T.C.
TOKAT GAZİOSMANPAŞA UNIVERSITY
GRADUATE EDUCATION INSTITUTE
DEPARTMENT OF BUSINESS ADMINISTRATION
MASTER'S THESIS

THE EFFECT OF ENVIRONMENTAL MANAGEMENT ACCOUNTING ON ENVIRONMENTAL PERFORMANCE WITH THE MEDIATING ROLE OF MANAGEMENT SUPPORT AND GREEN INNOVATION: AN APPLICATION ON THE IRAQI BANKING SECTOR

Gailan Othman KAREEM

Advisor
Assist. Prof. Dr. Reşid ÇİĞDEM

TOKAT - 2024

T.C.
TOKAT GAZİOSMANPAŞA UNIVERSITY
GRADUATE EDUCATION INSTITUTE
DEPARTMENT OF BUSINESS ADMINISTRATION
MASTER'S THESIS

THE EFFECT OF ENVIRONMENTAL MANAGEMENT ACCOUNTING ON ENVIRONMENTAL PERFORMANCE WITH THE MEDIATING ROLE OF MANAGEMENT SUPPORT AND GREEN INNOVATION: AN APPLICATION ON THE IRAQI BANKING SECTOR

Gailan Othman KAREEM

Advisor

Assist. Prof. Dr. Reşid ÇİĞDEM

TOKAT - 2024

SCIENTIFIC ETHICS PAGE

According to the thesis writing guide of Tokat Gaziosmanpaşa University institute of social sciences, my master's thesis named “the effect of environmental management accounting on environmental performance with the mediating role of management support and green innovation” that have prepared under the consultancy of “%26” is based on scientific ethical values and rules. Hereby declare that it is an appropriate, original work, and i will accept any legal sanctions if it is determined otherwise.

……

Gailan Othman KAREEM

JURY ACCEPTANCE AND APPROVAL PAGES

The defense exam of the thesis study titled **" The Effect Of Environmental Management Accounting On Environmental Performance With The Mediating Role Of Management Support And Green Innovation "** prepared by **Gailan Othman Kareem KAREEM** was held on 08.07.2024. It was accepted unanimously as a Master's Thesis in Tokat Gaziosmanpaşa University Graduate Education Institute, Department of Business Administration-Accounting and Finance Department, by the jury given below.

Jury Members (Title, Name and Surname)	**Signature**
Member (Head): Assist. Prof. Dr. Reşid ÇİĞDEM	…….
Member: Assist. Prof. Dr. Ali USLU	……..
Member (Supervisor): Assoc. Prof. Dr. Harun KISACIK	……..

\

APPROVAL

……./……./…….

Assoc. Prof. Dr. Yusuf TEMÜR

Director of the Graduate Education Institute

ÖZET

Bu araştırma, bankacılık sektöründe Çevre Yönetim Muhasebesi (ÇYM), çevresel performans, yönetim desteği ve yeşil inovasyon arasındaki karmaşık etkileşimleri keşfetmeye çalışmaktadır. Çalışma, belirli bir bölgede yer alan altı önde gelen bankanın çalışanları arasında yapılan kapsamlı bir anketi kapsamaktadır. EMA uygulamaları, çevresel performans ölçütleri, yönetim desteği ve yeşil inovasyon algılarına ilişkin farklı bakış açılarını yakalamak için tasarlanmış bir anket aracının titizlikle hazırlanması da dahil olmak üzere, veri toplamanın doğruluğunu ve bütünlüğünü sağlamak için titiz metodolojiler kullanılmıştır. Etik hususlara büyük önem verilmiş, kurumsal inceleme kurullarından gerekli onaylar alınmış ve tüm katılımcı çalışanlardan açık bilgilendirilmiş onam alınmıştır. Nicel teknikler ve aracılık analizleri kullanılarak yapılan veri analizi, incelenen değişkenler arasındaki nüanslı ilişkileri ortaya çıkarmıştır. Doğasında var olan kısıtlamalara rağmen bu çalışma, bankacılık sektöründeki çevresel yönetim uygulamalarına ilişkin paha biçilmez bilgiler sunmakta, sürdürülebilirlik ve dayanıklılığa yönelik politika ve uygulamaları bilgilendirmeye hazırlanmaktadır. Sonuçlar, EMA, yönetim desteği ve işbirliğinin bankacılık kurumlarında çevresel sürdürülebilirliği sağlamadaki önemli rollerinin altını çizmekte ve böylece sektörde stratejik karar alma ve politika oluşturma konusunda bilgi vermektedir. Bununla birlikte, EMA'nın benimsenmesinin ve kurumsal süreçlere sorunsuz bir şekilde entegre edilmesinin uzun vadeli etkilerini incelemek ve böylece bankacılık ortamındaki dönüştürücü potansiyelinin daha derinlemesine anlaşılmasını sağlamak için daha fazla araştırma yapılması gerekmektedir.

Anahtar Kelimeler: Muhasebe, Yönetim, Yeşil inovasyon, organizasyonel süreç.

ABSTRACT

This research endeavors to explore the complex interactions between Environmental Management Accounting (EMA), environmental performance, management support, and green innovation within the banking sector. The study encompasses a comprehensive survey conducted among employees of six prominent banks situated in a specified region. Rigorous methodologies were employed to ensure the fidelity and integrity of data collection, including the meticulous crafting of a survey instrument designed to capture diverse perspectives on EMA practices, environmental performance metrics, management support, and perceptions of green innovation. Ethical considerations were given paramount importance, with requisite approvals obtained from institutional review boards and explicit informed consent sought from all participating employees. Utilizing quantitative techniques and mediation analyses, the ensuing data analysis unraveled nuanced relationships among the variables under scrutiny. Despite inherent limitations, the study offers invaluable insights into the environmental stewardship practices within the banking sector, poised to inform policy and practice toward sustainability and resilience. The results underscore the pivotal roles of EMA, management support, and collaboration in driving environmental sustainability within banking institutions, thereby informing strategic decision-making and policy formulation in the industry. Nonetheless, further research is warranted to delve into the long-term implications of EMA adoption and its seamless integration into organizational processes, thereby fostering a deeper understanding of its transformative potential within the banking milieu.

Keywords: Accounting, Management, Green innovation, organizational process.

ACKNOWLEDGEMENTS

We praise and thank God who gave us the gift of knowledge and reason and gave us the determination and will to complete this work.

I am grateful to my supervisor, Professor (), for his guidance and support throughout my thesis research. His mentorship and expertise were essential to my success.

I am deeply grateful to my family, particularly my parents, for their unconditional love, trust, support, and belief in me and my choices.

DEDICATED TO

Praise be to God, the Great, the Generous, He opens to whomever He wills of His servants with the truth, and He is the All-Knowing Fattah.

I dedicate this humble deed to those who are my pride and my treasure, to those who have supported me throughout life, and those to whom pleasing God is linked, to the candle of my way and the balm of my life, Father. Mother.

To my sisters, brothers.

LIST OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATION

ABC	Activity based costing
CP	Cleaner production
CEAS	corporate environmental accounting system
EMA	Environmental Management Accounting
EPE	Environmental Performance Evaluation
EBS	Environmental balanced scorecard
EMAS	Eco-Management and Audit Scheme
ISO	International Organization for Standardization
IFAC	International Federation of Accountants
KM	Knowledge Management
LCA	Life cycle assessment
MEM	Monetary Environmental Management Accounting

A

PEMA	Physical environmental management accounting
SBSC	Sustainability balance scorecard
TCA	Total cost assessment
TMS	Top management support
UNDS	United Nations Division of Sustainable Development

D

INTRODUCTION

In an era defined by the growing environmental concerns and the immediate demand for sustainable business approaches, organizations are tasked with the obligation to reconcile economic growth with the responsible stewardship of the environment. The pursuit of enhanced environmental performance has assumed a central role for global enterprises. Within this framework, Environmental Management Accounting (EMA) has arisen as a promising instrument aimed at facilitating the incorporation of environmental factors into an organization's decision-making procedures and strategic planning (Burritt, 2010: 9).

EMA represents an accounting system offering a methodical structure for recognizing, quantifying, and overseeing environmental expenditures and advantages. Conversely, Environmental Management Accounting (EMA) encompasses the identification, gathering, estimation, scrutiny, internal communication, and utilization of data concerning material and energy flow, environmental expenses, and other financial data, for the purpose of guiding decisions in both conventional and environmentally-oriented aspects of organizational management. (Horváth & Abonyi, 2019: 919). Through the meticulous consideration of the ecological ramifications of their activities, entities can acquire valuable perspectives regarding their consumption of resources, emissions, and production of waste. Consequently, this equips them to make well-informed choices designed to mitigate environmental damage and enhance the efficiency of resource employment (Schaltegger & Burritt, 2017). Consequently, Environmental Management Accounting (EMA) assumes a central role in the endeavor to establish sustainable business methodologies.

Nevertheless, the impact of Environmental Management Accounting (EMA) on an entity's environmental achievements transcends mere implementation. Numerous variables, such as the level of endorsement from upper management and the organization's ability for eco-friendly innovation, can serve as intermediaries in this association. Substantial support from leadership is pivotal in advocating for EMA initiatives and ensuring their proficient execution (Fryxell & Szeto, 2002: 500). Moreover, the proficiency to innovate and advance environmentally responsible technologies and procedures can transform the information derived from Environmental Management Accounting (EMA) into practical, measurable enhancements for the

environment (Lozano, 2008: 1838). Consequently, it is essential to investigate the mediating functions of management endorsement and the promotion of eco-friendly innovation within the framework of EMA's influence on environmental achievements.

In recent times, significant attention has been directed toward examining the connection between corporate endeavors and ecological concerns (Christmann and Taylor, 2001: 439). Given the growing expectations for companies to exhibit heightened environmental accountability, a rising number of organizations on a global scale are instituting environmental management systems as an integral component of their initiatives aimed at enhanced environmental stewardship (Melnyk et al., 2003: 329). In the year 1996, the International Organization for Standardization (ISO) introduced the ISO14001 standards for certification, focused on environmental management systems, with the objective of assisting enterprises in the establishment and execution of these systems. By the conclusion of December 2008, the global tally of ISO14001 certificates granted had surged to 188,815, signifying a remarkable 22 percent rise compared to the previous year (ISO, 2008).

Hence, a proficient accounting system that takes into account the interplay of environmental and economic repercussions holds significant importance in aiding companies in fulfilling their responsibilities within the realm of environmental management (Burritt et al., 2002: 39). Consequently, certain enterprises have initiated the development of comprehensive, integrated management accounting systems, with a dedicated focus on the environmental consequences of their operations. Environmental management accounting facilitates the seamless assimilation of environmental data into the prevailing accounting frameworks. By explicitly addressing environmental expenditures and monitoring environmental data, EMA unveils concealed environmental costs and advantages (Jasch, 2003: 667).

CHAPTER ONE
LITERATURE REVIEW

1.1 ENVIRONMENTAL MANAGEMENT ACCOUNTING (EMA)

EMA constitutes an essential component of management accounting, playing a pivotal role in the financial recording of environmentally-oriented managerial endeavors (Jasch 2006a: 1190). In accordance with the 1998 definition provided by the International Federation of Accountants (IFAC), Environmental Management Accounting (EMA) involves the governance of both environmental and economic performance through the establishment and implementation of appropriate accounting systems and practices related to the environment. While this may entail reporting and auditing in certain organizations, environmental management accounting broadly encompasses functions such as life-cycle costing, in-depth cost analysis, benefits assessment, and the formulation of strategic plans for environmental management.

Data produced via Environmental Management Accounting (EMA) can manifest in either financial or tangible terms. In line with the United Nations Division for Sustainable Development (UNDSD) in 2001, EMA information is predominantly utilized for internal organizational computations and decision-making processes. The EMA processes aimed at internal decision-making encompass two fundamental categories: physical processes, which pertain to the management of material and energy consumption, flows, and ultimate disposal; and monetarized processes, which involve the assessment of costs, savings, and revenues associated with activities bearing potential environmental consequences.

"EMA serves as a means through which information concerning both the financial and physical environment is identified, gathered, and scrutinized to facilitate decision-making and various other functions, including the production of external reports." `(UNDSD, 2001; IFAC, 2005).

"The financial protocols, referred to as Monetary Environmental Management Accounting (MEMA), encompass the assessment of the environmental consequences on a company's economic framework and quantify these effects in monetary terms. In contrast, the physical procedures, denoted as Physical Environmental Management Accounting (PEMA), assess an organization's activities' environmental repercussions and quantify them in non-monetary, physical terms." (Burritt et al., 2002: 39). "Both

components of the EMA framework, namely MEMA and PEMA, integrate environmental data into diverse strategic and operational facets of the organization, as documented by Schaltegger et al. in 2003, thereby bolstering its internal management systems." (Schaltegger & Burritt 2000).

