



**THE APPLICATION OF ENVIRONMENTAL MANAGEMENT
ACCOUNTING PRACTICES ON PLASTIC POLLUTION CONTROL IN
FOOD AND BEVERAGES MANUFACTURING FIRMS IN DURBAN,
SOUTH AFRICA**

By

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**In partial fulfilment of the Master of Accounting degree
requirements (Cost and Management Accounting) at the Faculty of
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DECLARATION

I, Smangele Nzama, hereby declare that the conception and execution of this dissertation is a representation of my personal research. This dissertation has never been submitted to another university for a different degree. All sources used to obtain the information cited have been recognized and referenced.

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DEDICATION

This thesis is dedicated to my late grandma, who only wanted the best for me. She raised me into this strong and dedicated young woman. I also dedicate it to the young female learners I teach, and I hope this thesis inspires them to pursue their master's degrees.

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ABSTRACT

Businesses are confronted with pressure from several stakeholders to become more sustainable. Plastic waste is a global environmental issue that requires immediate attention. In South Africa, waste management is poor, and the adoption of Environmental Management Accounting (EMA) is low. The deterioration of plastic waste in the environment takes time and negatively impacts the environment, the ocean and its inhabitants. The essence of carrying out this study is to observe how EMA practices can be applied to plastic pollution control in food and beverage manufacturing companies in Durban, South Africa.

The quantitative approach was used in the research work and primary data was collected using questionnaires. A non-probability sampling called convenience sampling was used. Questionnaires were sent to 32 food and beverage manufacturing firms with four respondents in each. The respondents were financial managers, management accountants, factory accountants, and chief accountants. A total of 128 questionnaires were distributed and completed, only 124 questionnaires were correctly completed and analysed. Data obtained from the questionnaires were analysed using Statistical Package for Social Science (SPSS). Inferential statistics like correlation coefficient and linear regression analysis were utilized to respond to the research questions.

An adverse relationship was discovered between environmental management accounting and corporate environmental strategy. It was discovered that an improvement in plastic pollution control was directly related to disclosure of environmental information. Also, an improved corporate environmental strategy will result in improved measures to control plastic pollution. Additionally, the study discovered that addressing barriers to environmental sustainability will improve the implementation of EMA. Further findings revealed that food and beverage manufacturing companies which are engaged in environmental activities tend to build a good company image and not to reduce plastic waste.

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ABBREVIATIONS

BP- Biodegradable Plastic

CFA- Confirmation Factor Analysis

CGMA- Chartered Global Management Accountant

CSR- Corporate Social Responsibility

EFA- Exploratory Factor Analysis

EMA – Environmental Management Accounting

EMAP- Environmental Management Accounting Practices

EMS – Environmental Management Systems

EP- Environmental Performance

EU- European Union

FCA – Flow Cost Accounting

KMO- Kaiser-Meyer-Olkin

MEMA – Monetary Environmental Management Accounting

MFCA – Material Flow Cost Accounting

NGO – Non-Government Organization

OECD- Organization for Economic Co-operation and Development

PEMA -Physical Environmental Management Accounting

SETAC - Society of Environmental Toxicology and Chemistry

SME- Small Medium-sized Enterprises

UNDSD – United Nations Division of Sustainable Development

UNEP – United Nations Environmental Programme

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Plastic pollution appears to be a major problem faced by most countries in the world. Approximately 300 million tonnes of plastics are manufactured yearly, and about five trillion plastic pieces are floating in the ocean (Griffin, Wilkins and Bowen 2019). South Africa is drowning in plastic waste and this problem poses a serious threat to wildlife and human health (Muller 2019). The main challenge associated with plastic is that a large quantity of the plastic generated annually is utilized to build disposable packaging or other short-lived products such as plastic straws, earbuds, stirrers, table cups, tableware, and polystyrene packaging which are used and permanently discarded within a year of manufacture (Kalebaila 2019). Many businesses, including restaurants, in South Africa, have decided to ban the use of plastics. Bans imposed on single-use products will be beneficial to the environment but will have some negative implications for businesses and consumers (Muller 2019).

It is important to distinguish between different kinds of plastic litter as this will assist in clarifying the issues relating to plastic waste in our environment. There are three different kinds of plastic waste namely, macro plastic products, microplastic, and nano plastics. Macro plastic products are large objects that are visibly seen by people e.g., shopping plastic bags and plastic bottles whereas micro plastics are tiny plastics that remain less than around 5 millimetres in length such as microbeads. While nano plastics are very small microplastics however their size has not been defined by scientists (SETAC 2019).

Since the early 1970s, scientific literatures have documented how plastic waste pollutes the oceans. Many societies have been informed on the impact of plastic pollution. Recently, academic research has documented the negative impact of plastic pollution in the ocean. Many societies became more conscious of the effects of plastic pollution in recent times, and some organizations have begun to confront it as an

ethical obligation. However, many businesses are still unaware of plastic pollution effect on its long-term sustainability of the economy and risk administration in addition to reputational problems (ClientEarth 2018). Rigid plastic microbeads were progressively used as a cleanser or gentle exfoliator for face washing, body wash, and toothpaste in the mid-1990s by beauty and hygiene industries. Whilst in 2012, the companies that used microbeads in their beauty products were challenged by environmentalists to remove it as it was harmful (Dauvergne 2018). The rapid increase in the production and consumption of plastic has given rise to more concerns on possible negative impacts on human health and the society as early as 1970 (Azoulay *et al.* 2019).

Generally, there is a global awareness about the scale of plastic pollution. It is estimated that more than 50 nations have enacted bans and levies to control plastic waste caused by products that are used once and disposed off. However, the focus has been more on restricting the manufacture and sale of plastic shopping bags and foamed plastic products such as Styrofoam because they are the most visible forms of plastic pollution (UNEP 2018). In South Africa, the government prohibited plastic bags under a certain width and imposed a tax on food shops that sell 24-litre bags. This approach did little to minimize the consumption of plastic shopping bags, partly because the levy was far too low to change consumer behaviour (UNEP 2018). Some of the plastic products are restricted and banned due to the growing concern of the environmental implications (Gionfra 2018).

The civil society actions together with numerous NGOs and well known reports like (Foundation 2016; Forum and Foundation 2017; UNEP 2018) have assisted in raising global awareness of challenges linked with plastic waste. Government agencies, activists and media houses are increasingly concerned about the plastic build-up, reflecting the incremental growth in plastic use in society today. (Nielsen *et al.* 2020).

In order for the economy to grow sustainably, enterprises need to be held accountable for their impact on the environment while conducting economic activities (Pei 2017). Thus, green competitiveness is an important aspect in supporting firms' long-term success, and numerous stakeholders have begun to focus on companies' envir

onmental efforts (Tsai, Lin and Chou 2010). The manufacturing sector is a prominent actor in environmental sustainability challenges because of the essential inputs, such as water, electricity and raw materials, and the damaging outputs, such as pollution from air and water sources and garbage to disposal sites (Govender 2016).

A couple of stakeholders (internal and external) compel companies to minimize the effect of their economic operations that adversely affect the environment. Stakeholders demand companies to be ethical and ecologically sustainable in their business operations due to the increasing environmental costs of companies (Iredele and Ogunleye 2018). Firms need to be responsible for their environmental costs and control expenses of their environmental impact. This responsibility by firms results to the formation of EMA (Iredele and Ogunleye 2018). Due to limitations in theoretical understanding and awareness of EMA and its potential for detecting wastes in a manufacturing process and comparing environmental costs that would provide higher environmental and economic performance, the level of use of EMA in practice is believed to be insufficient (Doorasamy 2016).

