investors Pioneering the Green Economy Highlight Multi-Trillion Dollar Opportunity in Tackling Climate Change*. PNUMA. Available at: <https://www.unep.org/news-and-stories/story/businesses-and-investors-pioneering-green-economy-highlight-multi-trillion> (Accessed: December 26, 2023).

Unerman, J., Bebbington, J. and O'Dwyer, B. (2007). *Sustainability accounting and accountability*. London: Routledge.

UNIDO (2010). *Enterprise-Level Indicators for Resource Productivity and Pollution Intensity: A Primer for Small and Medium-Sized Enterprises*. Vienna.

Usher, O., Mysore, M. and Finn, P. (2022). *When nothing is normal: Managing in extreme uncertainty*. <https://www.mckinsey.com>. Available at: <https://www.mckinsey.com/business-functions/risk-and-resilience/our-insights/when-nothing-is-normal-managing-in-extreme-uncertainty> (Accessed: December 29, 2022).

Utting, P. and O'Neill, K. (2020). *Corporate Sustainability Accounting: What Can and Should Corporations Be Doing?* Sustainable Development Performance Indicators. United Nations Research Institute for Social Development (UNRISD), 1-32.

- Van Eupen, C. et al. (2021). The impact of data quality filtering of opportunistic citizen science data on Species Distribution Model Performance, *Ecological Modelling*, 444, 109453. <https://doi.org/10.1016/j.ecolmodel.2021.109453>
- Van Thanh, N. et al. (2016). The widening concept of “cleaner production”, *Cultura, Educación y Sociedad*, 7(2), 9–25.
- Van Wijk, J. et al. (2019). Social Innovation: Integrating Micro, Meso, and macro level insights from institutional theory, *Business & Society*, 58(5), 887–918. <https://doi.org/10.1177/0007650318789104>
- Vasanth, V. et al. (2012). Environmental Management Accounting - A Decision Making Tool. *International Journal of Management*, 3(3), 144-151. <https://ssrn.com/abstract=2687268>
- Verardi, V. and Croux, C. (2009). Robust regression in Stata. *The Stata Journal*, 9(3), 439-453.
- Verghese, K., Lewis, H. and Burritt, R. (2008). Sustainable packaging and sustainability accounting: exploring links and synergies. *Journal of the Asia-Pacific Centre for Environmental Accountability*, 14(3), 18-33.
- Walz, M. and Guenther, E. (2020). What effects does material flow cost accounting have for companies? Evidence from a case studies analysis. *Journal of Industrial Ecology*, 25(3), 593-613. <https://doi.org/10.1111/jiec.13064>
- Wang, F., Sun, J. and Liu, Y. (2019). Institutional Pressure, Ultimate Ownership, and Corporate Carbon Reduction Engagement: Evidence from China., *Journal of Business Research*, 104, 14-26. <https://doi.org/10.1016/j.jbusres.2019.07.003>
- Wang, J. and Xia, W. (2022). Research on Enterprise Carbon Accounting under the Framework of Carbon Emission Management Accounting - Taking Chemical Enterprises as an Example, *Accounting and Corporate Management*, *Clausius Scientific Press, Canada*, 4(1), 52–61. <https://doi.org/10.23977/acccm.2022.040108>.
- Wang, S., Wang, H. and Wang, J. (2018). Exploring the effects of institutional pressures on the implementation of environmental management accounting: Do top management support and perceived benefit work? *Business Strategy and the Environment*, 28(1), 233-243. <https://doi.org/10.1002/bse.2252>

- Wanxin, C. and Xiao, C. (2021). A Comparison of Institutional Theory and Contingency Theory. *International Journal of Research in Humanities and Social Studies*, 8(8), 14-17. <https://doi.org/10.22259/2694-6296.0808003>
- Waterhouse, J. and Tiessen, P. (1978). A contingency framework for management accounting systems research. *Accounting, Organizations and Society*, 3(1), 65-76. [https://doi.org/10.1016/0361-3682\(78\)90007-7](https://doi.org/10.1016/0361-3682(78)90007-7)
- Watts, M. and Zalik, A. (2020). Consistently unreliable: Oil spill data and transparency discourse, *The Extractive Industries and Society*, 7(3), 790–795. <https://doi.org/10.1016/j.exis.2020.04.009>
- Wei, Q. (2021). Do Urban Carbon Reduction Practices under China's Institutional Arrangement Go beyond 'Low-Hanging Fruits? Empirical Evidence from Guangzhou' *Journal of Environmental Planning and Management*, 64(6), 978-998. <https://doi.org/10.1080/09640568.2020.1796606>
- WHO (2024). Global Health Observatory data repository, World Health Organization. Available at: <https://apps.who.int/gho/data/view.main.2490> (Accessed: 03 June 2024).
- Wilkinson, R. (2023). *Purposive Sampling*. ENKIVILLAGE. Available at: <http://www.enkivillage.com/purposive-sampling.html> (Accessed: November 08, 2023).
- Winograd, M. and Farrow, A. (2009). Sustainable development indicators for decision making: concepts, methods, definition and use. *Dimensions of sustainable development*. Boston: EOLSS Publishers.
- Wolters, T. and Danse, M. (2002). Towards Sustainability Indicators for Product Chains. With Special Reference to an International Coffee Chain, in *Environmental Management Accounting: Informational Institutional Developments*. The Netherlands: Kluwer Academic Publishers.
- Worldometers, (2022). *Nigeria Population (2022) - Worldometer*. Available at: <https://www.worldometers.info/world-population/nigeria-population/> (Accessed: May 04, 2022).
- WSSD (2002). *Plan of Implementation of the World Summit on Sustainable Development - A/CONF.199/20*. Johannesburg, South Africa. Un-documents.net. Available at: <http://www.un-documents.net/jburgpln.htm> (Accessed: July 07, 2023).