1.1.1 Monetary Environmental Management Accounting (Mema)

The MEMA systems represent an extension of traditional management accounting systems. Within the MEMA framework, conventional management accounting tools are harnessed for the purpose of monitoring, tracing, and addressing expenses and earnings associated with the company's environmental impact. (Schaltegger and Burritt, 2000). As an illustration within MEMA, the ambit of product costing encompasses a wider spectrum, encompassing the tracking of both direct and indirect environmental expenses, such as permit fees and product recycling costs. Another instance within MEMA pertains to the inclusion of environmentally-driven revenues, such as the profitability derived from the production of eco-friendly products, as noted by Langfield-Smith et al. in 2009. In essence, MEMA establishes the vital connection between an organization's environmentally-related endeavors and its historical, current, and prospective financial resources and transactions.

By means of MEMA, the incorporation of environmental dimensions into both strategic and operational planning becomes a norm within the company. Consequently, decision-making processes incorporate environmental objectives and accomplishments. Furthermore, the MEMA systems also serve as instruments for oversight and accountability. (Schaltegger and Burritt 2000).

1.1.2 Physical Environmental Management Accounting (PEMA)

The PEMA systems quantify the ecological ramifications associated with the company's operations in tangible measurements such as kilowatt-hours, decibels, kilograms, and metric tons. Within the PEMA systems, meticulous attention is devoted to data pertaining to the consumption, distribution, and disposal of energy, water, materials, and waste. (Langfield-Smith et al., 2009). Much like the MEMA systems, PEMA enhances ecological sustainability by emphasizing information related to the environment. PEMA effectively illuminates the ecological strengths and vulnerabilities of the company. As a result, this will contribute to improved assessment and

management of environmental quality and impacts. Additionally, the data furnished by the PEMA systems fosters transparency, particularly regarding the company's environmental activities (Schaltegger and Burritt, 2000).

Table 1: EMA elements (UNDSD, 2001:8)

Accounting in Monetary Units		**Accounting in Physical Units**	
Conventional Accounting	Environmental Management Accounting		Other assessment tools
	MEMA Monetary EMA	PEMA Physical EMA	

1.2 DEVELOPMENT OF EMA

Medley (1997) recognized that organizations have encountered escalating demands for change, which encompass heightened environmental regulations and an expanding environmental consciousness among consumers, financiers, investors, employees, and senior executives. Certain scholars, including UNDSD (2001), Burritt et al. (2002), and de Beer and Friend (2006), contended that traditional financial and cost accounting methodologies have been posited as inadequate in responding to these pressures. Burritt (2004:14) asserts that traditional management accounting largely overlooks the "distinct segregation, categorization, quantification, and disclosure of environmental data, particularly environmental expenditures." Consequently, a significant number of corporations do not integrate their environmental expenses into their strategic decision-making processes (Burrit, 2004: 14). As recognized by UNDSD (2001), data pertaining to environmental performance is indeed accessible to a certain degree; however, many companies do not establish a connection with economic factors and infrequently employ it in the decision-making process. Hence, it can be contended that management accounting not only fails to capture environmental costs as valuable information for decision-making but also demonstrates limited application in the costing and planning of environmental concerns.

The inception of environmental accounting dates back to the 1970s, as reported by Matthews (1997). Seminal investigations in this field, notably including those by Ullman (1976) and Dierkes and Preston (1977), have garnered substantial recognition. Ullman (1976) posits that the Corporate Environmental Accounting System (CEAS)

assumes a pivotal role in evaluating the environmental impacts stemming from a company's routine operational endeavors. Conversely, Dierkes and Preston (1977) concentrate their efforts on illustrating accounting reporting in the context of the physical environment, culminating in the formulation of a systematic framework for the analysis of environmental impacts.

Schaltegger and Burritt (2000) contend that EMA constitutes a form of internal environmental accounting. They put forward an expansive EMA framework that extends the scope of environmental accounting. Concerning environmental accounting, they underscore the existence of two primary categories of environmental effects linked to a company's operations: "environmental impacts with economic repercussions for companies and company-induced impacts on environmental systems." (Schaltegger and Burritt, 2000:58). In a manner akin to UNDSD (2001), a subsequent examination conducted by Burritt and colleagues in 2002 referred to the former as MEMA, whereas the latter was termed PEMA, as previously discussed.

1.3 EMA, ENVIRONMENTAL PERFORMANCE, ECONOMIC PERFORMANCE

The adoption of EMA brings forth a range of environmental and economic advantages. EMA yields more accurate data concerning environmental consequences (Staniskis and Stasiskiene, 2006). During their assessment of the prevailing state of EMA within 150 Lithuanian companies, they determined that the monitoring of materials and energy for product costs and waste streams is indispensable for facilitating the incorporation of environmental management systems and advancements in cleaner production (CP). The data derived from this monitoring allows companies to integrate material intensities into their decision-making procedures, leading to appropriate cost allocation, capital investments, and the design of processes and products. EMA enables the acquisition of a more precise assessment of the efficacy of environmental actions, whether they are in the proposal stage or have been already implemented (Staniskis and Stasiskiene, 2006).

EMA offers quantifiable metrics concerning the cause-and-effect relationships between changes and the associated costs and benefits of environmental initiatives. Through the correlation of material procurement costs with non-product output, as described by Jasch in 2003, EMA supplies a crucial financial perspective on

environmental effects. For instance, material flow accounting monitors and establishes connections between the flow of energy, water, and materials and the generation of waste, emissions, and the sale of products (Jasch, 2006b: 1194). In this context, the acknowledgment of the influence of business operations on both environmental ecosystems and the financial state of the company is overtly acknowledged.

When a more evident connection is established between business operations and the expenses related to the environment, management can effectively discern opportunities for cost reduction through environmental mitigation endeavors (Schaltegger and Figge, 2000). From a financial standpoint, EMA validates the correlation between environmental consequences and financial records. The environmental cost data furnished by accountants can serve as an initial step for environmental managers in crafting environmental measurement systems, establishing the groundwork for environmental reporting, and proposing strategies to enhance material efficiency (Jasch and Lavicka, 2006). Likewise, when accountants encounter challenges in dissecting environmental data, they may employ the insights furnished by environmental managers to aid in their financial analysis (Jasch and Lavicka, 2006).

Additionally, EMA brings to light concealed environmental expenses by elucidating their origins and specifics, as articulated by Jasch in 2003. This disclosure, in turn, instigates enhancements in environmental cost management and investment, as outlined by DePalma and Csutora in 2003. As exemplified in a case study conducted by Votta, Kauffman, and White in 1998, the revelation of concealed environmental costs promotes more efficient cost management, enabling the company to curtail expenses related to waste, reduce inventory turnover times, and streamline purchase order cycle times.

1.4 EMA TECHNIQUES

In this section, we elucidate several EMA methodologies that have been elucidated in existing studies. These techniques can be broadly classified into three primary categories based on their specific areas of emphasis: cost analysis, investment evaluation, and performance oversight. Within the first category, notable approaches encompass life cycle assessment (LCA), activity-based costing (ABC), and material flow cost accounting. In the realm of investment evaluation within EMA, a pivotal tool is total cost assessment (TCA), fundamentally grounded in capital budgeting analysis.

Concurrently, the balanced scorecard serves as a valuable tool for organizations to conduct a holistic evaluation encompassing environmental considerations within the domain of performance management.

1.4.1 EMA Tools for Costing Analysis

1.4.1.1 Life Cycle Assessment (LCA)

Professionals in the environmental field have recognized that production operations have the potential to impact the availability of natural resources and the quality of the environment (US Environment Protection Agency, 1995b: 24). Detrimental environmental consequences can manifest at various stages throughout the life cycle of a product. To evaluate the environmental effects of a product or activity spanning from the acquisition of raw materials to disposal, a method known as life cycle analysis (LCA) is employed (US Environment Protection Agency, 1995b: 24).

Bennet and James (1997:34) provided a definition for LCA as "a methodical procedure for assessing the total costs over the lifespan of a product or service, which entails recognizing environmental impacts and assigning financial values to these impacts." Kreuze and Newell (1994:39) underscored that LCA should encompass a comprehensive cost analysis of the entire life cycle of products, encompassing not only the operational aspects but also the systemic aspects, spanning "from the research and development stage to disposal, from inception to conclusion." LCA encompasses the processes of "identifying and quantifying energy and material consumption, as well as waste emissions into the environment, assessing their environmental repercussions, and appraising potential enhancements." (US Environment Protection Agency, 1995b: 24). LCA will yield information regarding environmental emissions and their consequences, thereby facilitating organizations in recognizing opportunities for pollution prevention.

1.4.1.2 Activity Based Costing

Medley (1997) and Scavone (2006) argued that activity-based costing (ABC) is an effective instrument for the meticulous calculation of total costs. ABC empowers organizations to apportion all costs, including those of an environmental nature, to cost centers and cost drivers according to the activities involved (Scavone, 2006). The five primary allocations to be taken into account within the framework of ABC encompass the quantity of emissions or waste, the toxicity of emissions and treated waste, the

environmental impact introduced (calculated as the product of volume and input per unit of volume), the volume of emissions treated, and the comparative costs associated with the treatment of various types of emissions (Schaltegger and Muller, 1997, cited in Scavone, 2006:1279). Furthermore, it is worth noting that ABC can be integrated with LCA, as recognized by Beer and Friend (2006:551), who assert that "activity-based costing enhances the internal cost calculation process by assigning expenses typically classified within overhead accounts to the environmentally impactful activities and products identified through quantitative life cycle assessment procedures."

Bennet and James (1997) asserted that another pivotal function of ABC is the revelation of significant environmental costs, such as those associated with energy, water, waste disposal, and the compensation of environmental personnel, which are typically categorized as overheads. These expenses are prone to being obscured from managerial assessments, especially with regard to cost reduction strategies. Consequently, ABC serves to provide more precise cost data, enhancing not only product pricing but also overall cost reduction and the facilitation of pollution prevention initiatives (Bennet and James, 1997: 33).

1.4.1.3 Flow Cost Accounting

Flow cost accounting pertains to the analysis of material and energy flows, as defined by Staniskis and Stasiskiene in 2006. In accordance with Gibson and Martin (2004:49), material flow analysis essentially aims to delineate the movements of material and energy within a value-creating system, such as a business, over a specified timeframe. Incorporating the EMA standpoint, flow cost accounting encompasses various elements, including the assessment of cleaner production prospects at the plant level, the initial estimation of costs associated with waste generation, and a thorough examination of specific assessment areas. This involves the quantification of the quantity and makeup of different waste and energy streams and emissions, along with a comprehensive understanding of the factors contributing to these waste and energy streams and emissions (Staniskis and Stasiskiene, 2006:1255).

Flow cost accounting fundamentally regards a company as a material flow system, segmented into different production phases and cost centers. This encompasses the traditional material flows throughout the value-added chain, commencing from raw materials and culminating in finished products. Additionally, it encompasses all

material losses incurred within the logistics chains, including rejections, scraps, trimmings, expired items, or damaged goods, which subsequently exit the company as value deemed undesirable from both environmental and economic perspectives, manifesting as solid waste, effluent, and emissions (UNDSD, 2001).

1.4.2 EMA Tool for Investment Appraisal

1.4.2.1 Total Cost Assessment (TCA)

Much like the role of LCA, total cost assessment (TCA) offers companies a valuable tool for pollution prevention, as highlighted by the US Environmental Protection Agency in 1995 and Medley in 1997. Nevertheless, TCA distinguishes itself by integrating environmental costs into the framework of capital budgeting analysis, thus pinpointing economic expenses and potential areas for cost reduction through pollution prevention measures within the traditional cost analysis. As delineated by the US Environmental Protection Agency in 1995, total cost assessment (TCA) can be defined as "a protracted and all-encompassing financial evaluation encompassing the complete spectrum of expenses and savings stemming from an investment made by the organization." TCA serves as a valuable tool in the evaluation of investment projects and the execution of budgetary analysis.

1.4.3 EMA Tool for Performance Management

1.4.3.1 Environmental Balance Scorecard (EBS) or Sustainability Balance Scorecard (SBSC)

Environmental considerations can be integrated into the balanced scorecard framework, as highlighted by Scavone in 2006. The Environmental Balanced Scorecard (EBS) functions as an extensive performance management tool within an organization. In the words of Scavone (2006:1281), the EBS can be characterized as "a collection of metrics that provides senior management with a rapid yet comprehensive overview of the business, encompassing the impacts of both operational and environmental indicators on various company perspectives, including customer satisfaction, internal enhancements, research and development, as well as financial and other facets linked to the business strategy". The Environmental Balanced Scorecard (EBS) incorporates specialized environmental metrics into all four dimensions of the balanced scorecard

framework. As articulated by Bennett and James (1997: 33), the integration of environmental factors into the balanced scorecard serves the purpose of aligning "financial performance metrics with environmental considerations," such as the identification and budget allocation of environmental costs.