Environmental management accounting (EMA) originated in regards to the issues encountered by conventional management accounting systems when it came to environmental initiatives (Muhammad Jamil *et al.* 2015). Traditional accounting concentrated attention on the profitability of businesses and ignored the environmental impact of their business operations (Qian, Horisch and Schaltegger 2018). EMA has been used by organizations in approximately 30 countries to support a variety of environmental management efforts. The United Nations Division for Sustainable Development (UNSD) helped in developing EMA by forming a steering committee in 2001 which specialized in EMA practices and principles (Asiri, Khan and Kend 2020). Most of the past studies advocating EMA originated from global non-profit sectors, and was likely oriented at engaging the principles of sustainable development rather than enhancing organizational economic performance. However, the international government and professional accounting bodies are recently playing a role in supporting the application of EMA (Christ and Burritt 2013).

Environmental management accounting is an aspect of Environmental Accounting. Environmental accounting was initially included in the accounting category in the 1970s as an instrument for reflecting on and monitoring business activities affecting the environment (Pei 2017). Additionally, the establishment of environmental accounting served as a basis that assisted organizations to make informed decisions relating to the environment. On the contrary, environmental management accounting was established to assist organizations to manage the ingestion of natural resources and energy and to also manage pollution (Burritt *et al.* 2019). There are numerous interpretations of environmental management accounting. Generally, EMA system could be considered as a management accounting system that was developed to give users information which represents the organization's environmental sustainability. According to the United Nations Division for Sustainable Development's definition, environmental management accounting is defined as "performing better, more thorough management accounting whilst also carrying an environmental cap that exposes hidden costs" (Le, Nguyen and Phan 2019).

1.2 Statement of the Research problem

South Africa is a developing country and economic growth is predicted to occur in developing countries. As economic growth occur, there is a possibility of increased contamination of the environment due to the procedures which are carried out by businesses to convert inputs into outputs (finished goods) (Keit 2011). Firms have been pressured by internal and external stakeholders to reduce their ecological influences caused by their business operation. Apart from that, accounting systems have failed to provide the required information to solve the adverse effect of firms' activities on the environment and its associated costs which resulted in the need of EMA (Iredele and Ogunleye 2018). In developed countries, the EMA practices have improved in terms of support mechanisms to manage environmental problems. However, in South Africa, there exists a growing knowledge of environmental sustainability, and companies had commenced the integration of their corporate strategy with environmental management practices (Iredele and Ogunleye 2018) (Nyide and Lekhanya 2016). According to Smit and Kotzee (2016), many companies decide not to effectively determine and split environmental costs. Furthermore, these

companies lack the knowledge and understanding of environmental costs which resulted to loss in the concept of environmental management process.

Plastic production and consumption have increased drastically in the past years due to their functionality and low cost. About half of all plastics manufactured yearly are used to make disposable products for packaging, agricultural films, and single-used consumer items (ClientEarth 2018). After a plastic item has fulfilled its intended purpose, it is either recycled, burned, or disposed off to landfills. Whichever process a plastic item follows, it constitutes pollution to the environment (Krueger, Harms and Schlosser 2015).

Plastic pollution was identified as a major threat in the World Economic Forum's 2018 Global Risk Report (ClientEarth 2018). Plastic pollution remains a problematic environmental issue in South Africa as the country was listed in the top 20 countries with worse plastic pollution. South Africa is considering banning certain plastic products (Ryan 2018b; Muller 2019). The most disturbing factor is the long lifespan of plastic waste. Plastics degrade very slowly and it could take hundreds or even thousands of years to break down in the cold, dark environments found on the seabed (Ryan 2018b).

According to Hodal (2019), the cost of plastic pollution in the society rises to billions of dollars every year in terms of lost and damaged resources. Marine industries are more negatively affected by plastic pollution. In fact, one million seabirds and 100,000 mammals are killed by plastic products on yearly basis (Symons and Fahy 2018). The global economic impact of plastic pollution has not yet been thoroughly quantified, but there are some proves that exist of its effect (ClientEarth 2018). It is based on these menaces caused by single-use plastics that inspired this study and makes it imperative.

1.3 Research aim and objectives.

1.3.1 Aim

The study intends to examine the impact of the application of environmental management accounting practices on plastic pollution control in food and beverages manufacturing firms based in Durban, KwaZulu Natal.

1.3.2 Objectives

- I. To establish the relationship between environmental management accounting and corporate environmental strategy in food and beverage manufacturing companies.
- II. To determine the influence of environmental information on plastic pollution control in food and beverage manufacturing companies.
- III. To establish the relationship between corporate environmental strategy and plastic pollution control.
- IV. To establish the influence of barriers to environmental sustainability on environmental management accounting.
- V. To examine the role of corporate environmental strategy on plastic pollution control in food and beverages manufacturing firms.

1.4 Research Questions

- I. What is the relationship between environmental management accounting and corporate environmental strategy in food and beverage manufacturing firms?
- II. To what extent is the influence of environmental information on plastic pollution control in food and beverages manufacturing firms?
- III. Is there a relationship between corporate environmental strategy and plastic pollution control?

- IV. How do the barriers to environmental sustainability influence environmental management accounting?
- V. What is the role of corporate environmental strategy on plastic pollution control in food and beverages manufacturing firms?

1.5 Scope of the Study

The research work focused on plastic pollution as an environmental issue that economically affects numerous stakeholders in South Africa. As such, it makes use of environmental management accounting practices to determine effective ways to manage plastic pollution. Food and beverage manufacturing firms in Durban were used to carry out the study. Specifically, 55 Food and Beverage companies are the population, and 32 are the sample.

1.6 Significance of the Study

The research work is essential to companies who want to gain a sustainable competitive advantage using the environmental business aspect. It seeks to understand plastic pollution control and application of environmental management accounting at corporate level. This study further assists the authorities within the government and manufacturing sector in general to understand the elements that promote improved accounting and business sustainability. All stakeholders, including society at large, are to benefit from environmentally friendly operations that are carried out through accountable businesses. The policy makers are going to be better equipped to create and execute policies or legislation to inspire or compel organizations to do business more sustainably. The study also enhances the achievement of the SDG Goal that addresses the environment.

1.8 Structure of the Study

According to Dudovskiy (2018), the structure of research simply outlines the work of the researcher, and it should be shown at the end of chapter one. The research work consists of five (5) chapters.

Chapter One: This section introduces the research study, states the problem statement and provides a brief background. Furthermore, it is inclusive of research questions and objectives, scope and significance of the study and lastly, the research structure.

Chapter Two: This is the literature review section. The researcher uses other people's work to support the study and show that there is a need to conduct the research. This section outlines conceptual, theoretical, and empirical reviews. The researcher discusses variables and theories relating to the study and provides evidence of other similar studies.

Chapter Three: Chapter three explains the research methodology engaged to carry out research and shows how data is collected and analyzed. Moreover, it includes an explanation of the research design, nature and sources of data, and the selected and implemented data collection methods. Population, sample, and sampling techniques are also included in this chapter. The study's reliability and validity, as well as ethical considerations are explored in the chapter.

Chapter Four: This section provides the presentation of primary data collected in chapter three using questionnaires. This chapter offers a data analysis and a discussion of the results. Pie charts/bar charts, graphs and tables are used to display the findings.

Chapter Five: The researcher concludes and summarises the work. The study's barriers are recognized and the potential for future studies in the same research area is outlined.

1.9 Chapter Summary

The study was introduced in this chapter and the literature review will be covered in the following chapter.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

Literature review is referred to as a collection of other academic work relating to a specific topic. It outlines existing information and allows the researcher to determine appropriate theories, techniques and gaps in the present research. The process of reviewing the literature entails gathering, evaluating and analysing published material (McCombes 2019). The study was introduced in chapter one. Chapter two discusses the literature underlying the study. The literature review is divided into three parts which are; conceptual, theoretical, and empirical review. This section discusses environmental management accounting, its aspects and tools, and also relevant theories. This section will further discuss plastic pollution, how it impacts the land, ocean, and human health, measures of reducing it and poor waste management. Conceptual framework and empirical studies on environmental management accounting and plastic pollution are discussed in this section.