WTO (2020). *An Introduction to Trade and Environment in the WTO*. Available at: <https://www.wto.org/english/tratop_e/envir_e/envt_intro_e.htm> (Accessed: November 03, 2020).

Wucker, M. (2022). *Why managing uncertainty is a key leadership skill: The ability to cope with ambiguity is at a particular premium*. STRATEGY-BUSINESS Available at: <<https://www.strategy-business.com/blog/Why-managing-uncertainty-is-a-key-leadership-skill>> (Accessed: August 02, 2022).

Yang, G. and Liu, B. (2021). Research on the impact of managers' green environmental awareness and strategic intelligence on Corporate Green Product Innovation Strategic Performance, *Annals of Operations Research* [Preprint]. <https://doi.org/10.1007/s10479-021-04243-5>

Yang, R., Jaidi, J. and Ab Fatah, N. (2020). The Perception of Top Management's Commitment, Environmental Management Accounting and Corporate Sustainability Performance in Malaysian Manufacturing Sector. *International Journal of Business and Economy*, 2(2), 75-89.

Yates, S. (2004). *Doing social science research*. London: Sage Publications.

Zandi, G. and Lee, H. (2019). Factors affecting environmental management accounting and environmental performance: An empirical assessment. *International Journal of Energy Economics and Policy*, 9(6), 342-348. <http://dx.doi.org/10.32479/ijeep.8369>

Zhang, A. et al. (2019). Barriers to smart waste management for a circular economy in China, *Journal of Cleaner Production*, 240, 1–12. <https://doi.org/10.1016/j.jclepro.2019.118198>

Zielinski, C., (2022). COP27 climate change conference: Urgent action needed for Africa and the world, *BMJ Leader* [Preprint]. <https://doi.org/10.1136/leader-2022-000696>

Zikmund, W. (2003). *Business Research Methods*. 7th edition. South-Western: Thomson.

Zvezdov, D. and Schaltegger, S. (2015). "Decision support through Carbon Management Accounting—A framework-based literature review," *Corporate Carbon and Climate Accounting*, 27–44. https://doi.org/10.1007/978-3-319-27718-9_2.

APPENDIX A: QUESTIONNAIRE

QUESTIONNAIRE

The objective of this research is to investigate if the current Management Accounting System in use within the NNPC provides a useful flow of environmental information required for decision-making and to examine the effectiveness of environmental regulations in-place. The questionnaire is divided into the following sections:

Sections	Description
Section A	Geographic Information
Section B	Environmental Reporting
Section C	Environmental Management Accounting Information
Section D	Environmental Information for decision-making
Section E	Environmental Policy and Regulations

Please read each question carefully and answer it to the best of your ability. There are no correct or incorrect responses; we are merely interested in your company's point of view, in order to develop a framework that will provide adequate environmental information through EMA to enrich decision-making in the Nigerian petroleum industry.

All questions in this survey are closed ended, requiring you to mark (with an "X") the option that best describes the situation at your company.

It will take you about 30 minutes to complete this questionnaire

SECTION A: GEOGRAPHIC INFORMATION

1. Indicate your gender.

Male	
Female	

2. Indicate your highest level of qualification.

Doctoral degree	
Master's degree	
Honours degree	
Higher Diploma/First Degree (HND, B.Sc.)	
National Diploma (ND)	
Others	

3. Indicate your position in the company:

Environmental Manager	
Financial Accountant	
Management Accountant	

4. Indicate your time in service.

0 - 10 years	
11 - 20 years	
21 - 30 years	
31 and above	

SECTION B: ENVIRONMENTAL REPORTING

Indicate your level of agreement with the following statements where (1) is strongly disagree and (5) strongly agree.