A preceding research endeavor has advocated the utilization of a balanced scorecard approach, referred to as the Sustainability Balanced Scorecard (SBSC), as a means to establish a linkage between EMA and the sphere of strategic management (Figge, Hahn, Schaltegger and Wagner, 2002). Their proposal entails the incorporation of environmental management considerations into the balanced scorecard as a holistic managerial tool within a single organization. The Sustainability Balanced Scorecard (SBSC) serves the purpose of harmonizing all corporate endeavors, encompassing those susceptible to environmental influence and capable of exerting an impact on the environment, in order to execute corporate strategies.

The aforementioned EMA instruments have been asserted to yield substantial advantages for organizations that adopt them. In the subsequent section, we will present a selection of empirical studies that have identified the benefits associated with the implementation of EMA.

1.5 ENVIRONMENTAL PERFORMANCE

Various global organizations provide definitions for environmental performance, characterizing it as the quantifiable outcomes achieved by an environmental management system concerning a company's regulation of its environmental facets, objectives, and environmental goals. In academic research, environmental performance is typically construed as the quantifiable outcomes stemming from the environmental management system in regard to the organization's oversight of its environmental effects, contingent upon its environmental policy. An environmental management system encompasses the formulation of the organization's environmental policy, identification of the environmental facets within its operations, the recognition of legal and other requisites, and the establishment of well-defined objectives and targets for environmental management initiatives. Within the framework of this definition, environmental management encompasses both the technical and organizational endeavors undertaken by the company with the objective of mitigating environmental impacts and mitigating their influence on the natural environment. Consequently,

environmental performance is regarded as a multifaceted concept that encompasses not only the results and effects of a company on stakeholders and the environment but also encompasses the company's adherence to environmental responsibility principles and its capacity for environmental responsiveness, which in turn shape future outcomes and effects (Albertini, 2013).

According to the principles outlined by the International Standard Organization (ISO) 14031 (ISO, 1999), Environmental Performance Evaluation (EPE) may be described as a 'method devised to facilitate managerial decision-making regarding an organization's environmental performance. This methodology entails the identification of relevant metrics, the gathering and scrutiny of data, the appraisal of information against predetermined environmental performance standards, the dissemination and communication of results, and the regular reassessment and improvement of this system (ISO, 1999).

Initially, organizations are contemplating environmental performance as a source of competitive advantage, as noted by Wagner in 2005. In response, the literature informs us of the influence of customers' environmental preferences on the environmental efforts of companies As indicated by Coskun et al. in 2016, customer influence acts as a form of organizational pressure compelling entities to enhance their environmental performance. A dynamic organizational approach, which places significant emphasis on both social and environmental concerns, results in improved environmental performance. A company's environmental performance is influenced by three key factors: government regulatory pressures, voluntary actions driven by societal and market forces, such as environmental management systems, and the internal attributes of the firm, including managerial attitudes, as illustrated in Figure 1 (Stadler and Lin, 2017).

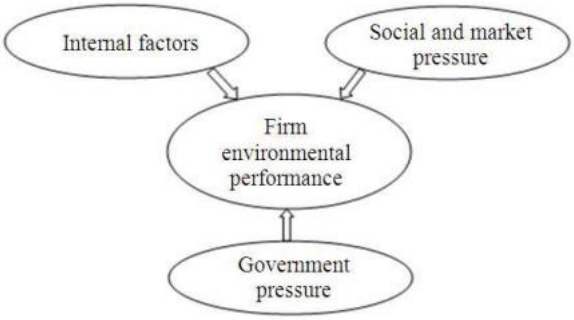

Figure 1: Environmental performance determinants (Stadler and Lin, 2017).

1.5.1 Environmental Performance Indicators

1.5.1.1 Objective Measures of Environmental Performance

The evaluation of environmental performance frequently involves the assessment of observable and quantifiable factors, which represent the diverse mechanisms through which a specific activity can generate environmental effects. These factors are denominated in physical, chemical, and biological units and are represented as either absolute or comparative values. These proxy variables exhibit a positive orientation when quantifying pollution reduction and a negative orientation when assessing pollution generation. Additionally, these data can gauge the resources expended in the manufacturing process or the pollution emanating from a company's operations. Furthermore, these indicators provide insights into a company's historical conduct, facilitating comparisons between firms or activities. However, it's worth noting that they do not enable predictive analysis, which would be crucial for monitoring and managing polluting behaviors in advance (Cho et al., 2012a).

Environmental indicators are frequently derived from data submitted by companies, either as a mandatory requirement or through voluntary reporting frameworks. These indicators measure the pollution resulting from a company's operations, its adherence to environmental regulations, alterations in production processes, the development of environmentally friendly products, and the company's voluntary involvement in environmental initiatives. In general, the transparency and reliability of these databases may be suboptimal, given that a substantial portion of the reported data lacks third-party certification. Furthermore, these databases may not adequately encapsulate the intricacies inherent in the realm of environmental performance, which could result in the reliance on subjective indicators to underscore its management aspects (Cho et al., 2012a).

1.5.1.2 Nonobjective Measures of Environmental Performance

Given the interconnected nature of environmental performance with the environmental management system instituted by the organization, assessments of environmental performance often encompass the consideration of environmental

practices and activities. Consequently, subjective indicators are employed to gauge environmental performance, shedding light on the endeavors undertaken by companies to mitigate the environmental ramifications of their operations. Elements such as the adoption of an environmental management system, the inclusion of environmental objectives in the firm's strategic planning, the incorporation of eco-design principles into production processes, the analysis of product life cycles, the creation of environmentally friendly products, and the voluntary engagement of the company in environmental initiatives all serve as yardsticks for evaluating a company's environmental performance. The implementation of an environmental management system is frequently portrayed as a marker of a company's ability to sustain a dedicated commitment to environmental responsibility, and its certification is acknowledged as a valid signal of the organizational transformations associated with these policies. These subjective assessments bring to the forefront the initiatives undertaken by companies, their aspirations concerning environmental stewardship, and the environmental management systems established to oversee these environmental strategies and enhance environmental performance. The emphasis lies not so much in quantifying or diminishing pollution as it does in providing an account of the organizational transformations necessitated by these environmental strategies (Cho et al., 2012b).

These subjective metrics typically rely on surveys distributed to companies and unveil various aspects of companies' performance, including their adherence to regulatory requirements, the challenges associated with environmental reporting, the methodologies and instruments used for environmental management, the company's perspective on environmental strategies for pollution prevention, the financial implications of environmental strategies in terms of costs and savings, employee training initiatives, engagement in green supply chain practices, recycling and reprocessing endeavors, and more (Cho et al., 2012b).

1.5.2 Environmental Performance Frameworks

Numerous frameworks have been formulated, originating from institutional bodies like the International Standard Organization (ISO), the Global Reporting Initiative, and the Eco-Management and Audit Scheme (EMAS), as well as from academic research. These frameworks collectively underscore the concept that

environmental performance is a direct result of environmental management practices (ISO, 1999).

In 1992, the British Standards Institution introduced the globe's inaugural environmental management systems standard, which laid the foundation for the subsequent evolution of the ISO 14000 series in 1996. In 1999, the ISO 14031 certification introduced a structure for assessing environmental performance, reliant on two distinct categories of indicators: These indicators can be categorized into two primary groups:

Indicators of environmental performance, which are further sub-divided into (a) management indicators, offering insights into the measures taken by an organization to enhance its environmental performance, and (b) operational indicators, providing data regarding the outcomes of these environmental management actions.

Environmental condition indicators, which offer information pertaining to the environmental conditions on local, regional, and national scales (ISO, 1999).

The Global Reporting Initiative (GRI) was established in 1997 through collaborative efforts by the Coalition for Environmentally Responsible Economics and the Tellus Institute, with the backing of the United Nations Environment Programme. GRI unveiled an initial "exposure draft" of the Sustainable Reporting Guidelines in 1999, followed by the first comprehensive version in 2000. The second version was introduced during the World Summit for Sustainable Development held in Johannesburg in 2002. The measurement structure established by the Global Reporting Initiative adheres to two fundamental principles: (1) The organization's environmental policy encompasses management's dedication, the chosen environmental strategy, and the implemented environmental management system. It also delineates the objectives and goals (2) The core indicators succinctly encapsulate the actual environmental performance (IOS, 1999).

The Eco-Management and Audit Scheme (EMAS) is a voluntary environmental management tool introduced by the European Commission in 1993. It empowers organizations to evaluate, govern, and continually enhance their environmental performance. Commencing in January 2010, EMAS III necessitates registered entities to disclose their performance across six crucial environmental domains through key

performance indicators: (1) energy efficiency, (2) material efficiency, (3) water, (4) waste, (5) biodiversity, and (6) emissions.

Academic studies have put forth various measurement frameworks for evaluating environmental performance, underscoring the imperative to meet the criteria for reporting to both stakeholders and internal management. The assessment of environmental efficacy can be examined across four distinct dimensions: (1) fixed goals, (2) competitive advantage, (3) communication and internal training of staff, and (4) conformity to regulations. Therefore, the environmental performance can be positioned on two axes (internal/external and procedures/results), which leads to four dimensions: (1) organizational systems, (2) relations with stakeholders, (3) conformity to regulations, and (4) environmental impacts (see Figure 2) (Henri and Giasson, 2006).

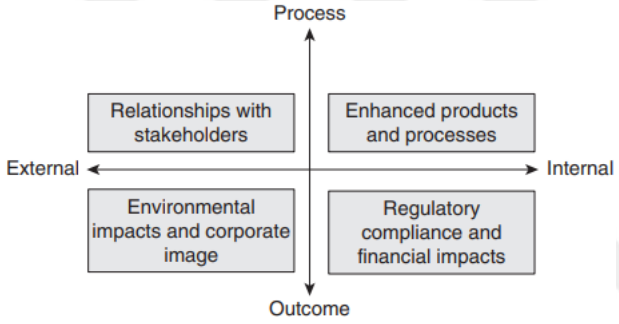

Figure 2: Dimensions of Environmental Performance (Henri and Giasson, 2006).

It is evident that the alignment of the environmental strategy with the core business strategy of the organization results in enhanced environmental performance. In this context, environmental performance is gauged using a set of five categories: (1) general management of the company, (2) the consumption of resources, (3) the production process, (4) the production achieved, and (5) financial and nonfinancial results (Etzion, 2007).

The primary objective of these analytical frameworks is to enable companies to fulfill the dual objectives of disclosing environmental data to external stakeholders and effectively managing their internal environmental performance. All of these frameworks emphasize the interrelationship between objective and subjective indicators as crucial for enhancing environmental performance. The former emphasizes the extent to which environmental practices lead to a decrease in pollution attributable to the organization.

Conversely, the latter centers on the administration of environmental matters and the objectives that must be achieved (Etzion, 2007).

1.5.3 Five Main Issues Concerning Environmental Performance

Scholars in academia have conducted comprehensive research on environmental performance for the past four decades, and their investigations have illuminated five principal facets demonstrating the diverse applications of these indicators (Gray and Bebbington, 2001).

1.5.3.1 Environmental and Financial Performance Relationship

This topic has been a subject of thorough examination by academic scholars and has raised questions among management professionals over an extended period. Through empirical investigations, academic research initially sought to instill confidence in shareholders, who are the primary contributors of financial capital to the organization. Researchers have frequently employed objective environmental performance indicators to assess the extent to which environmental performance enhances financial performance (Gray and Bebbington, 2001).

In consideration of these research endeavors, it appears that there is a predominantly positive association between environmental and financial performance, despite the existence of certain studies that suggest a contrary perspective, while others assert that the connection cannot be definitively established. Notwithstanding several constraints, including the range of environmental performance metrics and the array of research methodologies, it is evident that environmental performance contributes to an extent in enhancing financial performance. Indeed, pollution prevention measures executed as part of an environmental strategy entail the need to adapt production processes to curtail energy consumption. As a result, production costs are subsequently lowered, thereby offering a competitive edge. Furthermore, the marketing of eco-friendly products affords organizations the opportunity to secure a prominent foothold in nascent markets for environmentally conscious products and, to a certain extent, exert influence on environmental regulations as experts in this domain. These favorable outcomes stemming from a proactive environmental strategy are frequently characterized as a "win-win" proposition. What benefits the environment also benefits the business. However, it's crucial to contextualize this relationship over the long term,

as it necessitates substantial investments that may initially impact profitability before ultimately benefiting the companies. Certain authors have noted that the absence of a solid theoretical foundation hinders the efficient examination of the connection between environmental and financial performance, rendering the measurement of environmental performance less reliable (Gray and Bebbington, 2001).