2.1 Conceptual review on Environmental Management Accounting

2.1.1 Environmental management systems (EMSs)

The European Union and the growing globalization have been promoting environmental management systems (Pacana, Lew and Kulpa 2017). Presently, the effort is not enough to get an ISO 14001 certificate, but the specifications of this standard will be implemented with expertise in practice. That is why considerable attention is being paid to how the Environmental Management System is applied. Effendi (2010) described environmental management systems as a useful tool for integrating sustainable business practices. It also aims to reduce waste and emissions, develop environmentally friendly products, promote sustainable use of natural resources and provide opportunities to improve effect on the environment. According to Nyide and Lekhanya (2016), it is a system of methods whereby companies function in a proper approach to ensure that the natural environment is

protected. Doorasamy (2014) stated that environmental management systems take into account the economic operation of the firm as well as their environmental consequences.

Furthermore, it uses an environment indicator system to determine ways to improve environmental performance and reduce costs. Environmental management system is a further extension of the environmental management accounting through which systems are set in place to control the environmental performance of an entity (Keit 2011).

Over the past two decades, businesses have introduced EMSs in their business operations. The two commonly used models to adopt environmental management systems are the Eco-Management and Audit Scheme regulation and the ISO 14001 standard (Díaz de Junguitu and Allur 2019). The ISO 14001 aims to provide a useful framework to enhance environmental management systems in the organization. Furthermore, it provides a framework for a comprehensive, systematic approach to environmental policies, strategies, and activities of the organization (Doorasamy 2014); (Keit 2011). According to Brogi and Menichini (2019), ISO 14001 is one of the widely used standard for implementing environmental management systems around the world. Thus, it encourages the enhancement of the environmental performance of businesses. In particular, those deemed to be particularly littering. Moreover, companies must define environmental policy and follow-up action plans, execute those plans, track the results of the implementation and where applicable, take corrective action under ISO 14001 (Papagiannakis *et al.* 2019).

ISO14001 requires businesses to identify ways to gain a sustainable competitive advantage and improve their manufacturing processes. This can be achieved through incorporating clean techniques to minimize raw material inputs, resulting in less waste or in some cases, no waste at all (Doorasamy and Garbharran 2015).

The Eco-Management and Audit Scheme Legislation require organizations to join the group of eco-management and audit schemes voluntarily. It was motivated by prevention measure outlined in the European Union's Fifth Environmental Action

Program (Díaz de Junguitu and Allur 2019). The introduction of EMS is assumed to be an organization's internal driving force for encouraging the implementation of eco-innovations. EMSs are voluntary self-regulation mechanisms that set out the processes and management rules used to minimize the environmental effect of the organization (Brogi and Menichini 2019).

2.1.2 Environmental Accounting

Environmental accounting goes further than standardized environmental management by promoting an integrated approach to financial and ecological program that allows for the definition of win-win situations, as well as often potential trade, and the selection of the best way to proceed (Christ, Burritt and Varsei 2016). Environmental accounting is a global concept that shows the effect of economic activities on the environment. Furthermore, environmental accounting provides information and specific data both in physical units and in monetary units, which can assist in managerial decisions (Rakos and Antohe 2014). Araoye *et al.* (2018), stated that environmental accounting relates to economic and environmental information. Consequently, it has no definite definition. However, it involves a process of identifying the resource use measures, communication cost, and economic impact on the environment.

According to Effendi (2010), environmental accounting was developed to evaluate the effects of the company's activities in the environment and to provide feedback upon those effects. Environmental accounting was established to assist with environmental problems that had become increasingly relevant. Hence, the environmental impact of these issues could not be identified, categorized, and assessed using traditional financial accounting (Christ, Burritt and Varsei 2016).

Environmental accounting at an organizational level involves a sequence of functions that are concerned with the evaluation and monitoring of environmental performance. It also deals with reporting these outcomes to the concerned parties, both inside and outside the organization. However, environmental accounting at the national or regional level is part of an accounting system that deals with the action taken,

techniques, recordings, analysis, and disclosure of environmental impacts resulting from economic activities (Islam 2018).

2.1.3 Environmental Management Accounting (EMA)

Over time, the society has become aware of the negative implication that the operation of firms has on the environment and has put pressure on the firms to operate sustainably. Environmental management accounting was established to reduce the ecological effects of firms (Muza 2018); (Iredele and Ogunleye 2017). Burritt *et al.* (2019) described EMA as environmental and economic performance management through the production and use of effective ecological methods and procedures. Moreover, it consists of accounting practices and tools that assist in making decisions associated with reducing the environmental impact.

According to Iredele and Ogunleye (2018), EMA practices include monitoring, tracking, and treating costs, revenues, and savings incurred as a result of a company's environmental activities. Nyide and Lekhanya (2016) defined environmental management accounting as an “innovative sustainability initiative.” According to Ambe, Ambe and Ganda (2015), EMA deals with the management of ecological and financial execution through the turn of events and usage of appropriate environmental-related accounting methods and practices. Asiri, Khan and Kend (2020) state that the adoption of EMA will assist organizations to better manage environmental problems and their impact on the environment. According to Qian, Horisch and Schaltegger (2018), EMA tools which include environmental cost accounting, material flow cost accounting, bench marking, or auditing aim to assist firms to enhance their social, environmental and economic performance.

EMA is a compone of the environmental accounting system, it is not just about accounting for environmental costs on its own. However, environmental management accounting is described as accounting for all costs and benefits arising from differences in operational strategies which will eventually change their impact on the environment (Agustia, Sawarjuwono and Dianawati 2019). According to Mokhtar, Jusoh and Zulkifli (2016), the key objective of EMA is to measure environmental costs,

with physical environmental data serving as the foundation for quantifying such costs. EMA in most companies often concentrate on environmental costs and the means of controlling these costs. In general, EMA tracks the movements of basic elements such as freshwater, power, resources, and fossil fuels from the environment to the economy. Also, EMA monitors the shadow pricing for such elements and environmental protection expenditure (Islam 2018). There are two types of environmental information which are included in EMA. These are namely physical and monetary environmental management accounting (Mokhtar, Jusoh and Zulkifli 2016).

2.1.3.1 Physical Environmental Management Accounting (PEMA)

According to Phan, Baird and Su (2017), physical environmental management accounting is part of EMA that expresses environmental impact information in physical units such as litre of water. Therefore, there is an assumption that states that the physical inputs in making a product must be equivalent to the output (finished goods). Hence, any amount unaccounted for will be classified as waste. Physical information is data relating to the use and flow of water, materials and energy, including waste (Ismail, Ramli and Darus 2014). Mokhtar, Jusoh and Zulkifli (2016) described physical environmental information as information on the flow of power, raw materials, water and waste. For example, quantity of water used and amount of waste and power consumption.

2.1.3.2 Monetary Environmental Management Accounting (MEMA)

Monetary involves anything that relate to money. Monetary environmental management accounting deals with presenting environmental effect on information in monetary terms. For instance, costs expensed to prevent waste. Furthermore, it offers an essential method for monitoring, tracing, and managing the costs expensed as a result of the environmental events of the company (Phan, Baird and Su 2017). According to Doorasamy (2014), monetary environmental management accounting can be used to assess total costs incurred, assess the budget, assess the level of control and assess investment appraisal. Environmental management monetary information relates to costs, earnings and savings (Ismail, Ramli and Darus 2014).