Statement	1	2	3	4	5
5. The major physical environmental activities are being captured within current accounting systems.					
6. The major monetary environmental activities are being captured within current accounting systems.					
7. Our company's current accounting system specifically recognises and measures environmental costs.					
8. The current accounting system in my company places particular emphasis on identifying environmental costs.					
9. The current accounting system in my company generates environmental cost information.					
10. The major environmental costs are used to support the internal environmental management in my company.					
11. The major environmental costs are used to support the external environmental reporting in my company.					
12. My company discloses its environmental objectives with regard to the following:					
12.1 Emission levels					

Statement	1	2	3	4	5
12.2 Pollution					
12.3 Energy consumption					
12.4 Noise levels					
12.5 Waste production					
12.6 Recycling					
13. My company discloses the following environmental expenditure with regard to the following:					
13.1 Operating expenditure					
13.2 Capital expenditure					
13.3 Reserves					
13.4 Liabilities					
13.5 Contingent liabilities					

SECTION C: ENVIRONMENTAL MANAGEMENT ACCOUNTING INFORMATION

Indicate your level of agreement with the following statements where (1) is strongly disagree and (5) strongly agree.

Statement	1	2	3	4	5
14. My company generates and records physical environmental information with regard to the following:					
14.1 Materials (all materials used by your company, of all types; e.g. raw and auxiliary materials, packaging materials, merchandise, operating materials)					
14.2 Water (all water used by your company, from all sources)					

Statement	1	2	3	4	5
14.3 Energy (all energy used by your company, of all types; e.g. electricity, gas, coal, fuel oil, district heating and cooling, biomass, solar, wind)					
14.4 Products (any tangible products created by the company)					
14.5 By-products (minor products incidentally produced during the manufacture of the primary product)					
14.6 Waste (this includes, non-hazardous waste, hazardous waste)					
14.7 Air emissions (including radiation, noise)					
15. My company generates and records monetary environmental information with regard to the following:					
15.1 Material cost of product outputs (the purchasing cost of natural resources, such as energy, water and other materials).					
15.2 Material cost of non-product outputs, which include the purchasing (and sometimes processing) cost of energy, water and other materials that become non-product output (waste and emissions).					
15.3 Waste and emission control costs, which include the handling, treatment and disposal costs of waste and emissions; remediation and compensation costs related to environmental damage; and any control-related regulatory compliance costs.					
15.4 Prevention and other environmental management costs (the cost of preventive environmental management activities, such as cleaner production projects, and the cost of other environmental management activities, such as environmental planning and systems, environmental measurement, environmental communication, and any other relevant activities).					

Statement	1	2	3	4	5
15.5 Environmental research and development costs (the cost of research and development projects related to environmental issues).					
15.6 Environmental operating expenditure independent of any other operating expenditure.					
15.7 Environmental capital expenditure tracked independent of capital expenditure.					

SECTION D: ENVIRONMENTAL INFORMATION FOR DECISION MAKING

Indicate your level of agreement with the following statements where (1) is strongly disagree and (5) strongly agree.

	1	2	3	4	5
16. The accounting system used by your company provides the required set of information for management use.					
17. My company identifies, collects and analyses information on the following for decision-making:					
17.1 Energy					
17.2 Water					
17.3 Materials					
18. My company identifies, collects and analyses monetary information for internal decision-making:					
18.1 Environment-related costs					
18.2 Earnings					
18.3 Savings					

	1	2	3	4	5
19. My company generates and uses the following environmental information for decision-making:					
19.1 Environmental Cost Information					
19.2 Environmental Impact and Risk Information					
19.3 Financial Environmental Information					
19.4 Quantitative Non-Financial Environmental information					
20. Major environmental costs are used in supporting the internal decision-making process within my company.					
21. My company recognises the importance of environmental management accounting with respect to decision-making.					
22. The information currently generated within my company is particularly useful for activities and decisions with environmental impacts.					

SECTION E: ENVIRONMENTAL POLICY AND REGULATIONS

Indicate your level of agreement with the following statements where (1) is strongly disagree and (5) strongly agree.

	1	2	3	4	5
23. My company has implemented the following environmental strategies and tools:					
23.1 Environmental mission statement					

	1	2	3	4	5
23.2 Environmental values statement					
23.3 Environmental policy					
23.4 Environmental action plan					
23.5 Environmental section in its annual report					
23.6 Stand-alone sustainability report					
24.I accept the broad environmental issues faced by my company:					
24.1 Legislation (compliance with legislation)					
24.2 Solid waste (management, minimisation, disposal, recycling, litter)					
24.3 Energy (global warming, carbon trading, challenge programme)					
24.4 Water (quality, reduction, contamination, management)					
24.5 Land (conflicts, impacts)					
24.6 Resource-related (efficiency, use)					
25.The following environmental issues are currently and in future important to my company:					
25.1 Wastewater management					
25.2 Hazardous waste management					
25.3. Protection of soil and groundwater					
25.4 Surface water use and management					
25.5 Land management and development					
25.6 Non-hazardous waste management					

	1	2	3	4	5
26. My company is able to reduce the impact of crude oil on the environment.					
27. My company is able to seek to prevent any new significant pollution.					
28. The regulatory authorities have programmes and policies in place to encourage your company to use an environmental management system.					
29. The regulatory authorities provide adequate policies and regulation on environmental matters.					
30. The environmental costs development in my company attained a prescribed standard.					
31. My company is pursuing environmental degradation prevention.					
32. My company is pursuing environmental pollution prevention.					