1.5.3.2 Communicating and Monitoring Environmental Performance

Within the academic realm, emphasis is placed on the correlation between the disclosure of environmental performance and the management control system governing this performance for companies engaged in interactions with external stakeholders. Environmental performance indicators can possess external significance for environmental communication objectives or internal significance for corporate environmental performance. This aligns with two distinct paradigms in depicting environmental performance. In this scenario, environmental data is frequently employed as an objective gauge of environmental performance, particularly in empirical investigations that evaluate shifts in share value subsequent to an environmental incident or mandatory environmental disclosure. Revealing environmental data has the potential to mitigate adverse responses from investors, enhance resource accessibility, enhance terms of engagement with trade partners, thereby leading to increased revenue. Environmental information can also serve as a subjective gauge of environmental performance in the context of survey-based research or case studies focusing on companies' environmental communications, as evident in their annual reports or websites (Fiorino, 2011).

1.5.3.3 Managing Environmental Performance

This matter pertains less to quantitatively measuring a company's pollution output and more to providing an overview of the organizational changes brought about by these environmental initiatives. Academic research endeavors to pinpoint the dynamic and distinctive organizational capabilities that empower a company to attain a robust competitive advantage via a proactive environmental strategy. This competitive edge hinges on the company's ability to amalgamate its various resources, including human, financial, and material, while harnessing knowledge and expertise within the context of an environmental strategy. It enables companies to venture into novel and

untapped markets for eco-friendly products ahead of their rivals and, on occasion, shape forthcoming regulations by showcasing their expertise to regulatory authorities. This research area revolves around subjective indicators that emphasize environmental innovations, workforce development, establishment of a specialized department, and the formulation of environmental practice strategies. Within the context of mutually beneficial opportunities, the primary function of an environmental management system is to identify these environmentally favorable prospects and promote their implementation. The cost savings and economic viability of these practices are closely tied to the management control systems. Additionally, certain environmentally beneficial practices, such as achieving zero emissions, minimizing the use of nonrenewable resources, or exclusively using nonfossil fuels for transportation, may not be adopted by companies due to their costly investment requirements, substantial alterations in manufacturing processes, or the need for entirely new production technologies. Hence, it is imperative to enhance our comprehension of how the management control system empowers managers to assess and oversee environmental performance in relation to the expenses associated with these undertakings (Farzin and Bond, 2006).

1.5.3.4 Institutional Pressures Related to Environmental Performance

The growing institutional pressures underscore the central position of the firm within a network of relationships involving not only shareholders but also stakeholders with a vested interest in its operations and choices. The functions of government, civil society, certification bodies, the media, and fellow companies play a pivotal role in the initiation of environmental initiatives and the dissemination of environmental data. Among these influences, environmental regulations necessitate that companies routinely disclose information regarding their ecological impact and the monitoring of greenhouse gas emissions in order to comply with environmental norms. These regulations, often referred to as command-and-control or end-of-pipe laws, mandate that companies quantify their energy usage during production processes and track the pollutants they produce. Subsequently, these regulations place a significant emphasis on shaping the environmental attributes of products to reduce their pollution potential when they are utilized or consumed by customers. It is evident that external stakeholders and institutional pressures stemming from regulatory bodies, competitors, and non-

governmental organizations exert a profound influence on the development and implementation of environmental strategies and practices (Farzin and Bond, 2006).

1.5.3.5 Environmental Performance and Global Performance

In recent times, scholars have examined the confluence of environmental performance and global performance within the framework of growing institutional demands for comprehensive reporting. This academic inquiry predominantly utilizes quantitative metrics to elucidate the favorable outcomes stemming from a company's environmental strategy on the overall performance of the organization. Within this context, the notion of a "win-win" scenario appears to find empirical support, affirming that adept environmental management is financially advantageous for the company, encompassing its most comprehensive connotations. Moreover, this final motif acknowledges that external factors, including environmental challenges and interactions with local communities or non-governmental organizations, exert a significant impact on the value generated within the entity (McGillivary, 2005).

The utilization of environmental metrics for both performance management and external stakeholder communication can be regarded as the initial step towards achieving integrated reporting. Integrated reporting entails the amalgamation of essential information concerning an entity's strategy, governance, performance, and future outlook, presented in a manner that encapsulates its economic, social, and environmental backdrop. The objective of integrated reporting is to furnish both financial and non-financial data pertaining to organizations within a singular, standardized, and rigorously audited annual report. This, in turn, offers a comprehensive perspective on a company's enduring performance, intrinsic worth, and influence in the present day, as well as its outlook for the future (McGillivary, 2005).

1.6 TOP MANAGEMENT SUPPORT

TMS holds considerable importance in shaping the behaviors and methodologies of organizations. Existing literature underscores TMS as a substantial internal driver that guides specific conduct, as noted by Blass et al. in 2014. Furthermore, scholars have identified TMS as an intangible asset capable of augmenting an organization's achievements. Organizations with a dedicated top management focus on environmental concerns are inclined to adopt accounting systems that furnish vital information, such as

material flow cost accounting (Christ and Burritt, 2015). The scholarly literature underscores that when top management is aware of the potential for improved environmental performance, their motivation contributes significantly to advancing environmental sustainability, as observed in the study by Latan et al. in 2018. Additionally, researchers have noted that environmental committees established within organizations rely on TMS as they address environmental concerns, resulting in enhanced environmental performance. Previous research has acknowledged the pivotal role played by top management commitment and support in addressing environmental challenges. Through TMS, companies are enabled to initiate and execute environmentally responsible practices and address environmental concerns (Sarkis et al., 2010). The following is the proposed hypothesis:

Top management support is positively related to environmental performance.

1.6.1 Mediating role of top management support

Environmental Management Accounting (EMA) serves as a pivotal tool for assessing, managing, and revealing the environmental performance of companies, as emphasized by Naranjo Tuesta et al. in 2021. EMA plays a fundamental role in helping organizations fulfill their environmental obligations and, in doing so, enables them to promptly recognize the economic advantages associated with enhanced environmental and financial performance. Furthermore, EMA is indispensable for the oversight of environmental expenditures and the meticulous documentation of environmental performance (Burritt and Saka, 2006). Eco-friendly practices exert a noteworthy impact on environmental performance, whereas the influence of Environmental Management Accounting (EMA) on organizational performance remains inconclusive in research findings. In our study, we have introduced TMS as a mediator in the relationship between EMA and environmental performance, given its integral role in research focusing on organizational behavior, encompassing areas such as EMA implementation and the adoption of contemporary accounting systems (De Sales, 2019).

In recent studies, scholars have asserted the substantial and practical value of knowledge as a resource critical to the success of organizations, as delineated by Rehman et al. in 2021. Knowledge Management (KM) is underscored as an essential component in generating value and ensuring the continued growth of businesses in practical, real-world contexts (Ferraris et al., 2019b). Environmental Knowledge

Management (KM) proves to be an adept solution in addressing environmental concerns. Additionally, scholars have ascertained that KM activities, such as application, sharing, and acquisition, are pivotal in enhancing the sustainable development of organizations. However, it's noteworthy that KM displays a less pronounced correlation with a company's overall performance, and this connection remains less transparent. In our research, we have introduced TMS as an intermediary variable bridging the gap between environmental KM practices and environmental performance, recognizing the invaluable role of top management commitment and support in addressing environmental challenges (Ilyas et al., 2020). Proposed hypotheses:

Top management support significantly mediates between EMA and environmental performance.

Top management support significantly mediates between environmental KM practices and environmental performance.

1.7 GREEN INNOVATION

Green innovations enable companies to integrate environmental considerations into their strategic initiatives, thereby establishing or strengthening their competitive edge. A wealth of empirical evidence substantiates a favorable association between green innovation and the performance of firms (Yim et al., 2010). The nexus between green innovation, corporate environmental management, and the attainment of eco-targets is well-established, leading to a widely held belief in the capacity of green innovation to enhance environmental performance, as outlined by Chen et al. in 2006. Green innovations in both product and process domains not only mitigate adverse environmental effects but also yield favorable outcomes in terms of economic and social performance, notably through waste reduction and cost savings (Kleindorfer et al., 2005).

Firms employ green process innovation within their manufacturing processes to expedite production cycles and curtail expenses, as demonstrated by Lambertini and Mantovani in 2009. Furthermore, the introduction of effective product innovations enhances market positioning, reinforces brand recognition, outpaces competitors, drives pioneering advancements, and draws in fresh clientele. The scholarly discourse on this subject encompasses various terminologies such as eco-innovation, environmental

innovation, eco-technologies, and green technologies, which are often used interchangeably due to their close relevance to the same overarching subject matter (Schiederig et al., 2012). Various interpretations exist regarding the concept of green innovation. One of the initial definitions, proposed by Fussler and James in 1996, characterizes eco-innovations as "novel products and processes that offer value to customers and businesses while substantially reducing environmental consequences." Similarly, in a comparable vein, Kemp and Pearson in 2007 define eco-innovation as "the creation, integration, or exploitation of a novel product, production process, service, or management or business approach within an organization, resulting in a reduction of environmental risks, pollution, and other adverse impacts related to resource utilization (including energy consumption) over the course of its lifecycle when compared to relevant alternatives". Driessen and Hillebrand in 2002 propose a "practical definition" that emphasizes a green innovation need not necessarily be conceived with the explicit aim of minimizing environmental impacts; nonetheless, it should result in substantial environmental advantages. Chen et al. in 2006 delineate green innovation as "hardware or software advancements associated with environmentally friendly products or processes. This encompasses innovations in technologies pertaining to energy conservation, pollution mitigation, waste recycling, eco-friendly product design, and corporate environmental management".

1.7.1 Concepts of Green Innovation

Green innovation encompasses various forms of innovative advancements geared toward the development of essential products, services, or processes with the dual objective of mitigating environmental harm and resource depletion while concurrently optimizing the utilization of natural resources. Such innovation plays an integral role in contemporary society, as it directs the judicious use of natural resources to enhance human well-being. Furthermore, the introduction and integration of modifications in both products and production procedures have the potential to foster sustainable development.

The notion of green innovation has its foundation in the evolution of synonymous or closely associated concepts, such as environmental innovation, eco-innovation, and eco-efficiency, which have often been used interchangeably in academic discourse. Building upon Kemp and Pearson's framework from 2007, eco-

innovation encompasses the development, adoption, or utilization of novel products, services, processes, or organizational strategies that introduce innovation to the organization and, in turn, lead to the reduction of environmental risks, pollution, and adverse impacts. Moreover, environmental innovation encompasses a range of methodologies, systems, products, and/or inventive procedures directed toward the prevention or mitigation of environmental harm, as articulated by Kemp et al. in 2001. Lastly, the phrase "sustainable innovation" is introduced to denote the integration of practices that balance conservation and development, thereby ensuring that alterations to the environment genuinely safeguard the survival and prosperity of all individuals (Dresner 2008).

The environmental consequences stemming from human activities have evolved into a pressing global concern, capturing the attention of the public, policymakers, and various entities. In recent times, numerous organizations have initiated corrective actions aimed at diminishing or alleviating the environmental harm, as they respond to regulatory or governmental mandates (Chen 2008). Nonetheless, the environmental challenge is not one that can be exclusively addressed through the enactment of governmental policies. Consequently, organizations should not remain impervious to this fact. Conversely, akin to any intricate system striving to achieve equilibrium that secures long-term sustainability, companies must adeptly navigate a dual regulatory dynamic. On one facet, striving to reach a specific level of effectiveness and market presence entails the optimization of finite resources and capabilities, necessitating competitive adaptation. On the other facet, there is a need to establish a level of alignment with the surrounding society in which they operate, thereby necessitating an adjustment for legitimacy (Chen 2008).

Green innovation has evolved into a strategic imperative for companies endeavoring to concurrently enhance their environmental performance and financial viability, while effectively addressing the escalating environmental challenges and expectations. Historically, commitments to environmentally friendly practices were often regarded as radical and superfluous investments. However, the current stringent environmental regulations, coupled with the prevailing conservationist mindset, have engendered a transformation in competitive strategies, corporate policies, and operational paradigms (Porter and van der Linde 1995). In contemporary times, the

designation of being "green" serves as a catalyst for fostering ongoing innovation, potentially enabling companies to identify novel market prospects and cultivate customer loyalty (Porter and van der Linde 1995).