MEMA aids financial and tactical planning, serves as a tool for management and monitoring, and is the major comprehensive source of knowledge for decisions on how to attain desirable company goals (Abiola and Ashamu 2012).

2.1.3.3 The shortcomings of traditional costing systems

Management accounting is the development of experience and strategies by companies and managers of the companies that use information, in particular financial information about their businesses for decision-making so as to give them a competitive advantage. Furthermore, management accounting practices are relevant to the performance of the company through the historic usage of managing expense, efficiency and pricing decisions in the organization (Ashfaq *et al.* 2014). According to Keit (2011), conventional management accounting system has viewed costs associated with the environment as overhead costs due to the fact that it is not easy to track these costs individually. Therefore, the advantages of monitoring these costs independently have been minimal. Moreover, the traditional costing system grouped environmental costs as an organizational overhead which could not be traced to activities (Cloete *et al.* 2014). The old system cannot effectively deal with environmental costs. Hence, the managers lack awareness and information on how to control or reduce these costs (UKEssays 2018). Ismail, Ramli and Darus (2014) suggest that traditional accounting is incapable of providing adequate information on managing the environment because of insufficient information and the inability to account for hidden environmental costs.

Traditional management accounting is unsatisfactory in responding to environmental issues. Therefore, the changing business needs and application of EMA is the solution to a such problem. EMA is considered as contemporary accounting which is viewed as an essential strategy that should be used by businesses, particularly those whose processes have a significant impact on the environment (Mohd Ariffin 2016).

2.1.4 Environmental Cost Accounting

Rakos and Antohe (2014) defined environmental cost accounting as a methodology that reflects a collection of principles and procedures, offering important information

for activities specific to managing the environment. The origin of environmental accounting led to the development of environmental cost accounting which assigns costs to every environmental aspect and identify all kinds of costs associated with the procedures. These consist of environmental costs such as pollution prevention, environmental design, and environmental management. Furthermore, with environmental cost accounting, environmental costs can be allocated using an activity-based framework and cost of the quality framework (Effendi 2010).

- Activity-based costing (ABC) framework: This is a technique that focuses on assigning costs to activities using cost drivers. This method also provides accurate costing information which will be applied by management for better decision-making. The ABC system identifies the cost drivers of environmental costs and assigns environmental costs to products based on their contribution to the activity.
- Cost of the quality framework: This method consists of costs of prevention programs, assessment, internal failure, and external failure. Prevention costs are always considered vital because they add value. External failure costs can be avoided if the company invest in prevention costs.

Okafor, Okaro and Egbunike (2013), defined environmental cost accounting as part of the EMA that focuses on the acknowledgment and re-classification of environmental impacts and costs to help in better decision-making.

2.1.5 Environmental costs

Cloete *et al.* (2014), defined environmental costs as those costs that are incurred by an organization in an attempt to prevent, monitor, and report the organization's activities in the environment. Thus, these costs can be measured using different methods chosen by the organization. According to Araoye *et al.* (2018), these environmental costs must be recognized, recorded properly and cautiously disclosed alongside company overhead expenses before being allocated to products and processes. To improve management and financial decision, businesses are recognizing environmental costs. The tracking of environmental costs involves

identifying, describing, and classifying various environmental costs which are then recorded using cost accounting systems (Fuzi *et al.* 2019a); (Henri, Boiral and Roy 2016). Rakos and Antohe (2014), stated that environmental costs are considered to be a vital instrument which provides managers with information volume and quality necessary for decision-making. Pei (2017) stated that environmental costs are classified as follows:

- Internal environmental costs are incurred internally in an organization during the production process and could be measured in monetary terms such as environmental control costs and pollution discharge costs.
- External environmental costs are created by the company's production activities that negatively affect the environment; however, the company does not bear those costs e.g., pollution discharge costs.

Pei (2017) classified environmental costs using the Table 2.1 below:

Table 2.1 Classification of Environmental costs

Classification	Content 1	Content 2	Content 3
Cost of Internal environmental	Cost of Environmental prevention	Cost of Environmental management	Management salaries, expenses incurred by Technology R&D
		Environmental monitoring costs	Salary of Employee Salary, Operating expenses
		Environmental facility cost	Facility operating costs,

			Depreciation of facilities
	Cost of Environmental pollution	Sewage Charges	
		Pollution compensation	
External environmental costs	Cost of Resource value	Mining costs of Coal, iron ore, and other natural resources	
	Pollution discharge cost	Water wastage, waste gas, solid waste, atmospheric dust emission loss	

Source: Pei (2017)

2.1.6 Green accounting

Moorthy and Yacob (2013), described green accounting as accounting which identifies, tracks, analyses and reports material and costs data relating to the environmental aspect of the company. Whereas (Hanifa and Kahar 2015), defined green accounting as a concept in accounting that supports the green movement by acknowledging, assessing, and reporting the environmental impact to the company's business operations. According to Kiranmai and Swetha (2018), green accounting is a comprehensive evaluation of the cost and efficacy of the organization in environmental conservation activities. Thus, it allows companies to recognize the cost of running the resources used and the costs expensed. To balance the manufacturing processes of the company with the demands for environmentally sustainable procedures, the company needs to apply green accounting. In short, green accounting can assist in sustainably enhancing the productivity and efficacy of the company's capital, which can be aligned with the advancement of environmental functions of the company and support the local community (Ulupui *et al.* 2020).

2.1.7 Sustainable Development

Keit (2011) described sustainable development as the incorporation of socioeconomic, and environmental aspects to organizing, implementing, and decision making to guarantee that construction serves current and the next generations to come. According to Klarin (2018), sustainable development should address fundamental human necessities while incorporating environmental development and preservation, ensuring social self-determination, accomplishing equality and cultural diversity, and preserving ecological integrity. Doorasamy (2014) states that sustainability became a topical concern many years ago, and this led to the idea of sustainable development as a result of increased environmental issues caused by increased production and consumption. According to Rosen (2017), sustainable development is a fast expanding, yet still comparatively recent subject that is progressively implemented in many fields. Furthermore, it represents humanity's desire to ensure that the practices conducted can be maintained in the future and do not negatively impact the environment and the ecological structures surrounded by it. Moldan, Janoušková and Hák (2012) described sustainable development as the application of natural renewable resources in a way that does not deplete, deteriorate, or otherwise minimize their effectiveness to generations to come. Moreover, it entails utilizing non-renewable mineral resources in a way that does not prevent future generations from having easy access to them. It is necessary for exhaustible energy resources to deplete at an adequately slower pace to maintain a good chance of an orderly societal transition to renewable ones.

2.1.8 Environmental management accounting tools

EMA provides a range of strategies and resources developed to help companies identify and mitigate their effect on the environment. Among these tools are, but not limited to input/output analysis, activity-based costing, life-cycle costing, flow cost accounting and target costing.

2.1.8.1 Activity-based costing

Activity-based costing is a technique used by businesses for estimating detailed costs. Further, it allows companies to delegate all costs, including cost centres, environmental costs and cost drivers based on operations (Wahyuni 2009). According to the Vinayagamoorathi *et al.* (2012), activity-based costing differentiates between environmental costs, which can be traced to cost centres, and environmental costs, which are usually buried in overheads. Environmental costs included in general overheads are removed and traced to product or service. According to Jing and Songqing (2011), the cost of a company's impact on the environment can be acknowledged using activity-based costing, which is used to allocate corporate environmental costs.

2.1.8.2 Input/out analysis

The company should track all inputs of material and all outputs of its production process in physical units. Material sources are products and packaging, raw and auxiliary materials, operating materials, resources, and water that are part of the enterprise. Outputs include finished goods, utilities, by-products, pollution, or waste (PapaspYROPOULOS *et al.* 2012). Input/output assessment is a technique that tracks and compares content inflows and outflows based on the premise that what comes in must go out (Vinayagamoorathi *et al.* 2012).