APPENDIX B: PARTICIPANT INFORMATION SHEET

FOCUS GROUP PROTOCOL FOR QUALITATIVE INFORMATION

Dear Prospective Participant,

My name is Azeez Busayo Kehinde and I am doing research with Prof. HM van der Poll, a professor, in the Department of Accounting Sciences towards a PhD at the University of South Africa. We are inviting you to participate in a study entitled 'a framework for adequate environmental information through environmental management accounting practices (EMAPs) for greener decision-making in the Nigerian petroleum industry'. I am conducting this focus group to validate a proposed framework. I am therefore seeking from you some important information that will enable me to reach worthwhile task.

The focus group selected in this framework validation comprises managers actively using the information to direct financial, management, and environmental matters within the NNPC. The managers were selected based on their job descriptions, and the objective was to ensure that typical or representative subjects that could validate the proposed framework were selected.

The study involves a focus group, the duration of the focus group session may last between 60 -90 minutes, and the following questions will be asked:

- What comes to mind when you hear 'environmental information' and 'environmental management accounting'?
- What did you think of the framework in terms of providing adequate information for decision-making?
- What do you find valuable and significant about the framework in the context of the information provided for greener decision-making?
- What are the improvements the NNPC can make to the existing management accounting system through this framework?
- Do you think that the framework has missing elements?

Participating in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep

and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason.

Should you require any further information or want to contact the researcher about any aspect of this study, please contact Azeez Busayo Kehinde at +447444489839 or 47973803@mylife.unisa.ac.za.

Should you have concerns about the way in which the research has been conducted, you may contact Professor HM van der Poll at 011 652 0251 or vdpolhm@unisa.ac.za. Contact the research ethics chairperson of the College of Accounting Sciences, Prof Lourens J Erasmus at 012 429 8844 or erasmij1@unisa.ac.za if you have any ethical concerns.

Thank you for taking time to read this information sheet and for participating in this study.

Thank you.

Azeez Busayo Kehinde

APPENDIX C: LETTER OF PERMISSION



www.nnpcgroup.com

Telephone: 09 - 46081000

NIGERIAN NATIONAL PETROLEUM CORPORATION
CENTRAL BUSINESS DISTRICT, HERBERT MACAULAY WAY, P.M.B 190, GARKI, ABUJA.

GGM/HR/002

30th October 2015

Mr. Kehinde Azeez Busayo,
c/o Prof Huibrecht Margaretha van der Poll
Department of Management Accounting (SBL)
University of South Africa (Unisa)
1 Preller Street, Muckleneuk
P O Box 392
0003. Unisa
SOUTH AFRICA.

Dear Sir,

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT THE NIGERIAN NATIONAL PETROLEUM CORPORATION

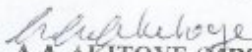
Your letter dated 14th September, 2015 on the above subject requesting to carry out a research study entitled "*A framework for adequate information provision through environmental management accounting to enrich decision making in the petroleum industry*" refers.

Please be informed that the Management of the Nigerian National Petroleum Corporation has approved your request.

When you visit the Corporation in Nigeria, do contact Dr. Isokari Francis Ololo (Manager, Library and Archives) who will conduct you through the relevant departments and link you with your prospective respondents.

Wishing you the best of luck in your research endeavours.

Yours faithfully,
for: **NIGERIAN NATIONAL PETROLEUM CORPORATION**


A.A. AKITOYE (MRS.)
Group General Manager, Human Resources

APPENDIX D: ETHICS CERTIFICATE



COLLEGE OF ACCOUNTING SCIENCES RESEARCH ETHICS REVIEW COMMITTEE

Date: 15 February 2016

Ref: 2016_CAS_002
Name of applicant: Mr K A
Busayo
Staff/student #: 47973803

Dear Mr Kehinde Busayo

Decision: Ethics Approval

Name: Mr Kehinde Busayo
47973803@mylife.unisa.ac.za
+2348093452444

Proposal: A Framework to Provide Adequate Environmental Information to Enrich
Decision-making in the Petroleum Industry

Qualification: Post graduate student research

Thank you for the application for research ethics clearance by the College of Accounting Sciences Research Ethics Review Committee for the above mentioned research. Final approval is granted for the completion of the research.