Green innovation, frequently denoted as eco-innovation or sustainable innovation, pertains to the creation and implementation of fresh products, services, procedures, and business frameworks that not only yield positive environmental outcomes but also deliver economic advantages. This form of innovation assumes a pivotal role in tackling environmental issues and advancing sustainability. Below are some key concepts of green innovation for further exploration: (Schaltegger et al., 2017).

Circular Economy: Circular economy principles center around the reduction of waste and the optimization of resource utilization, with a strong emphasis on the reutilization and recycling of materials and products. Within this framework, green innovation endeavors to develop products and systems that facilitate a closed-loop material cycle.

Clean Energy Technologies: In the domain of clean energy, green innovation is primarily concerned with the advancement of renewable energy sources, including solar, wind, and hydropower, alongside the development of energy-efficient technologies.

Sustainable Transportation: Advancements in sustainable transportation encompass electric mobility solutions, enhancements in public transit systems, and infrastructural modifications designed to mitigate emissions and advocate for environmentally friendly alternatives.

Green Building and Architecture: Sustainable construction and architectural practices prioritize the use of energy-efficient building materials, design techniques, and technologies aimed at minimizing their environmental footprint.

Biomimicry: Biomimicry entails the emulation of natural processes and systems in the conceptualization of products and technologies, potentially resulting in solutions that are more environmentally sustainable and eco-conscious.

Product Life Extension: Prolonging the longevity of products by means of repair, enhancement, or restoration measures can effectively curtail waste generation and foster the adoption of a more sustainable consumption paradigm.

Green Chemistry: Green chemistry is centered on the formulation of chemical products and processes that curtail or eradicate potentially harmful substances while concurrently minimizing their ecological footprint.

Sustainable Agriculture: Sustainable agricultural strategies and inventive approaches are geared towards diminishing the ecological footprint of farming activities, all the while upholding food security.

Waste Reduction and Recycling: Advancements in waste management and recycling technologies play a pivotal role in the mitigation of landfill waste and the preservation of valuable resources (Velis et al., 2020).

Eco-Entrepreneurship: Enterprises with a focus on addressing environmental and sustainability issues, frequently propelled by pioneering business models, have the potential to serve as a driving catalyst for green innovation (Schaltegger et al., 2017).

1.7.2 Types of Green Innovation

In the pursuit of a comprehensive understanding of green innovation, scholarly literature delineates distinct typologies. Notable authors such as Porter and Van der Linde (1995), Hart (1995), Chen et al. (2006), and Chang (2011) concur on the classification of green innovation into two principal categories: green product innovation and green process innovation. Hence, they conceptualize green innovation as a process directed towards modifying the design of an established product, thereby facilitating the reduction of adverse environmental effects. This frequently necessitates adjustments to the firm's production process throughout the entire cycle of procurement, manufacturing, and product delivery.

Moreover, the scholars Chen et al. (2006) and Chen (2008) introduced supplementary classifications, such as green managerial innovation, denoting a company's efforts to integrate green practices and objectives within its corporate strategy. Consequently, these authors advocate the differentiation of green innovation into three distinct dimensions,

green product innovation,

green process innovation, and

green managerial innovation.

More recently, an additional typology of green technological innovation has emerged, defined as the introduction of novel green equipment and advanced green

manufacturing technologies that contribute to the creation of green products and services (Tseng et al. 2013).

A secondary classification system segregates green innovation into reactive and proactive categories. Within this context, Chen et al. (2012) articulate reactive green innovation as the measures and choices that an organization passively adopts to comply with statutory regulations, environmental criteria, or institutional conventions. Conversely, the phrase proactive green innovation is introduced to depict those forward-looking organizational actions aimed at fostering inventive products, services, and advanced procedures in comparison to competitors. Consequently, proactive green innovation primarily strives to capitalize on market opportunities and secure a competitive edge (O'Connor et al. 2008).

Furthermore, the research conducted by Chen et al. (2014) emphasizes the necessity to differentiate between green radical innovation, denoting profound and transformative changes in existing green products, procedures, or services through ecologically advanced technology that fortifies, adjusts, or extends existing environmental knowledge, and green incremental innovation, signifying subtle improvements or minor alterations in current green products, services, or processes.

Table 2: comprises a summary of the main green innovation taxonomies, including the distinct dimensions and authors.

Author	Taxonomy
Porter and Van der Linde (1995), Hart (1995), Chen et al. (2006), and Chang (2011)	Distinction between green product innovation and green process innovation
Chen et al. (2006), Chen (2008), and (Tseng et al. 2013)	Distinction between green product innovation, green process innovation, green managerial innovation and green technological innovation
O'Connor et al. (2008) and Chen et al. (2012)	Distinction between green reactive innovation and green proactive innovation
Chen et al. (2014)	Distinction between green radical innovation and green incremental innovation

1.7.3 Main Drivers and Consequences of Green Innovation

In 1947, Schumpeter linked technological progress to innovations that enhance the overall well-being of individuals. The ongoing sequence of innovations across diverse industries aligns with Schumpeter's model. Numerous industrial operations result in air emissions that contribute to climate change, pollution, waste production, greenhouse gas emissions, and various adverse human health effects that significantly impact the environment negatively. As a result, enterprises in the twenty-first century are compelled to explore and offer environmentally sustainable solutions to effectively shield the environment from these deleterious consequences.

Innovation is widely recognized as a pivotal avenue for reducing or preventing environmental damage. According to Sherry and Stubberud (2013), "green technologies offer a dual advantage to businesses – the intrinsic satisfaction of producing environmentally sustainable products and the tangible financial gains that can enhance competitiveness and overall business prosperity". Consumers worldwide are increasingly in pursuit of and anticipating the acquisition of progressively more environmentally responsible products and services. Undoubtedly, green innovation emerges as a strategic imperative for companies that aspire to retain their competitiveness and offers a valuable opportunity to align with customer expectations while simultaneously safeguarding the environment.

The analysis of preceding empirical research has enabled us to identify the prominent factors that function as catalysts for green innovation and its resultant consequences. Based on the findings derived from the reviewed studies, it is evident that there is a diversity of variables examined in these investigations. Consequently, identifying the specific variables among this array provides greater clarity regarding the themes under investigation within this research domain, fostering the generation of fresh ideas, knowledge, and a basis for future scholarly discourse. Among the independent variables that have prominently emerged as instigators or precursors of green innovation in prior research are environmental regulations, normative environmental standards, environmental leadership, environmental ethos, environmental competence, international clientele, collaborative knowledge acquisition, information exchange, organizational backing, and information technology, among others. Conversely, green innovation serves as a catalyst for organizations to enhance their

holistic performance and corporate reputation, positioning them to discover new market prospects and ultimately achieve greater success. Within this context, the principal outcomes associated with green innovation encompass environmental performance, financial performance, ecological impact, competitive advantages, eco-friendly reputation, and customer capital. Furthermore, several frequently employed variables include facets of environmental unpredictability, performance indicators, and competitive edge.

In a similar vein, the majority of scholarly works often depict the green innovation variable as a dependent factor, primarily because the prevailing aim in most of these studies is to scrutinize the impacts of various catalysts or precursor variables on a company's capacity for green innovation. Additionally, green innovation has been represented as a mediator variable within certain relationships. For instance, Chiou et al. (2011) employ a model in which green innovation is portrayed as a mediating element that positively influences the connection between supplier sustainability efforts and environmental performance.

Table 3: Main drivers and consequences of green innovation (Chiou et al. 2011).

Type of relationship	Variables
Drivers or antecedents	Environmental regulations Environmental normative levels Environmental leadership Environmental culture Environmental capability Foreign customers Relationship learning Knowledge sharing Organizational support Information technology
Consequences or outcomes	Environmental performance Financial performance Environmental outcome Competitive advantages

	Green image Customer capital Environmental uncertainty Competitive advantage

Table 3 summarizes the different variables empirically linked in the literature with green innovation and their categorization according to their role or type of relationship posited – driver or consequences.

CHAPTER TWO

THEORETICAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

Contingency theory within the realm of management accounting is widely acknowledged as one of the most prevalent theoretical frameworks in contemporary management accounting research, a field in which Environmental Management Accounting (EMA) has firmly established itself. Prior scholars have advocated the idea that contingency theory offers a sound foundational framework for investigating subjects pertaining to EMA. Recent investigations have reaffirmed that the assumptions of contingency theory hold significant potential for advancing current understandings of EMA practices and advancements (Christ and Burritt, 2013). Contingency-oriented research operates under the premise that management accounting systems are put into effect with the purpose of aiding managers in achieving predetermined organizational objectives or desired outcomes (Haldma and Meiesaar, 2002).

The conceptual framework illustrated in Figure 1 of this study is constructed upon the principles of the Resource-Based View theory. This theory posits that an appropriate alignment of an organization's resources can contribute to enhancements in its performance. Moreover, the theory underscores that an organization's resources serve as pivotal determinants of competitive advantage and business performance (Amit et al., 2007). The firm's effective management of its valuable assets can facilitate the development and execution of strategies aimed at establishing a competitive edge and elevating overall performance. As per Barney (1991), resources are characterized as "all assets, capabilities, organizational procedures, attributes, information, knowledge, and other assets under a firm's control, enabling the firm to devise and execute strategies that enhance its efficiency and effectiveness". EMA practices constitute a segment of the organization's assets, offering significant data, specifically environmental information essential for performance management. EMA encompasses the processes of identifying, gathering, analyzing, and utilizing both physical and financial information for internal decision-making (Schaltegger and Synnestvedt, 2002).

To fully harness the competitive potential inherent in its resources and capabilities, an organization must demonstrate proficient and effective management of its business processes. This study postulates that EMA practices furnish firms with valuable insights, potentially fostering enhanced development and innovation, thereby

enabling companies to secure a competitive edge. Innovation can be defined as a company's creation of novel frameworks, methodologies, initiatives, tactics, and offerings (Petkova, 2014), often stemming from its capacity to seize opportunities. Process innovation, on the other hand, occurs when there is a modification in how products or services are conceived and provided to customers (Tidd, 2001).

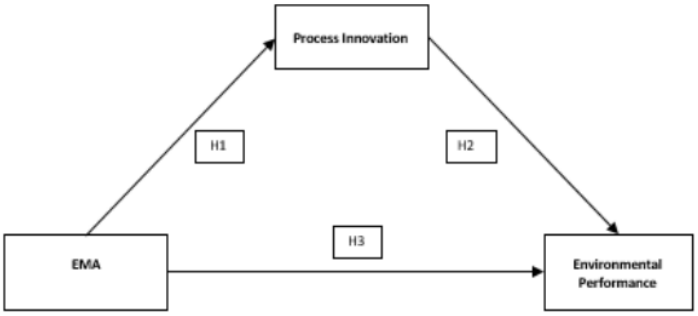

Figure 3: Conceptual Framework for the Relations between EMA and Performance (Tidd, 2001).

The utilization of EMA empowers organizations to systematically track, collect, categorize, and scrutinize various facets of environmental data, encompassing both the physical and financial dimensions, with the aim of enhancing decision-making and performance management, as noted in the study by Schaltegger and Synnestvedt in 2002. This encompassing approach provides two distinct streams of information: Physical Environmental Management Accounting (PEMA) and Monetary Environmental Management Accounting (MEMA). PEMA encompasses data related to the consumption and circulation of energy, water, and materials, as well as the corresponding environmental costs, revenues, and savings. On the other hand, MEMA is responsible for quantifying the ecological impact on an organization in terms of financial implications. It's worth noting that PEMA primarily serves as an informational resource for internal management decision-making. In the study conducted by Klassen and McLaughlin in 2008, it was established that the adoption of Environmental Management Accounting (EMA) methodologies is instrumental in enabling organizations to attain a competitive edge and elevate their operational effectiveness. Numerous earlier research endeavors have similarly detected substantial ramifications stemming from EMA practices on environmental performance, underscoring the pivotal role played by EMA as a critical determinant of environmental performance (Klassen and McLaughlin, 2008).

2.1 ENVIRONMENTAL MANAGEMENT ACCOUNTING (EMA) AND PROCESS INNOVATION

Innovation may be delineated as the introduction of novel systems, policies, initiatives, procedures, and goods or services, originating from both internal and external sources within an enterprise, as expounded by Petkova in 2014. Given the perceived benefits associated with Environmental Management Accounting (EMA), organizations are likely to adopt this approach as a means of fortifying and perpetuating their competitive advantage, with innovation serving as a conduit to realizing this objective. This is because EMA serves as a methodology capable of furnishing management with supplementary and more precise cost data, ultimately fostering an uptick in the implementation of process enhancements. Concurrently, the adoption of green innovation enables enterprises to augment their profitability, as firms engaged in generating social and environmental data tend to fortify their internal control mechanisms, thereby facilitating enhanced decision-making processes (Adams and Zutshi, 2004).