2.1.8.3 Flow cost accounting

This approach employs the organization structure as well as the material flows. It makes the material flows visible by examining the physical quantities involved, their expenditures and their significance. The goal of flow cost accounting is to cut down the number of materials used while improving the company's impact on the environment. This should further benefit the overall cost of a company in the nearest future (Vinayagamoorathi *et al.* 2012). In comparison to conventional approach, material flow cost accounting takes into account transparency of flow of materials and the incurring costs associated with the product and material losses during manufacturing processes. These cover all economic resources from raw material

losses (inputs) to waste disposal (Ulupui *et al.* 2020). The concept of MFA stems from the recognition that material resource flows are limited. Hence, products and services should be focused on the productive and effective use of natural resources (Skaf *et al.* 2019).

2.1.8.4 Lifecycle costing

Lifecycle costing is an environmental management accounting tool that focuses on product and the environmental impacts of the product (Muza 2018). Lifecycle costing considers the costs and profits of a product over a lifetime rather than a single accounting period. The full environmental effect of making a product will also be considered. In order to reduce the cost of a lifecycle, an enterprise can follow a TQM approach (Vinayagamoorthi *et al.* 2012).

2.1.8.5 Target costing

Target costing is a technique in which the firm prepares ahead of time for the price ranges, the cost of the product and the revenues expected from the new product. With target costing, the managers on the upper level have a valuable resource to continuously monitor products from the stage it was designed to the end of the life cycles (Cooper 2017). Target costing is commonly known as the effective strategy for managing costs including environmental costs. It has a comprehensive approach to managing costs, reducing product premiums early in the product planning and design process and attaining long-term profits/returns (Sharafoddin 2016). Whilst also target costing is a useful tool for developing strategies and managing resources, it necessitates an enhanced version of cost determination and control (Al-Qady and El-Helbawy 2016).

2.1.9 The Benefits of Environmental management accounting

Food and beverage manufacturing companies can benefit from the implementation of environmental management accounting. According to (Fuzi *et al.* 2019a), these advantages consist of compliance with environmental regulations, managing the resources used, enhancing efficiency, and growing profitability. Further benefits include competitive advantage, credibility of the business, minimizing environmental

costs, environmental decision-making and risk to the environment. CGMA (2012) highlighted the following benefits:

- Improved revenue- The knowledge of the customer on environmental effect of goods or services has a gradual impact on their preferences and purchasing behaviour.
- Cost reduction- Reduced use of production services has a direct positive impact on cost reduction. Improvements to the systems also minimize costs.
- Reducing failure costs- Getting involved in activities that reduce the impact and cost-effectiveness of failure, such as waste management or environmental clean-up.
- Improving organization's status- Improved status make it easier to hire better people, minimize talent return and the company is able charge higher prices.

Wahyuni (2009) added that these advantages would, in turn, boost corporate image by introducing environmentally friendly goods on the market and carrying out corporate operations with less adverse effects on the environment. EMA provides essential information for designing and executing pollution control measures, as well as implementing cost-effective alternatives to toxic materials. To accomplish ecoefficiency, EMA promotes simultaneous reduction of costs and environmental consequences through extra effective resource usages. The application of EMA will improve a company's long strategic position (Gunarathne and Alahakoon 2016).

2.1.10 Corporate environmental strategy

Environmental strategies are collection of measures which can minimize the effect of operational activities on the natural environment through processes, products, and business practices. This includes minimizing power usage and waste, adopting green sustainable tools, and implementing environmental management systems (Latan *et al.* 2018). Xie, Nozawa and Managi (2020) described corporate environmental strategy as collection of voluntary environmental strategies that reflect company's strategic capability. The three stages of environmental strategies include product stewardship,

pollution prevention and sustainable development as introduced by Hart (1995). Corporate environmental strategy increases employees' organizational commitment, voluntary environmental behaviour and organization's environmental performance. Thus, the success of an organization in presenting and applying a corporate environmental strategy is heavily reliant on employees' personal beliefs and behaviour (Das *et al.* 2019). Company environmental strategy tends to reflect how companies can minimize adverse impacts or bring positive results to ecosystems processes through sustainable products and markets. Thus, practicing green human resource management, employing environmental management systems and reducing energy consumption and waste will help to reduce the negative impact (Uddin *et al.* 2021). An environmental strategy will guide corporate policy towards the application of an environmental management system, which will include the application of EMA (Solovida and Latan 2017).

2.1.11 Environmental Sustainability

Environmental sustainability can be described as a type of stability, adaptability and interconnectivity that enables individuals to meet their desires by not surpassing the potential of its supporting ecologies to regrow the facilities required to meet up with those necessities or through our actions in reducing bio diversity (Morelli (2011). When manufacturing and advertising beverages, many companies claim socially or environmentally sustainable orientations, incorporating sustainability to their communications plan to strengthen their market positioning and brand (Rodriguez-Sanchez and Sellers-Rubio 2020). According to Morelli (2011), the term "environmental sustainability" is an extension of our general view of the nature of the human activity for proper integration with the environmental concept of interdependence and assistance to environmental managers to achieve their objectives. Sutton (2004) described environmental sustainability basically as the power to preserve the attributes appreciated in the natural environment. Also, it includes initiatives to minimize the utilization of natural resources as well as the implementation of a "reuse and purchase recycled" method. It promotes the usage of renewable resources rather than non-renewable ones, the remodel of manufacturing procedures and goods to eliminate the manufacturing of harmful substances and the

safeguards and preservation of natural environment valued for their responsibility or magnificence. Moldan, Janoušková and Hák (2012) highlighted that Goodland (1995) describes how the concept of environmental sustainability fits into the resource-constrained environmental economic structure of development constraints.

2.1.12 Environmental activities

Organizations are becoming more concerned about the environment and are searching for ways to inspire their employees to take environmental actions that will improve the environmental performance of their operations, products, and services (Ramus 2002). Corporate and individual action on environmental issues has been largely ignored in the past (Tapang, Bassey and Bessong 2012). Environmental activities are activities to reduce or eliminate environmental pressures and to make use of natural resources more efficiently. Examples include investing in pollution prevention or reduction technologies, repairing the environment after environmental damage, protecting the economy against the deteriorating environment, recycling, conservation, and management of resources and the production of environmental goods and services (OECD 2005). Csutora (2007) stated that by definition, EMA is connected to the cost of estimating environmental activities. Nevertheless, some benefits of investing in environmental activities include product properties, customer relationships as well as the reputation and image of the company. Ván and Gärtner (2011) also highlighted that environmental management accounting (EMA) seems to be more concerned with the costs of environmental activities than with the gains. Environmental benefits are frequently viewed solely as a cost-cutting measure or as a limited opportunity for revenue generation. Nevertheless, the profitability of environmental activities reflects a huge advantage for businesses (Ván and Gärtner 2011).

2.1.13 Environmental Accounting Information

Environmental accounting requires a company to disclose any activities that pollute the environment, as well as measure and report on the use of environmental assets. Because it is presumed that such activities have a substantial effect on the assets and performance of the company (Noodezh and Moghimi 2015). Stakeholders are

particularly frustrated about how businesses affect the environment, as well as the magnitude to which they participate in environmental safety and environmental damage preventive measures. Many businesses have reacted to pressure of stakeholders by willingly reporting environmental information in financial statements or in different environmental reports (Hassan and Ibrahim 2012). By reporting accounting information relating to the environment, the environmental safety department can master the overall situation of the environment and make an objective assessment of the corporation's ecological commitment. Disclosure impact managers' public image and social profile, as well as assist the public and investors in making sound investment decisions. Financial, environmental performance and policy elements of environmental accounting are spread throughout social responsibility reports and annual reports (Li *et al.* 2018).