For full approval: *The application was reviewed in compliance with the Unisa Policy on Research Ethics by the College of Accounting Sciences Research Ethics Review Committee on 20 January 2016.*

The proposed research may now commence with the proviso that:

- 1) The researcher/s will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.*
- 2) Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the College of Accounting Sciences Research Ethics Review Committee. An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants.*




University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

3) *The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study.*

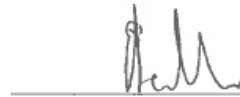
Note:

The reference number [top right corner of this communiqué] should be clearly indicated on all forms of communication [e.g. Webmail, E-mail messages, letters] with the intended research participants, as well as with the College of Accounting Sciences RERC.

Kind regards,



Prof Debbie Scheepers
(Acting Chairperson of CAS RERC)
scheed@unisa.ac.za
(012) 429 4342



Prof Elmarie Sadler
(Executive Dean of CAS)

Statistics for column categories in standard normalization

		overall		dimension_1			dimension_2		
Categories	mass	quality	%inert	Coord	sqcorr	contrib	Coord	sqcorr	contrib
Materials									
1	0.003	0.567	0.003	0.622	0.434	0.001	1.799	0.133	0.011
2	0.047	0.995	0.018	0.654	0.994	0.020	-0.107	0.001	0.001
4	0.001	0.539	0.005	-1.568	0.539	0.003	0.122	0.000	0.000
5	0.020	0.995	0.044	-1.562	0.995	0.048	-0.048	0.000	0.000
Water									
1	0.008	0.935	0.004	0.647	0.680	0.003	2.070	0.255	0.034
2	0.042	0.994	0.017	0.657	0.984	0.018	-0.336	0.009	0.005
3	0.000	0.057	0.005	0.670	0.022	0.000	-4.365	0.034	0.006
4	0.010	0.946	0.022	-1.497	0.946	0.023	-0.122	0.000	0.000
5	0.011	0.959	0.026	-1.579	0.959	0.027	0.005	0.000	0.000
Energy									
1	0.013	0.910	0.008	0.650	0.617	0.006	2.341	0.293	0.071
2	0.037	0.986	0.016	0.660	0.928	0.016	-0.856	0.057	0.027
3	0.000	0.193	0.003	0.311	0.009	0.000	7.292	0.184	0.016
4	0.013	0.945	0.028	-1.508	0.945	0.029	-0.119	0.000	0.000
5	0.009	0.906	0.022	-1.586	0.906	0.022	0.035	0.000	0.000
Products									
1	0.009	0.815	0.006	0.647	0.583	0.004	2.132	0.232	0.040
2	0.041	0.987	0.017	0.660	0.967	0.018	-0.486	0.019	0.010
4	0.015	0.953	0.031	-1.481	0.952	0.032	0.050	0.000	0.000

		overall		dimension_1			dimension_2		
Categories	mass	quality	%inert	Coord	sqcorr	contrib	Coord	sqcorr	contrib
5	0.007	0.855	0.018	-1.586	0.855	0.017	0.030	0.000	0.000
Byproducts									
1	0.006	0.858	0.005	0.633	0.395	0.002	3.584	0.463	0.072
2	0.045	0.994	0.018	0.655	0.979	0.019	-0.433	0.016	0.008
4	0.012	0.948	0.027	-1.543	0.948	0.029	-0.077	0.000	0.000
5	0.009	0.919	0.022	-1.588	0.919	0.022	0.014	0.000	0.000
Waste									
1	0.008	0.866	0.007	0.646	0.427	0.003	3.425	0.439	0.097
2	0.042	0.987	0.017	0.654	0.952	0.018	-0.656	0.035	0.018
4	0.009	0.934	0.021	-1.533	0.934	0.022	-0.081	0.000	0.000
5	0.012	0.963	0.028	-1.584	0.963	0.030	-0.006	0.000	0.000
AirEmissions									
0	0.000	0.479	0.001	-1.561	0.479	0.001	0.028	0.000	0.000
1	0.010	0.911	0.008	0.651	0.494	0.004	3.123	0.417	0.101
2	0.041	0.989	0.015	0.622	0.935	0.016	-0.782	0.054	0.025
3	0.001	0.733	0.003	-1.586	0.733	0.002	0.034	0.000	0.000
4	0.006	0.888	0.015	-1.585	0.888	0.015	0.024	0.000	0.000
5	0.013	0.972	0.030	-1.556	0.972	0.032	-0.061	0.000	0.000
Mat~fproduct									
1	0.002	0.679	0.002	0.643	0.330	0.001	3.456	0.349	0.025
2	0.049	0.997	0.018	0.646	0.995	0.020	-0.137	0.002	0.001
4	0.004	0.886	0.011	-1.576	0.886	0.011	-0.026	0.000	0.000