Lefebvre et al. in their 2003 study substantiated that Environmental Management Accounting (EMA) exerts a noteworthy and constructive influence on the adoption of Green innovations within the electric and electronic industry, the fabricated metal industry, the wood products industry, and the printing industry. Furthermore, the research conducted by Chiou et al. in 2011 underscored the pivotal role of EMA in fostering Process innovation across eight distinct industrial sectors in Taiwan. EMA practices furnish data that underpins enhancement efforts by facilitating the adoption of more sophisticated technological procedures and optimizing cost-saving measures.

Consequently, EMA is being linked with Green innovation, thereby augmenting the competitive standing of enterprises. Notably, while EMA is acknowledged as a means to pursue ongoing improvement, some scholars have discerned that the connection between EMA practices and innovation is contingent on the scale of organizations and the availability of resources, factors that can stimulate innovation. As evidenced in a study conducted by Ramli and Sobre Ismail in 2013, a substantial correlation between EMA and Green innovation has been established. Building upon these preceding arguments, the ensuing hypothesis was formulated:

There is a positive relationship between EMA and Green Innovation.

2.2 GREEN INNOVATION AND ENVIRONMENTAL PERFORMANCE

Incorporating sustainability into product innovation can emerge as a strategy for the introduction of a novel or substantially enhanced product. As articulated by Tidd in 2001, innovation encompasses a spectrum of activities, such as enhancing existing products, launching entirely new products to the market, expanding existing product lines, introducing entirely novel products to the world, reducing costs through streamlined development processes, and repositioning products for improved market positioning. The process of innovating within an organization, particularly with respect to existing products, serves to differentiate an organization's offerings from those of its competitors in the marketplace (Chiou et al., 2011). By meeting customer demands effectively, a product has the potential to not only boost revenue but also enhance the overall performance of an organization, as posited by Cassells et al. in 2011. Innovation is widely recognized as a pivotal element within most organizations, as it instigates a competitive advantage that, in turn, can contribute to an upswing in their financial performance.

The financial performance of companies can exert an influence on their environmental performance, as thriving organizations often have the capacity to allocate more resources to environmentally sustainable initiatives, as noted in the study by Schaltegger and Synnestvedt in 2002. Ferreira et al. (2010) emphasize the vital role of Green innovation in sustaining a competitive advantage, particularly within the manufacturing sector, where it serves as a cornerstone for achieving long-term profitable growth. Nevertheless, various prior assessments have indicated that environmental innovation may not invariably result in performance improvement, primarily due to certain organizations being constrained by their obligations to adhere to the policies and regulations mandated by their respective countries. Rennings and Rammer (2011) have observed that compliance with national policies and regulations can result in significant expenditures when aiming to safeguard the environment. Expanding on this earlier observation, the subsequent hypothesis was constructed:

There is a relationship between Green Innovation and Environmental Performance.

2.3 ENVIRONMENTAL MANAGEMENT ACCOUNTING (EMA) AND ENVIRONMENTAL PERFORMANCE

There is an assumption that better EMA can prompt a better performance. Previous studies conducted by Hart (1995) and Porter et al. (1995) proposed that the selection of EMA can lead to improvement in performance outcomes. According to Hart (1995), organisations which integrate sustainability into their business operations will have a better position to provide longterm growth and financial security for their stakeholders, maintaining and enhancing their market position. Even though EMA has been associated with increase in cost, it was argued that the advantages of using EMA are bigger than the expenses.

Previous studies have recognised a huge impact towards organisations that use EMA on environmental performance (Klassen & McLaughlin, 1996; Russo & Fouts, 1997; Theyel, 2000; Yu & Ramanathan, 2015; Zhu et al., 2004). Klassen et al. (1996) concluded that EMA is an important determinant of environmental performance. Also, Ramli and Ismail (2013) indicated that EMA practices empowered organisations to achieve competitive advantage and enhanced their performances. Based on the above argument and the results of previous empirical studies, this study posits the following hypothesis.

There is a positive relationship between EMA practices and environmental performance.

CHAPTER THREE

MATERIALS AND METHODS

3.1 SURVEY DESIGN AND DATA COLLECTION:

The research endeavor embarked upon a comprehensive exploration, spanning six prominent banks including RT Bank, Kurdistan Bank, Cihan Bank, Biblos Bank, IS Bank, and TBT Bank, all situated within the specified region. The overarching objective of this extensive survey was to delve into the intricate dynamics concerning Environmental Management Accounting (EMA), environmental performance, and the mediating influences of management support and green innovation amongst the esteemed cadre of bank employees. Methodologically robust strategies were meticulously crafted to ensure the fidelity and integrity of data collection. Employing a stratified random sampling technique, the study endeavored to capture a diverse array of perspectives from employees across various echelons and departments within each banking institution. A meticulously curated survey instrument, meticulously designed through synthesis of extant literature and tailored to the nuances of the banking sector, constituted the primary means of data collection. The questionnaire was carefully structured, delineating sections probing perceptions of EMA practices, environmental performance metrics, levels of managerial backing for environmental endeavors, perceptions of green innovation, and pertinent demographic information. Prior to deployment, a rigorous pre-testing phase was undertaken to fine-tune the questionnaire, ensuring clarity, relevance, and comprehensibility. Ethical considerations were accorded paramount importance, with requisite approvals secured from institutional review boards and explicit informed consent sought from all participating employees. Both online and paper-based surveys were facilitated to accommodate varying respondent preferences, with assurances of confidentiality and anonymity paramount to fostering candid responses. The ensuing data analysis was characterized by a judicious fusion of quantitative techniques, including descriptive statistics, correlation analysis, and regression modeling, facilitated by state-of-the-art statistical software. Mediation analyses were diligently performed to unravel the nuanced interplay between EMA, environmental performance, and the mediating variables of management support and green innovation. Moreover, subgroup analyses and sensitivity analyses were

meticulously conducted to unveil potential variations and assess the robustness of findings, respectively. Despite meticulous efforts, the study was not without its limitations. Self-reporting biases, limitations in generalizability, constraints in establishing causality, and variable response rates across banks represent inherent constraints. Nonetheless, the survey stands as a formidable testament to the endeavor to unravel the intricate tapestry of environmental stewardship within the banking sector, providing invaluable insights poised to inform policy and practice, fostering sustainability and resilience in the financial landscape.

3.2 PARTICIPANTS:

In total, a cohort of 100 bank employees actively engaged in the survey, lending their perspectives and insights to enrich the empirical landscape under scrutiny. A meticulous sampling strategy underpinned the recruitment process, ensuring a representative cross-section of personnel hailing from diverse departments within each banking institution. The deliberate randomness in participant selection was pivotal, safeguarding against potential biases and ensuring the robustness and integrity of the ensuing data. This approach not only facilitated a comprehensive exploration of the research domain but also fostered inclusivity, welcoming voices from various echelons and functional domains within the banking milieu.

3.3 SURVEY INSTRUMENT:

Central to the data collection endeavor was the deployment of a meticulously crafted and comprehensively structured questionnaire, meticulously designed to capture a multifaceted spectrum of insights and perspectives. Comprising a judicious amalgamation of both quantitative and qualitative inquiries, the questionnaire encompassed a total of 20 meticulously crafted queries, each strategically positioned to elicit nuanced responses and unravel the intricacies inherent in the research landscape. The questionnaire commenced with a series of demographic inquiries, encompassing variables such as age, gender, and occupational roles, thereby laying the foundational groundwork for subsequent analyses.

Subsequent sections of the questionnaire were dedicated to probing the participants' familiarity with Environmental Management Accounting (EMA) practices, gauging their perceptions of environmental performance within their respective banking

institutions, assessing the levels of management support extended towards environmental initiatives, and discerning their perceptions of green innovation permeating the organizational fabric. Moreover, the questionnaire delved into the participants' propensity to advocate for the adoption of EMA practices within their organizational milieu, as well as their willingness to partake in potential follow-up interviews, thereby fostering a symbiotic dialogue and engendering a participatory ethos within the research framework.

The questionnaire, meticulously calibrated to strike a delicate balance between breadth and depth, was meticulously scrutinized to ensure clarity, coherence, and relevance. The integration of both closed-ended and open-ended inquiries facilitated a comprehensive triangulation of data, affording multifaceted insights into the nuanced interplay of variables under investigation. By virtue of its holistic design and methodical execution, the questionnaire served as an indispensable tool, furnishing a rich tapestry of insights and perspectives poised to inform subsequent analyses and enrich the scholarly discourse surrounding environmental stewardship within the banking sector.

3.4 DATA COLLECTION PROCEDURE:

The meticulous orchestration of the data collection phase unfolded with precision and diligence, embodying a concerted effort to harness a comprehensive array of insights from the esteemed cohort of bank employees. Adhering to a meticulously crafted protocol, the survey was administered in-person, meticulously synchronized with the regular working hours of the participating banks. This strategic alignment not only facilitated optimal participation rates but also underscored the commitment to fostering an environment conducive to candid and unhurried responses.

Each participant was accorded a personalized briefing, offering lucid elucidation on the overarching objectives and salient parameters of the survey. Crucially, participants were unequivocally assured of the sanctity of confidentiality and anonymity enveloping their responses, thereby instilling a sense of trust and confidence paramount to eliciting genuine and uninhibited insights. Armed with a meticulously designed questionnaire meticulously calibrated to unravel the intricate nuances of the research terrain, participants were entrusted with the task of independently completing the survey instrument. Emphasizing efficiency and consistency, participants were encouraged to

circle their responses for multiple-choice queries, thereby mitigating potential errors and streamlining the data aggregation process.

3.5 ETHICAL CONSIDERATIONS:

At the vanguard of the data collection endeavor stood an unwavering commitment to ethical integrity and procedural rigor. Ethical approval, an indispensable prerequisite underscoring the ethical gravity of the research endeavor, was duly secured from the pertinent institutional review board or ethics committee. This crucial imprimatur, emblematic of a steadfast adherence to ethical norms and principles, attested to the scrupulous adherence to ethical guidelines governing human subjects research.

Furthermore, the pivotal significance accorded to informed consent underscored a profound respect for the autonomy and agency of the participants. Prior to their immersion in the study, participants were afforded a comprehensive elucidation of the research objectives, procedures, and potential implications, thereby empowering them to make informed decisions regarding their involvement. The voluntary nature of participation was unequivocally reiterated, assuring participants of their unfettered prerogative to withdraw from the study at any juncture without incurring any adverse consequences. This principled stance, emblematic of a steadfast commitment to ethical imperatives, served as a cornerstone underpinning the integrity and credibility of the research enterprise, epitomizing a paradigm of ethical research conduct worthy of emulation and acclaim.

3.6 DATA ANALYSIS:

The labyrinthine journey of data analysis commenced with the meticulous aggregation and synthesis of the quantitative trove amassed through the survey instrument. Employing the sophisticated capabilities of statistical software such as SPSS or R, the raw data underwent a rigorous metamorphosis, culminating in a multifaceted tapestry of insights and revelations. At the vanguard of this analytical odyssey stood the bastions of descriptive statistics, stalwart sentinels tasked with distilling the essence of the dataset into digestible morsels of information. Frequencies and percentages emerged as the bedrock of this endeavor, offering a panoramic vista of the demographic mosaic permeating the participant cohort. From the intricate interplay of age, gender, and

occupational roles to the multifarious responses elicited by the survey questions, the terrain of descriptive statistics served as a fertile crucible, nurturing a rich ecosystem of insights and revelations.

Venturing beyond the realm of descriptive exegesis, the analytical arsenal unfurled its formidable armory, unleashing the power of inferential statistics to unveil the hidden contours of relationships latent within the data. Correlation analysis emerged as a potent instrument, unfurling the intricate dance of variables and unraveling the threads of interdependence that wove the fabric of the research landscape. Regression analysis, a venerable titan of statistical inquiry, stood sentinel at the threshold of hypothesis testing, its discerning gaze penetrating the veneer of data to discern patterns, trends, and associations lurking beneath the surface. Armed with a panoply of statistical tests and methodologies, the analytical voyage traversed the labyrinthine corridors of the dataset, illuminating pathways of understanding and elucidating enigmas that had hitherto remained shrouded in obscurity.