2.1.14 Environmental performance

Environmental performance (EP) refers to ecological control of an organization regarding its aims, strategies, and environmental objectives. To assess the EP, the firm regulates the production process affecting the productivity of the materials used and reduces environmental pollution. The environment has an impact on the processes, products, or services provided by businesses that are using natural resources to dispose waste such as energy, raw materials, water, toxic products production wastes. As a result, EP allows for decisions to be made on the process of production which includes disposal of waste, environmental pollution and waste reduction (Fuzi, Habidin and Effendy 2016). According to Walls, Berrone and Phan (2012) environmental performance can be described as the result of a company's strategic actions that control (or do not control) its effect on the natural environment. These actions might range from proactive measures that require organizations to build certain competencies and resources to reactive solutions that satisfy (or fail to reach) regulatory demands just slightly. Jacobs, Singhal and Subramanian (2010) highlighted that better environmental performance provides open up to emerging markets. Environmentally responsible markets, with growing zeal for environmentally friendly goods, could provide opportunities for sales. Furthermore, environmental performance can have an impact on costs in numerous ways, such as decreasing the amount of

waste and the ingesting of numerous production inputs such as materials and energy. According to Gallego-Alvarez *et al.* (2014), environmental performance components include, among other things, pollutant reduction, resource conservation, reducing waste, energy-saving, promoting safe products, and disclosing possible hazards.

2.2 Conceptual review of plastic pollution

2.2.1 Plastic and plastic products

McLellan (2014) defined plastic as a smartly marketable and convincing slogan when taken at face value. Furthermore, the making of plastic is cleverly designed to last but most plastic items are used once and thrown away. (Vegter *et al.* 2014), state that most plastic products are durable, lightweight and cheap, which makes plastics a suitable material for the production of daily products. Plastics have suddenly become the commonly used product of the modern economy. The application of plastic has increased drastically in the previous ten years due to its supreme low cost of manufacture. Plastics and plastic packaging are essential components of the international economy which provide numerous advantages. Despite these advantages, their traditional linear and take-make-dispose process have important economic and environmental risks (Forum and Foundation 2017). Krueger, Harms and Schlosser (2015) highlighted that after a plastic item is used for its intended purpose, it will either be recycled, burned, or goes to landfills. Whichever path the plastic material follows after being disposed off, some will be missing and enter the environment.

Plastic can be found anyplace but mostly in the supermarkets. It is a necessary component of modern society's facilities. The design of plastic is flexible, inexpensive, last longer, lightweight, and bio inert. As a result, it has become the best material for a variety of applications including smartphones, food containers, and 3D printing. Plastics preserve fresh produce and aid in the reduction of food waste, allow for the layout of small vehicles, and protect power lines for maximum efficiency (Nielsen *et al.* 2020) The commonly single-use plastics discovered in the environment include plastic drinking bottles, food wrappers, plastic lids, cigarette butts, plastic bottle caps, plastic

grocery bags, plastic lids, straws and stirrers, other types of plastic bags and foam take-away containers (UNEP 2018).

Drinking bottles are significant plastic packaging application which accounts for at least 16% of the industry. While beverage bottles that are used once and disposed off are commonly collected for reprocessing, the material value loss after every cycle of usage is noticeable; including PET bottles in Europe, this loss exceeds 50% (Forum and Foundation 2017). Plastics are useful resources which cover a variety of applications in daily life and could be discovered anywhere, from home to organizations. Plastics are highly used as raw materials in essential business activities such as packaging, construction, transportation, healthcare, and electronic components (Milios *et al.* 2018). All plastic products become plastic waste after they have reached the end of their useful life ranging from short lifespan for plastic food packaging and all single-use products to an extended period for construction materials (de Kock *et al.* 2020).

2.2.2 Plastic pollution in the Ocean

Schreiber *et al.* (2020), highlighted a study carried out in 2014 which showed an estimate of 5.25 trillion individual plastic materials found floating in the ocean or the near-surface areas. The continuous accumulation of plastic waste in the ocean could kill marine animals through entanglement of plastic substances or digestion of plastics mistaken for food. According to Sibisi (2019), a lot of people in KwaZulu Natal became aware of plastic pollution after the April floods because of the pictures shared on social media of beaches, river mouths, and the Durban harbour. These places were covered with single-used plastic products. These plastic products were assumed to be carried by flood water from where they were disposed of and ended up in the ocean. Hancock (2019), described the plastic problem as a global emergence especially in the ocean because of the quantity of plastic waste which enters the oceans. This menace eventually pollutes beaches, food supply and kills marine wildlife. Reddy (2018) highlighted that many sea turtles and birds died of starvation because of ingesting plastic, mistaken for food and believing they have eaten. Furthermore, the degree of

reproduction of sea turtles is affected by plastic pollution which change the temperatures of the sand where incubation occurs.

Plastic pollution in the ocean is a fast-growing environmental issue faced worldwide. This issue has a great focus on international supply which is pushed by an exponential increase in manufacture. Seabirds are exposed to this form of pollution by consuming floating plastic (Wilcox, Van Seville and Hardesty 2015). Tons of microbeads entering lakes, rivers and oceans, eventually end up in fish seabirds, zooplankton, whales, coral and shellfish (Dauvergne 2018). Macroplastics are shown to endanger wildlife physically. A large portion of the harm is caused by the physical impact of plastics, which occur when animals consume macroplastics, which then clog their digestive systems. Macroplastics can also entangle wildlife by making it difficult for them to move, feed, or breed (SETAC 2019).

Once plastics or plastic products enter the marine environment, they cut down and fragment into smaller pieces. Researchers are increasingly conscious of the fact that such pieces of plastic or small pure pellets of plastics pose a serious risk to aquatic environments (Vegter *et al.* 2014). Presently, there exists no international approach for managing marine plastic pollution that matches the magnitude of the issue. Coordination of policy is limited at the international level, and governance is fractured product lines and sectors (Cristi *et al.* 2020).

2.2.3 Plastic pollution on land

Plastic pollution on land results to blocked drainage systems by virtue of the pieces of plastic bags, films, and other items which litter the environment. Land birds and animals that feed on these littered plastics have been discovered to have pieces of plastic materials in their stomachs. The expansion of waste dumps in residential areas is causing tremendous havoc to the populace living close to the dumping site of these piles of residual plastics (Schreiber *et al.* 2020). According to (Anon 2018), plastic pollution poses serious threats to plants, animals, and humans who are based on land. A small number of plastics which are disposed on daily basis are recycled and thereby ends in landfills where they release toxic substance into the soil and water. Gionfra

(2018), highlighted that most plastic items found in the marine environment have been produced, consumed, and disposed off on land where they also pollute and damage the terrestrial environment. The level of microplastics pollution on land has been observed to be higher than microplastics pollution in the ocean.

The ecosystems may have a higher accumulation of the environment than marine environments because of the high intensity of plastic materials in terrestrial environments, the limited surface area and a wide range of distribution processes (Windsor *et al.* 2019). In year 2015, a small portion of plastic waste was recycled, the other portion was burnt and the rest of the waste material was accumulated in the landfill. Plastic waste dumped in the landfill is approximately 79% of the waste generated each year. The industrial processing of a small portion of plastic waste collected may negatively affect human health and the environment (de Kock *et al.* 2020).