		overall		dimension_1			dimension_2		
Categories	mass	quality	%inert	Coord	sqcorr	contrib	Coord	sqcorr	contrib
5	0.016	0.989	0.037	-1.578	0.989	0.041	-0.024	0.000	0.000
Mat~nproduct									
1	0.004	0.781	0.005	0.655	0.355	0.002	3.749	0.426	0.058
2	0.046	0.993	0.018	0.648	0.982	0.019	-0.365	0.011	0.006
3	0.000	0.142	0.001	0.541	0.108	0.000	-1.592	0.034	0.001
4	0.009	0.945	0.020	-1.518	0.944	0.021	0.264	0.001	0.001
5	0.012	0.974	0.027	-1.577	0.974	0.029	-0.064	0.000	0.000
WasteandEm~c									
1	0.009	0.900	0.006	0.650	0.602	0.004	2.396	0.299	0.053
2	0.041	0.991	0.016	0.645	0.964	0.017	-0.563	0.027	0.013
3	0.001	0.253	0.001	0.663	0.162	0.000	2.587	0.090	0.004
4	0.009	0.959	0.022	-1.575	0.959	0.024	0.010	0.000	0.000
5	0.011	0.970	0.026	-1.581	0.970	0.028	-0.053	0.000	0.000
Prevention~t									
1	0.008	0.885	0.005	0.649	0.576	0.003	2.483	0.309	0.051
2	0.041	0.992	0.016	0.648	0.960	0.017	-0.618	0.032	0.016
3	0.001	0.307	0.004	0.541	0.087	0.000	4.498	0.220	0.024
4	0.009	0.944	0.020	-1.567	0.944	0.021	0.025	0.000	0.000
5	0.012	0.972	0.028	-1.586	0.972	0.031	-0.059	0.000	0.000
Environme~st									
1	0.010	0.833	0.005	0.668	0.788	0.004	0.837	0.045	0.007
2	0.036	0.984	0.014	0.655	0.975	0.016	-0.343	0.010	0.004

		overall		dimension_1			dimension_2		
Categories	mass	quality	%inert	Coord	sqcorr	contrib	Coord	sqcorr	contrib
3	0.000	0.057	0.005	0.670	0.022	0.000	-4.365	0.034	0.006
4	0.013	0.902	0.011	-0.933	0.896	0.011	0.401	0.006	0.002
5	0.012	0.974	0.027	-1.541	0.974	0.029	0.041	0.000	0.000
Environ~gexp									
1	0.007	0.755	0.007	0.632	0.378	0.003	3.306	0.378	0.074
2	0.044	0.985	0.017	0.648	0.964	0.018	-0.502	0.021	0.011
4	0.009	0.944	0.021	-1.567	0.944	0.022	0.015	0.000	0.000
5	0.012	0.967	0.028	-1.586	0.967	0.030	-0.054	0.000	0.000
Environ~lexp									
1	0.009	0.834	0.007	0.623	0.471	0.004	2.858	0.363	0.077
2	0.041	0.984	0.017	0.651	0.946	0.017	-0.678	0.038	0.019
3	0.000	0.295	0.001	0.671	0.137	0.000	3.770	0.158	0.004
4	0.007	0.960	0.017	-1.580	0.960	0.019	0.002	0.000	0.000
5	0.013	0.986	0.030	-1.577	0.986	0.033	-0.039	0.000	0.000

Statistics for column categories in standard normalization

		overall		dimension_1			dimension_2		
Categories	mass	quality	%inert	Coord	sqcorr	contrib	Coord	sqcorr	contrib
Materials									
1	0.006	0.732	0.005	0.620	0.427	0.002	2.282	0.305	0.034
2	0.094	0.997	0.035	0.651	0.994	0.040	-0.152	0.003	0.002
4	0.002	0.492	0.010	-1.564	0.492	0.006	-0.070	0.000	0.000
5	0.040	0.995	0.084	-1.550	0.995	0.096	-0.005	0.000	0.000
Water									
1	0.016	0.979	0.008	0.657	0.798	0.007	1.366	0.181	0.031
2	0.083	0.998	0.031	0.654	0.991	0.036	-0.242	0.007	0.005
3	0.001	1.024	0.000	0.656	0.589	0.000	-2.457	0.435	0.004
4	0.020	0.914	0.045	-1.507	0.914	0.047	-0.016	0.000	0.000
5	0.022	0.937	0.050	-1.558	0.937	0.054	-0.022	0.000	0.000
Energy									
1	0.026	0.934	0.016	0.658	0.643	0.011	1.931	0.291	0.098
2	0.073	0.991	0.030	0.656	0.929	0.032	-0.735	0.061	0.039
3	0.001	0.277	0.004	0.287	0.010	0.000	6.320	0.267	0.023
4	0.025	0.903	0.055	-1.507	0.903	0.057	0.001	0.000	0.000
5	0.018	0.845	0.045	-1.571	0.845	0.043	-0.047	0.000	0.000
Products									
1	0.018	0.958	0.013	0.658	0.534	0.008	2.553	0.424	0.118
2	0.081	0.996	0.032	0.657	0.953	0.035	-0.605	0.043	0.030
4	0.030	0.923	0.062	-1.479	0.923	0.065	0.136	0.000	0.001