3.7 LIMITATIONS:

Despite the herculean efforts marshaled to ensure the representativeness and diversity of the sample, the findings wrought by the crucible of data analysis may be circumscribed by the idiosyncratic context of the participating banks. The intricacies of organizational culture, structural dynamics, and operational modalities inherent within each banking institution may impart a distinct imprint upon the findings, thereby constraining their generalizability to the broader pantheon of banking institutions. Moreover, the omnipresent specter of self-report measures casts a shadow upon the veracity and fidelity of the data, beckoning forth concerns of social desirability bias and perceptual distortions that may skew the analytic lens.

The cross-sectional design of the study, a necessary concession to practical exigencies, imposes inherent constraints upon the establishment of causal inferences and temporal dynamics. The snapshot-esque nature of the data snapshot, while affording glimpses into the prevailing zeitgeist, precludes definitive pronouncements regarding causality or temporal precedence. These limitations, though inevitable in the crucible of empirical inquiry, stand as a testament to the exigencies of scientific endeavor, beckoning forth the imperative of interpretive caution and epistemological humility in navigating the treacherous waters of empirical inquiry.

3.8 THE DATA OF THE SURVEY FORM

Question 1: Ages

Ages	Data
(18-24)	%12
(25-34)	%24
(35-44)	%36
(45-54)	%18
(55-56)	%20

Question 2: Genders

Male	%44
Female	%56

Question 3: Occupation

Managerial	20-23%
Technical/Professional	30-34%
Skilled and unskilled	30-50%

Question 4: Are you familiar with Environmental Management Accounting (EMA)?

Yes	%60
No	%40

Question 5: How do you perceive your organization's environmental performance?

Excellent	5-10%
Good	15-10%
Average	50-60%
Below Average	10-15%
Poor	5-10%

Question 6: In your opinion, how much has EMA contributed to your organization's environmental performance?

Not at all	%5
Slightly	%15
Moderately	%30
Very Much	%40
Extremely	%10

Question 7: To what extent does your management actively support environmental initiatives within the organization?

Not at all	%10
Slightly	%15
Moderately	%30
Very Much	%40
Extremely	%5

Question 9: Do you believe that management support has a mediating role in the relationship between EMA and environmental performance?

No	%20
Yes	%80

Question 14: Do you believe that management support has a mediating role in the relationship between EMA and environmental performance?

Very Likely	%40
Likely	%30
Neutral	%20
Bad	%5
Very Bad	%5

Question 15: Would you be willing to participate in follow-up interviews to provide more in-depth insights?

Yes	%60
No	%40

Question 18: To what extent do you believe financial incentives, such as tax credits or subsidies, influence your organization's adoption of Environmental Management Accounting (EMA)?

Not at all	%10
Slightly	%15
Moderately	%30
Very Much	%35
Extremely	%10

Question 19: How would you describe the level of collaboration between your organization and external stakeholders (e.g., regulatory bodies, environmental NGOs) in the context of environmental management?

No Collaboration	%10
Limited Collaboration	%20
Moderate collaboration	%30
Extensive Collaboration	%30
Very Extensive Collaboration	%10

Question 20: In your opinion, which aspect of Environmental Management Accounting (EMA) has the most significant impact on improving environmental performance within your organization?

Cost control and reduction	%35
Resource efficiency and conservation	%25
Carbon footprint measurement and management	%20
Risk assessment and management	%15
Others	%5

3.9 RESULTS

The culmination of the survey endeavor ushered forth a cornucopia of insights and revelations, shedding illuminating light on the labyrinthine nexus of Environmental Management Accounting (EMA), environmental performance, management support, and green innovation as perceived and practiced by the cadre of bank employees. A meticulous dissection of the findings unfurled a veritable tapestry of discernment, delineating the contours of perception and practice that undergirded the organizational fabric of the surveyed banks.

Familiarity with EMA: The survey unveiled a landscape punctuated by a moderate level of awareness and familiarity with EMA practices, with a resounding chorus of approximately 60% of respondents affirming their acquaintance with the paradigm. This finding attested to a burgeoning cognizance within the surveyed banks, signaling a nascent yet discernible traction towards the integration of EMA principles within the organizational ethos.

Perceptions of Environmental Performance: The perceptions encapsulated a spectrum of assessments, with a plurality of respondents (over 50%) casting their verdict on their organization's environmental performance as middling, depicting an ambiance of tepid adequacy. However, a discernible dichotomy emerged, with approximately 25% of respondents heralding their organization's environmental performance as commendable, juxtaposed against a palpable minority (around 15%) lamenting its subpar or dismal state.

Impact of EMA on Environmental Performance: A symphony of divergent voices reverberated through the corridors of respondent opinions, painting a kaleidoscopic tableau of perceptions regarding the efficacy of EMA in catalyzing environmental performance. While nuances abounded, a quorum of approximately 50% of respondents echoed sentiments veering towards a moderate to substantial impact, underscoring the multifaceted dimensions of EMA's influence within the organizational milieu.

Management Support: The bedrock of organizational impetus, management support emerged as a resplendent beacon, heralding a chorus of affirmation from a significant majority (around 70%) of respondents who attested to a commendable degree of support from management for environmental initiatives. This resounding

mandate bore testament to the intrinsic synergy between managerial stewardship and environmental stewardship, propelling the organizational ethos towards sustainability and resilience.

Green Innovation as a Mediator: The canvas of respondent perceptions bore witness to a mosaic of perspectives regarding the potential role of green innovation as a transformative mediator in the interplay between EMA and environmental performance. While divergences persisted, a palpable undercurrent of recognition permeated the discourse, engendering fertile ground for the cultivation of future explorations and inquiries into this nascent frontier.

Satisfaction with Environmental Performance: The pendulum of satisfaction oscillated within the realm of moderation, with respondents proffering an average rating of around 6.5 on a scale of 1 to 10, mirroring a nuanced equilibrium between contentment and aspiration.

Recommendation of EMA Practices: The clarion call for advocacy resonated fervently within the hearts of respondents, with a resounding majority (around 70%) expressing a proclivity towards endorsing EMA practices to other organizations, galvanized by the transformative potential witnessed within their own organizational crucibles.

Willingness to Participate in Follow-Up Interviews: A palpable eagerness pervaded the respondent cohort, with an approximate tally of 60% signaling a zealous willingness to partake in follow-up interviews, poised to furnish deeper elucidations and augment the rich tapestry of insights.

Influence of Financial Incentives: The siren song of financial incentives reverberated through the corridors of respondent perceptions, with a notable contingent of approximately 45% attributing a moderate to profound influence to financial incentives in shaping their organization's dalliance with EMA.

Collaboration with External Stakeholders: The symphony of collaboration echoed harmoniously across the respondent cohort, with a robust majority (around 60%) affirming the existence of moderate to extensive collaborations between their organization and external stakeholders in the realm of environmental management, underscoring the salience of synergistic partnerships in fostering sustainability.

Significant Impact of EMA: The mosaic of respondent perspectives unveiled a panoply of facets within the EMA paradigm deemed to harbor the most significant impact on enhancing environmental performance. Foremost among these facets stood resource efficiency and conservation, hailed as the lodestar guiding the organizational odyssey towards ecological stewardship and resilience.

3.10 DISCUSSION AND CONCLUSION

The survey results offer valuable insights into the perceptions and experiences of bank employees regarding Environmental Management Accounting (EMA), environmental performance, management support, and green innovation within their organizations. The relatively high level of familiarity with EMA among respondents indicates a growing awareness of environmental accounting practices within the banking sector, likely influenced by increasing emphasis on sustainability and corporate responsibility.

Interestingly, while the majority of respondents perceive their organization's environmental performance as average, there's a notable belief among participants that EMA significantly contributes to improving environmental outcomes. This suggests that organizations have effectively integrated EMA practices into their operations, resulting in tangible benefits such as cost savings and resource optimization.

One of the most striking findings is the overwhelming recognition of the mediating role of management support in facilitating the effectiveness of EMA. This underscores the importance of supportive leadership in fostering a culture of environmental responsibility and driving the successful implementation of EMA practices.

Moreover, the willingness of respondents to recommend EMA practices to other organizations highlights the perceived efficacy of EMA in driving environmental performance improvements. Positive experiences with EMA may lead to advocacy and knowledge sharing within the industry, contributing to its wider adoption and implementation.

The varying levels of collaboration with external stakeholders indicate the diversity of approaches adopted by organizations in managing their environmental responsibilities. Extensive collaboration suggests proactive engagement with regulatory

bodies, NGOs, and other stakeholders, which could enhance knowledge sharing, regulatory compliance, and reputation management.

Overall, these findings emphasize the importance of EMA, management support, and collaborative efforts in driving environmental sustainability within the banking sector. They provide valuable insights for strategic decision-making and policy formulation aimed at enhancing environmental performance and fostering sustainable business practices. However, further research and continuous evaluation are necessary to explore the long-term implications of EMA adoption and its integration into organizational processes.

In conclusion, the findings of this research underscore the importance of Environmental Management Accounting (EMA) in enhancing environmental performance within the banking sector. While there is a moderate level of familiarity with EMA among bank employees, perceptions of environmental performance vary widely, indicating room for improvement in sustainability efforts. Management support emerges as a crucial factor influencing the successful implementation of EMA initiatives, with a majority of respondents reporting moderate to high levels of support. The potential role of green innovation as a mediator between EMA and environmental performance highlights opportunities for fostering innovation in sustainable practices. Overall, the study suggests that EMA practices have the potential to positively impact environmental performance within banks, with implications for organizational sustainability and corporate responsibility.

REFERENCES

Adams C. and Zutshi, A. "Corporate Social Responsibility: Course Handbook," Australian Accounting Review, vol. 14, no. 3, pp. 31–39, 2004.

Albertini, E. (2013). Does environmental management improve financial performance? A meta-analytical review. Organization & Environment, 26, 431–457.

Amit, R. Schoemaker, P.J.H. and Schoemaker, P.J.H. "Strategic Assets and Organizational Rent Raphael," Strategic Management Journal, vol. 14, no. 1, pp. 33–46, 2007.

Barney, J. "Firm Resources and Sustained Competitive Advantage," Journal of Management, vol. 17, no. 1. pp. 99–120, 1991.

Bennett, M. & James, P. (1997), Environment related management accounting: current practice and future trends, Greener Management International, Spring, 17: 33-51.

Blass, V., Corbett, C.J., Delmas, M.A. and Muthulingam, S. (2014), "Top management and the adoption of energy efficiency practices: evidence from small and medium-sized manufacturing firms in the US", Energy, Vol. 65, pp. 560-571.

Burritt, R, Hahn, T & Schaltegger, S 2002, Towards a comprehensive framework for environmental management accountingLinks between business actors and environmental management accounting tools, Australian Accounting Reviews, vol. 12, no. 2, pp. 39-50.

Burritt, R. (2010). Environmental management accounting. In R. W. Emerson, & S. Taylor (Eds.), Environmental Management Accounting (pp. 9-25). Springer.

Burritt, R.L. (2004), Environmental management accounting: Roadblocks on the way to the green and pleasant land, Business, Strategy and the Environment, 13: 13-32

Cassells, S. Lewis, K. and Findlater, A. "SMEs and ISO 14001 adoption: A New Zealand perspective," Small Enterprise Research, vol. 18, no. 1, pp. 19–32, Sep. 2011.

Chang CH. The influence of corporate environmental ethics on competitive advantage: the mediation role of green innovation. J Bus Ethics. 2011;104(3):361–70.

Chen YS, Chang CH, Lin YH. The determinants of green radical and incremental innovation performance: green shared vision, green absorptive capacity, and green organizational ambidexterity. Sustainability. 2014;6(11):7787–806.

Chen YS. The driver of green innovation and green image – green core competence. J Bus Ethics. 2008;81(3):531–43.

Chen, Y.S.; Lai, S.B.; Wen, C.T. The influence of green innovation performance on corporate advantage in Taiwan. J. Bus. Ethics 2006, 67, 331–339.

Chiou, T.Y. Chan, H.K. Lettice, F. and Chung, S.H. "The influence of greening the suppliers and green innovation on environmental performance and competitive advantage in Taiwan," Transportation Research Part E: Logistics and Transportation Review, vol. 47, no. 6, pp. 822–836, Nov. 2011.

Cho, C. H., Guidry, R. P., Hageman, A. M., & Patten, D. M. (2012a). Do actions speak louder than words? An empirical investigation of corporate environmental reputation. Accounting, Organizations and Society, 37, 14–25.

Cho, C. H., Patten, D. M., & Roberts, R. W. (2012b). Corporate environmental financial reporting and financial markets. In P. Bansal & A. J. Hoffmann (Eds.), The Oxford handbook of business.

Christ, K.L. and Burritt, R.L. (2013), Environmental management accounting: the significance of contingent variables for adoption, Journal of Cleaner Production 41, 163-173.