2.2.4 Plastic pollution on human health

The removal of resources for plastics includes aggressive processes that discharge dangerous chemicals into the environment and pollute the environment. Thus, when a plastic item becomes waste, technologies used to recycle the waste release toxic metals into the surrounding air, soils, and water. Therefore, plastics affect human health in every process of its life cycle (Hall 2020). According to Azoulay *et al.* (2019), plastic has toxic substances that affect human health during its life cycle. Plastic can impact human health through exposure to these substances. It can affect human health through inhalation, ingestion and skin contact. According to (Andrews 2020), lead, cadmium, and mercury are plastic toxins found in fishes in the oceans which are very dangerous when ingested by humans. These toxic substances may cause health problems such as cancer, birth defect, immune systems problems, and childhood development issues. It has been mentioned in some media reports that the intake of finfish and shellfish contaminated with microplastics may pose a threat to human health (Thompson 2017).

2.2.5 Consumer's behaviour to plastic pollution

Consumer behaviour is the study of persons, groups, or organizations and all behaviours related to the purchase, use, and disposal of products and services, and how customer feelings, perceptions, and desires influence purchasing behaviour (Wikipedia 2020). Consumer's lifestyle is evolving, and the usage of plastic is becoming popular due to its convenient use. Human behaviour is complex and difficult to understand. However, the consumers can be motivated to properly handle plastic waste (Khan, Ahmed and Najmi 2019). According to Barrett (2019), the impact of plastic on the environment has captured the attention of consumers worldwide. About 48% of consumers around the world expect the manufacturers to lead and take the responsibility to act on the issue of plastic pollution. Horská, Pulatov and Abdirashidov (2015), state that effects on the consumer's behaviour could be a solution to reducing the ingestion of plastic bags which could lead to greater plastic pollution.

2.2.6 Measures for reducing plastic pollution.

According to Sibisi (2019), the solutions to reducing plastic pollution which affects the environment and water streams lies in the hands of consumers, South African corporates, businesses and retailers. Reusable packaging, innovative delivery systems, and a complete overhaul of the current business models could assist in addressing plastic pollution. According to Engler (2016), the following methods could be adopted by any individual to reduce plastic pollution; cooking more and buying less takeout, avoid buying single-used products and water, recycle, purchase second-hand items, use beauty products extracted from nature, buying in large quantities, supporting a bag ban, using your garment bag to drycleaners and buying alternative products instead of plastic products. Dell (2019) proposed that cities can assist in reducing plastic pollution in the environment through restrictions on single-use plastic distribution, promoting the use of water refill station, reward those who cut plastic waste in their practice, making the retailers responsible for their waste, identifying pollution hotspot and create campaigns which fight against plastic litter.

The act of curbing plastics pollution involves an appropriate life-cycle perspective to boost efficient decision to dispose at the end of the life cycle. This includes discouraging the creation and ingestion of products with high social disposal costs and boosting lower-impact, easily recyclable, and reusable product designs (Abbott and Sumaila 2019).

2.2.6.1 Recycling plastic waste

One of the common methods used to reduce plastic pollution is recycling. Plastic recycling is a method for scrap reuse or plastic waste and the recycling of the material into usable items. Thus, plastics can be reprocessed several times, depending on the nature of the fraction of waste retrieved in the process and still maintain its value and functional properties (Milios *et al.* 2018). Waste plastic recycling is an environmental solution to the disposal of plastic waste issue which has become a standard practice in the industry (Gu *et al.* 2017). (Satapathy 2017) stated that the recycling of plastic products eradicates plastic materials on landfills and helps plastics to be reused in the production of new products.

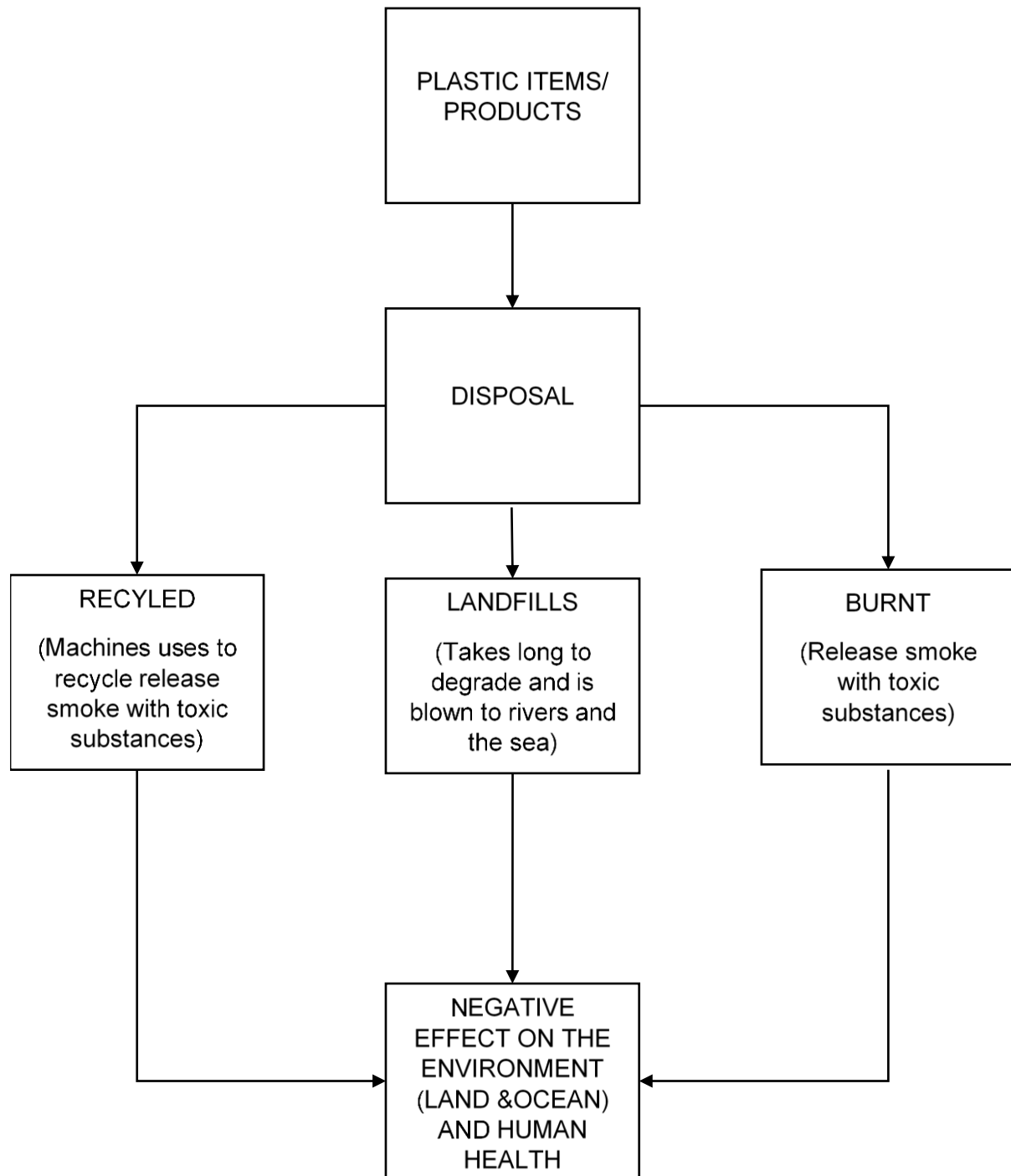
End-of-life plastics are rarely reused or recycled, especially when matched with other materials such as glass, metals or paper. Recycling has widespread approval and enhances plastic waste management. It is undoubtedly less contentious than controlling plastic usage or manufacturing (Nielsen *et al.* 2020). Plastic recycling does not only minimize the amount of waste that must be managed through other methods such as landfill, but it also reduces the need for fossil oil and gas to manufacture new plastics. (Thompson 2017).