		overall		dimension_1			dimension_2		
Categories	mass	quality	%inert	Coord	sqcorr	contrib	Coord	sqcorr	contrib
5	0.013	0.766	0.038	-1.576	0.766	0.033	-0.087	0.000	0.000
Byproducts									
1	0.011	0.931	0.012	0.637	0.329	0.005	3.758	0.602	0.157
2	0.090	0.997	0.034	0.651	0.971	0.038	-0.463	0.026	0.019
4	0.025	0.910	0.056	-1.538	0.910	0.058	0.017	0.000	0.000
5	0.018	0.849	0.045	-1.568	0.848	0.043	-0.043	0.000	0.000
Waste									
1	0.016	0.901	0.016	0.645	0.368	0.007	3.380	0.533	0.187
2	0.084	0.990	0.033	0.650	0.940	0.036	-0.653	0.050	0.036
4	0.018	0.904	0.041	-1.536	0.904	0.043	-0.015	0.000	0.000
5	0.024	0.946	0.054	-1.562	0.946	0.059	-0.003	0.000	0.000
AirEmissions									
0	0.001	0.497	0.003	-1.559	0.497	0.001	0.047	0.000	0.000
1	0.020	0.904	0.017	0.661	0.449	0.009	2.900	0.455	0.172
2	0.081	0.988	0.030	0.619	0.921	0.031	-0.730	0.067	0.043
3	0.002	0.664	0.006	-1.560	0.664	0.004	-0.021	0.000	0.000
4	0.012	0.854	0.029	-1.566	0.854	0.029	-0.055	0.000	0.000
5	0.027	0.966	0.059	-1.558	0.966	0.065	0.023	0.000	0.000

APPENDIX G: MULTIPLE/JOINT CORRESPONDENCE ANALYSIS FOR MONETARY INFORMATION

Total inertia = 1.0404456

principal		Cumul	
Dimension	inertia	Percent	percent
dim 1	.9372956	90.09	90.09
dim 2	.0411356	3.95	94.04
dim 3	.0131658	1.27	95.31
dim 4	.007488	0.72	96.02
dim 5	.0054868	0.53	96.55
dim 6	.003213	0.31	96.86
dim 7	.0015638	0.15	97.01
dim 8	.0001346	0.01	97.02
dim 9	.0000467	0.00	97.03
Total	1.040446	100.00	

		overall		dimension_1			dimension_2		
Categories	mass	quality	%inert	Coord	sqcorr	contrib	Coord	sqcorr	contrib
Mat~fproduct									
1	0.004	0.717	0.005	0.613	0.258	0.002	3.904	0.459	0.063
2	0.097	0.994	0.037	0.652	0.992	0.041	-0.138	0.002	0.002
4	0.009	0.949	0.021	-1.583	0.949	0.022	-0.018	0.000	0.000
5	0.033	0.992	0.074	-1.572	0.992	0.081	-0.077	0.000	0.000
Mat~nproduct									
1	0.008	0.705	0.010	0.639	0.294	0.003	3.605	0.411	0.107
2	0.092	0.991	0.036	0.655	0.981	0.039	-0.320	0.010	0.009
3	0.001	0.226	0.001	0.406	0.116	0.000	-1.891	0.110	0.002
4	0.019	0.931	0.042	-1.520	0.930	0.043	0.227	0.001	0.001
5	0.024	0.959	0.055	-1.571	0.959	0.058	-0.148	0.000	0.001
WasteandEm~c									
1	0.019	0.813	0.012	0.632	0.563	0.008	2.013	0.251	0.076
2	0.081	0.985	0.033	0.654	0.961	0.035	-0.491	0.024	0.020
3	0.001	0.264	0.004	0.653	0.101	0.001	3.966	0.163	0.018
4	0.019	0.945	0.046	-1.569	0.945	0.048	-0.002	0.000	0.000
5	0.022	0.957	0.052	-1.579	0.956	0.056	-0.119	0.000	0.000
Prevention~t									
1	0.016	0.785	0.010	0.628	0.558	0.006	1.913	0.227	0.060
2	0.082	0.987	0.033	0.659	0.961	0.036	-0.521	0.026	0.022
3	0.002	0.500	0.008	0.496	0.068	0.001	5.979	0.432	0.084
4	0.017	0.929	0.040	-1.548	0.929	0.041	-0.047	0.000	0.000