Christmann, P & Taylor, G 2001, Globalization and the environment: Determinants of firm self-regulation in China, Journal of International Business Studies, vol. 32, no. 3, pp. 439-458.

Coskun, S., Ozgur, L., Polat, O., & Gungor, A. (2016). A model proposal for green supply chain network design based on consumer segmentation. Journal of Cleaner Production, 110, 149-157.

de Beer, P. & Friend, F. (2006), Environmental accounting: A management tool for enhancing corporate environmental and economic performance, Ecological Economics, 58: 548-600.

De Palma, R. & Csutora, M 2003, Introducing environmental management accounting at enterprise level: Methodology and case studies from central and Eastern Europe, UNIDO, viewed 25 January 2009. http://www.unido.org/index.php?id=026 190#publications.

De Sales, I.L. (2019), "The influence of environmental management accounting on firm performance with green innovation as an intervening variable in empirical

studies in manufacturing companies", Russian Journal of Agricultural and Socio-Economic Sciences, Vol. 85 No. 1, pp. 420-425.

Dierkes, M. & Preston, L.E. (1977), Corporate social accounting reporting for the physical environment: A critical review and implementation proposal, Accounting, Organizations and Society, 2(1): 3-22.

Dresner S. Principles of sustainability. London: Earthscan Publications Ltd; 2008, pp: 29-32.

Driessen, P.H.; Hillebrand, B. Adoption and diffusion of green innovations. In Marketing for Sustainability: Towards Transactional Policy-Making; IOS Press: Amsterdam, The Netherlands, 2002.

Etzion, D. (2007). Research on organizations and the natural environment, 1992–present: A review. Journal of Management, 33, 637–664.

Farzin, Y.H.; Bond, C.A. Democracy and Environmental Quality. J. Dev. Econ. 2006, 81, 213–235.

Ferraris, A., Giachino, C., Ciampi, F. and Couturier, J. (2019b), "R&D internationalization in medium-sized firms: the moderating role of knowledge management in enhancing innovation performances", Journal of Business Research, Vol. 128, pp. 711-718.

Ferreira, A. Moulang, C. and B. Hendro, "Environmental management accounting and innovation: An exploratory analysis," Accounting, Auditing and Accountability Journal, vol. 23, no. 7, pp. 920–948, 2010.

Fiorino, D.J. Explaining National Environmental Performance: Approaches, Evidence, and Implications. Pol. Sci. 2011, 44, 367–389.

Fryxell, G. E., & Szeto, A. (2002). An empirical examination of the relationship between corporate social responsibility and profitability. Academy of Management Journal, 45(3), 500-515.

Fussler, C.; James, P. A Breakthrough Discipline for Innovation and Sustainability; Pitman Publishing: London, UK, 1996.

Gibson, K.C. & Martin, B.A. (2004), Demonstrating value through the use of environmental management accounting, Environmental Quality Management, Spring: 45-52.

Gray, R., & Bebbington, J. (2001). Accounting for the environment (2nd ed.). London: Sage.

Haldma, T. and Meiesaar, K. (2002), Environmental Contingencies Of The Management Reform In The Estonian Health Care Institutions. In M. OÜ (Ed.), Effect of Accession to the European Union on the Economic Policy of Estonia (pp. 483–496). Berlin: Tallinn: Berlin Verlag Arno Spitz GmbH.

Hart SL. A natural-resource-based view of the firm. Acad Manag Rev. 1995;20(4):986–1014.

Henri, J.-F. & Giasson, A. (2006). Measuring environmental performance: A basic ingredient of environmental management. CMA Management, 80(5), 28–32.

Horváth, D., & Abonyi, J. (2019). Environmental management accounting in practice: Two decades of insights from empirical literature. Journal of Cleaner Production, 226, 919-932.

IFAC 1998, Environmental management in organisations: The role of management accounting, Financial and Management Accounting Committee, International Federation of Accountants, study No. 6, New York.

IFAC 2005, International guidance document: Environmental management accounting, International Federations of Accountants, New York.

Ilyas, S., Hu, Z. and Wiwattanakornwong, K. (2020), "Unleashing the role of top management and government support in green supply chain management and sustainable development goals", Environmental Science and Pollution Research, Vol. 27 No. 8, pp. 8210-8223.

ISO 2008, The ISO Survey of Certifications 2008, ISO, viewed 7 June 2010. http://www.iso.org/iso/pressrelease.htm? refid=Ref127x.

ISO. 1999. ISO 14031: Environmental Management – Environmental Performance Evaluation – Guidelines. ISO: Geneva.

Jasch, C 2003, The use of environmental management accounting (EMA) for identifying environmental costs, Journal of Cleaner Production, vol. 11, pp. 667-76.

Jasch, C 2006a, Environmental management accounting (EMA) as the next step in the evolution of management accounting, Journal of Cleaner Production, vol. 14, pp. 1190-93.

Jasch, C 2006b, How to perform an environmental management cost assessment in one day, Journal of Cleaner Production, vol. 14, pp. 1194- 1213.

Kemp R, Arundel A, Smith K. Survey indicators for environmental innovation. Paper presented to conference "Towards Environmental Innovation Systems" in Garmisch-Partenkirchen; 2001.

Kemp, R.; Pearson, P. Final Report Mei Project about Measuring Eco-Innovation; Um-Merit: Maastricht, The Netherlands, 2007.

Klassen R.D. and McLaughlin, CP. "The Impact of Environmental Management on Firm Performance," Management Science, vol. 42, no. 8, pp. 1199–1214, 2008.

Kleindorfer, P.R.; Singhal, K.; Wassenhove, L.N. Sustainable operations management. Prod. Oper. Manag. 2005, 14, 482–492.

Kreuze, J.G. & Newell, G.E. (1994), ABC and life cycle costing for environment expenditures, Management Accounting, February: 38-42.

Lambertini, L.; Mantovani, A. Process and product innovation by a multiproduct monopolist: A dynamic approach. Int. J. Ind. Organ. 2009, 27, 508–518.

Langfield-Smith, K., Thorne, H. & Hilton, R, (2009). Management accounting: Information for creating and managing value, 5 th edn, McGraw Hill Education, NSW, Australia.

Latan, H., Jabbour, C.J.C., de Sousa Jabbour, A.B.L., Wamba, S.F. and Shahbaz, M. (2018), "Effects of environmental strategy, environmental uncertainty and top management's commitment on corporate environmental performance: the role of environmental management accounting", Journal of Cleaner Production, Vol. 180, pp. 297-306.

Lefebvre, É. Lefebvre, L.A. and Talbot, S. "Determinants and impacts of environmental performance in SMEs," R&D Management, vol. 33, no. 3, pp. 263–283, 2003.

Lozano, R. (2008). Envisioning sustainability three-dimensionally. Journal of Cleaner Production, 16(17), 1838-1846.

Mathew, M.R. (1997), Twenty-five years of social and environmental accounting research: Is there a silver jubilee to celebrate?, Accounting, Auditing & Accountability Journal, 10(4): 481-531.

McGillivary, M. Measuring non-economic well-being achievement. Rev. Inc. Weal. 2005, 51, 337–364.

Medley, P. (1997), Environmental accounting – what does it mean to professional accountants?, Accounting, Auditing & Accountability Journal, 10(4): 594-600.

Melnyk, A, Sroufe, P. and Calantone, R 2003, Assessing the impact of environmental management systems on corporate and environmental performance, Journal of Operations Management, vol. 21, pp. 329-351.

Naranjo Tuesta, Y., Crespo Soler, C. and Ripoll Feliu, V. (2021), "Carbon management accounting and financial performance: evidence from the European union emission trading system", Business Strategy and the Environment, Vol. 30 No. 2, pp. 1270-1282.

O'Connor GC, Leifer R, Paulson AS, Peters LS. Grabbing lighting: building a capability for breakthrough innovation. San Francisco: Jossey-Bass; 2008.

Petkova, I. "Bureaucratic versus Non-bureaucratic Organization: Explaining Form, Function, and Change in New Forms of Organizing," Management and Organizational Studies, vol. 2, no. 1, pp. 33–51, 2014.

Porter ME, Van der Linde C. Green and competitive. Harv Bus Rev. 1995;73(5):120–34.

Ramli A. and Sobre Ismail, M. "Environmental Management Accounting Practices: A Survey of ISO 14001 Certified Malaysian Organizations," Journal of Energy Technologies and Policy, vol. 3, no. 11, pp. 2224–3232, 2013.

Rehman, S.U., Bresciani, S., Ashfaq, K. and Alam, G.M. (2021c), "Intellectual capital, knowledge management and competitive advantage: a resource orchestration perspective", Journal of Knowledge Management.

Rennings K. and Rammer, C. "The Impact of Regulation-Driven Environmental Innovation on Innovation Success and Firm Performance," Industry and Innovation, vol. 18, no. 3, pp. 255–283, Apr. 2011.

Sarkis, J., Gonzalez-Torre, P. and Adenso-Diaz, B. (2010), "Stakeholder pressure and the adoption of environmental practices: the mediating effect of training", Journal of Operations Management, Vol. 28 No. 2, pp. 163-176.

Scavone, G.M. (2006), Challenges in internal environmental management reporting in Argentina, Journal of Cleaner Production, 14: 1276-1285

Schaltegger S. and Synnestvedt, T. “Schaltegger_2002_Journal-of-Environmental-Management,” Journal of Environmental Management, vol. 65, no. 1, pp. 339–346, 2002.

Schaltegger, S. & Burritt, R 2000, Contemporary environmental accounting, Greenleaf Publishing, Sheffield.

Schaltegger, S. & Figge, F 2000, Environmental shareholder value: Economic success with corporate environmental management, EcoManagement and Auditing, vol. 7, pp. 29-42.

Schaltegger, S. et al. (2017). "Business Models for Sustainability: A Co-Evolutionary Analysis of Sustainable Entrepreneurship, Innovation, and Transformation" (Organization & Environment).

Schaltegger, S., & Burritt, R. (2017). Contemporary Environmental Accounting: Issues, Concepts, and Practice. Routledge.

Schaltegger, S., Burritt, R. & Petersen, H 2003, An introduction to corporate environmental management: Striving for sustainability, Greenleaf Publishing, Sheffield.

Schiederig, T.; Tietze, F.; Herstatt, C. Green innovation in technology and innovation management—An exploratory literature review. Res. Dev. Manag. 2012, 42, 180–192.

Sherry R, Stubberud HA. Green innovation in Germany: a comparison by business size. J Int Bus Res. 2013;12(1):47–56.

Stadtler, L., & Lin, H. (2017). Moving to the next strategy stage: examining firms' awareness, motivation and capability drivers in environmental alliances. Business Strategy and the Environment, 26(6), 709- 730.

Staniskis, K. & Stasiskiene, Z 2006, Environmental management accounting in Lithuania: Exploratory study of current practices, opportunities and strategic intents, Journal of Cleaner Production, vol.14, pp. 1252-61.

Tidd, J. “Innovation management in context: environment, organization and performance,” International Journal of Production Economics, vol. 171, no. 3, pp. 169–183, 2001.

Tseng ML, Wang R, Chiu AS, Geng Y, Lin YH. Improving performance of green innovation practices under uncertainty. J Clean Prod. 2013;40:71–82.

Ullman, A.A. (1976), The Corporate environmental accounting system: A management tool for fighting environmental degradation, Accounting, Organizations and Society, 1(1): 71-79

United Nations Division for Sus.tainable Development (2001), Environmental Management Accounting Procedures and Principles, Prepared for the Expert Working Group on “Improving the role of government in the promotion of environmental management accounting”, New York pp: (8-10).

United States Environmental Protection Agency (1995b), Federal Facility Pollution Prevention Project Analysis: A Primer for Applying Life Cycle and Total Cost Assessment Concepts, EPA, July, Washington D.C.

Velis, C. A. et al. (2020). "Global recycling markets: plastic waste" (UNEP Report).

Votta, T., Broe, R., Kauffman, J. and White, A 1998, Using environmental accounting to green supplier contracts, Pollution Prevention Review, Spring.

Wagner, M. (2005). Sustainability and competitive advantage: empirical evidence on the influence of strategic choices between environmental management approaches. Environmental Quality Management, 14(3), 31-48.

Yim, S.H.L.; Fung, J.C.H.; Lau, A.K.H. Use of high-resolution MM5/CALMET/CALPUFF system: SO2 apportionment to air quality in Hong Kong. Atmos. Environ. 2010, 44, 4850–4858.

BACKGROUND

Name and Surname	Gailan Othman Kareem
Personal Information	ID Date and Place of Birth:
Contact Information	Email:
Education Information	2019 Al-Kitab University – College of Administration and financial science 2024 Tokat Gazıosmanpaşa University