		overall		dimension_1			dimension_2		
Categories	mass	quality	%inert	Coord	sqcorr	contrib	Coord	sqcorr	contrib
5	0.025	0.967	0.058	-1.593	0.967	0.063	-0.077	0.000	0.000
Environme~st									
1	0.019	0.924	0.009	0.674	0.910	0.009	-0.403	0.014	0.003
2	0.073	1.008	0.029	0.669	1.008	0.033	0.010	0.000	0.000
3	0.001	1.002	0.000	0.678	0.663	0.000	-2.319	0.340	0.003
4	0.025	0.844	0.023	-0.930	0.842	0.022	0.200	0.002	0.001
5	0.025	0.966	0.057	-1.570	0.966	0.061	0.137	0.000	0.000
Environ~gexp									
1	0.014	0.813	0.018	0.605	0.248	0.005	4.352	0.564	0.256
2	0.088	0.985	0.036	0.657	0.945	0.038	-0.641	0.039	0.036
4	0.018	0.906	0.042	-1.550	0.906	0.042	-0.040	0.000	0.000
5	0.024	0.950	0.058	-1.592	0.950	0.061	-0.082	0.000	0.000
Environ~lexp									
1	0.019	0.838	0.016	0.584	0.363	0.006	3.186	0.475	0.191
2	0.082	0.982	0.035	0.665	0.935	0.036	-0.711	0.047	0.041
3	0.001	0.157	0.002	0.676	0.129	0.000	1.499	0.028	0.001
4	0.015	0.937	0.035	-1.570	0.937	0.036	-0.028	0.000	0.000
5	0.027	0.980	0.062	-1.577	0.980	0.067	-0.084	0.000	0.000

APPENDIX H: MULTIPLE/JOINT CORRESPONDENCE ANALYSIS FOR SUSTAINABILITY

Multiple/Joint correspondence analysis Number of obs = 246
 Total inertia = .67052394
 Method: Burt/adjusted inertias Number of axes = 2

	principal		cumul
Dimension	Inertia	percent	percent
dim 1	.3341389	49.83	49.83
dim 2	.1771881	26.43	76.26
dim 3	.0578678	8.63	84.89
dim 4	.0057667	0.86	85.75
dim 5	.0013714	0.20	85.95
Total	.6705239	100.00	

Statistics for column categories in standard normalization

		overall		dimension_1			dimension_2		
Categories	Mass	quality	%inert	Coord	sqcorr	contrib	Coord	sqcorr	contrib
Environme~an									
1	0.001	1.343	0.011	0.933	0.052	0.001	6.380	1.291	0.055
2	0.077	1.173	0.048	1.121	1.010	0.097	-0.618	0.163	0.029
3	0.028	0.948	0.015	0.784	0.576	0.017	0.864	0.372	0.021
4	0.165	1.017	0.007	-0.289	0.971	0.014	0.085	0.045	0.001
5	0.061	0.999	0.032	-1.023	0.999	0.064	0.006	0.000	0.000
Environme~pt									
1	0.045	0.791	0.136	0.506	0.042	0.011	2.936	0.749	0.386
2	0.191	0.861	0.083	0.750	0.644	0.108	-0.598	0.217	0.068
3	0.054	0.749	0.132	-1.904	0.744	0.197	-0.207	0.005	0.002

		overall		dimension_1			dimension_2		
Categories	Mass	quality	%inert	Coord	sqcorr	contrib	Coord	sqcorr	contrib
4	0.031	0.425	0.074	-1.427	0.425	0.063	-0.070	0.001	0.000
5	0.012	0.541	0.026	-1.502	0.531	0.028	-0.291	0.011	0.001
Sustainability									
1	0.058	0.793	0.127	0.573	0.075	0.019	2.435	0.718	0.345
2	0.186	0.864	0.076	0.683	0.565	0.087	-0.682	0.299	0.086
3	0.070	0.824	0.151	-1.879	0.820	0.249	-0.183	0.004	0.002
4	0.015	0.323	0.070	-1.738	0.323	0.045	-0.003	0.000	0.000
5	0.004	0.068	0.012	-0.472	0.039	0.001	-0.557	0.029	0.001

APPENDIX I: TURNITIN SIMILARITY REPORT

Similarity Report

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Summary

APPENDIX J: LANGUAGE EDITOR CERTIFICATE

RMC LANGUAGE PRACTITIONER

117 Oostvallei Village
657 Coley Street
Garsfontein, Pretoria, 0081

TO WHOM IT MAY CONCERN

This is to certify that I have proofread and edited the doctoral thesis entitled: *An environmental management accounting information framework for greener decision-making in the petroleum industry* by Azeez Busayo Kehinde

I applied Microsoft Office Word track changes to the document and have suggested certain changes and corrections to language usage, syntax, general style and the referencing. I trust these suggestions will be effected to make it adhere to the editorial principles required for examination.

Signed:



Date: 04 February 2024

Dr RV McCabe
MA in Applied Linguistics (NWU)
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