2.2.7 Poor waste management

When plastic waste is not retrieved, it contributes significantly to pollution. Plastics are typically distributed as waste in the environment because of poor waste management practices that do not effectively treat or curtail plastic materials (Milios *et al.* 2018). According to Makgae (2011), key issues with waste management in South Africa include lack of waste collection service in cities with illegal dumping, unlicensed waste management activities, a large population, lack of space at permitted landfills,

insufficient waste minimization and recycling initiatives, and a lack of waste information. According to Lenkiewicz (2018), population growth, increasing urbanization and changes in consumers' lifestyles will lead to a greater volume of solid waste around the world in the few years to come. When waste is not effectively managed, it could end up in drains, rivers and eventually the ocean. Moreover, poor management of solid waste negatively affects the environment, human health, and local economies. Ritchie and Roser (2018), state that countries with high-income create additional waste per person. However, these countries have an effective waste management control likened to middle-and low- income countries. In comparison, this means that low-and middle-income are the major source of plastic pollution that end up in the ocean.

Figure 2.1: Plastic Waste Cycle



Author's Design (2020)

2.3 Empirical Review

2.3.1 Review on environmental management accounting

A study conducted by Ambe, Ambe and Ganda (2015), which assessed the implementation of EMA on a service organization showed that the implementation of EMA is very weak. Hence, the study identified the following barriers: institutional pressure, a low profile of accounting for the environment and the attitude of management. However, Iredele and Ogunleye (2018) established that the level of EMA practices in the Republic of South Africa is high and the main barrier preventing EMA practices is the financial barrier. Nyide (2019) explored environmental management accounting in hotel sector in South Africa. The study determined that the implementation of environmental management accounting in this sector is limited due to lack of awareness of the existing framework that is employed and the implementation of these practices is voluntary. A study conducted by Smit and Kotzee (2016) revealed that the level of consciousness of EMA in the chemical industry in South African is good. Hence, associations are applying sound natural practices and are embracing ecological methodologies and apparatus to increase their present status.

Doorasamy (2016) investigated the observation of management on the gains of implementing EMA systems as a tool for waste management in a paper and pulp manufacturing firm. It was discovered that environmental costs were recorded as general overheads and not assigned to specific products or processes because the firm used the traditional costing method. Furthermore, the firm did not regard the environmental costs as crucial. Therefore, they saw no need to implement the environmental management accounting tools. A prior study by Doorasamy and Garbharran (2015) investigate EMAs' role in calculating environmental costs using a paper manufacturing company in a developing country. The result indicated that the company disclosed incorrect environmental costs in their financial documents. This was due to the fact that these environmental costs were previously recorded as production costs.

Mohd Ariffin (2016) conducted a study to determine if there is a need for companies to implement EMA. The results obtained were based on the diffusion innovation perspective which revealed that most companies do not prioritize environmental concerns. Therefore, these companies do not see the need to change their conventional accounting systems and they regarded EMA as unsuitable to them. A study conducted by Muharram (2017) found that construction companies have knowledge on the importance of EMA and consider it a very important aspect. A study by Järvenpää and Lämsiluoto (2016) demonstrates the significance of institutional logic and collective identity in comprehending EMA projects change. Generally, the findings showed that incorporating environmental concerns into practical decision-making and operational activities may likely be far more difficult than anticipated.

A study carried out by Muhammad Jamil *et al.* (2015) looked at the factors affecting the application of EMA practices in small-medium manufacturing companies. The findings indicated that most companies have budgets allocated to physical environmental management accounting and environmental activities. Thus, the prevailing factor affecting the implementation of environmental management accounting is coercion. Consequently, the government and other bodies should promote EMA practices and resolve any barriers to its development. Asiri, Khan and Kend (2020) also discovered that coercive pressure has a significant impact on the execution of EMA practices, and hence, the government should facilitate it. A study conducted by Qian, Burritt and Chen (2015) determined that normative institutions tend to minimize the beneficial effect of authoritarian and cognitive institutions on the growth of the EMA. Iredele, Tankiso and Adelowotan (2019) conducted a study that revealed evidence in the analysis that encourages both institutional and contingency hypotheses as they refer to EMA procedures. The findings suggest that coercive pressure may likely be appropriate to promote the application of EMA.

A study conducted by Wang, Wang and Wang (2019), observed the effect of institution pressure on the application of environmental management accounting. The findings showed that mimetic pressure has an insignificant effect on the application of EMA while normative pressure and coercive pressure have a positive and significant impact. Jalaludin, Sulaiman and Nazli Nik Ahmad (2011) findings revealed an impact of

institutional pressure on EMA adoption. From these assertions, normative pressure in terms of training and accounting body membership was discovered to be the most influential. Results from Muhammad Jamil and Mohamed (2017) study also suggest that coercive and normative influences have had a substantial effect on EMA practices that support the assertion that regulatory and industry factors would contribute to an increase in EMA practice. Chathurangani and Madhusanka (2019) determined that the pressure to implement environmental management accounting in manufacturing firms is positively influenced by education, training, and politic. Thus, coercive isomorphism has a significant role in pressuring the firms to adopt environmental management accounting. Further results in this study supported the practical implications of the role of the accountant and the political/legitimate impact of the company in handling environmental issues.

A study carried out by Qian, Horisch and Schaltegger (2018), revealed that the application of environmental management accounting tools positively impacts corporate carbon management and quality disclosure. Latan *et al.* (2018) carried out a study that focused on the role of EMA while investigating the impact of the collaboration of corporate environmental strategy, environmental uncertainty and top management commitment. The results showed a positive and major result between all of them on the application of EMA. These findings indicated that EMA is a relevant and significant tool for providing information to attain superior corporate environmental performance. Hajizadeh (2019) highlighted that environmental accounting and reporting is a useful tool for better environmental management and therefore, should be made compulsory for companies that cultivate the habit of plastic pollution. The study found that there is poor environmental information disclosure in developing countries because there is no standardize requirement to disclose.

Ji (2017) found that environmental accounting information disclosure of listed companies is very unclear and confusing because the user has no method to follow, and it is difficult to find information relating to the environment. According to Ahmad (2012), if companies include environmental accounting information on their annual report, this will paint a green image about the firm and emphasized the need for environmental accounting. Krivačić and Sandra (2017) highlighted that environmental

information forms part of the firms' social responsibility, and it is moral for businesses to collect and report such information. The findings revealed that managers believe that companies perform environmental reporting for ethical reasons, and it has nothing to do with the operations of the business.

According to the findings of a study conducted by Fuzi *et al.* (2019a), environmental safety is the key critical success key which plays a vital role in ensuring safety consciousness at a workplace. Thus, it revealed that for manufacturing firms to enhance their performance, they have to attain critical success factors of implementing EMA practices. Le, Nguyen and Phan (2019) determined that professional education network, community expectations, government enforcement, financial condition, stakeholder interest and positive environmental strategies affect the application of EMA positively. In a study conducted by Christ and Burritt (2013), current and future EMA use were linked to environmental plan, organizational size and environmentally sensitive organisations. Organizational structure was exempted from the report linking accountants' perceptions of EMA use in their organizations, contrary to expectations.

A study carried out by Fuzi *et al.* (2019b) investigated the duty of information systems in facilitating the relationship between EMA practices and organizational performance. The findings showed a partial mediate effect and revealed that most manufacturing firms are implementing EMA practices to improve organization performance. Further, Al-Mawali *et al.* (2018), determined a correlation between organizational performance and environmental management accounting. Agustia, Sawarjuwono and Dianawati (2019), conducted a study that showed that green innovation influences environment management accounting, while environmental management accounting influences firm value. Jermsittiparsert, Somjai and Toopgajank (2020) found that green innovation, environment proactiveness, and environment management accounting possess a significant effect on environmental performance and energy efficiency. A study on innovation, environmental management accounting, and future performance by Agustia (2020) tested hypotheses. The findings revealed that EMA has irrelevant and adverse effect on innovation. However, innovation positively influence future performance. According to an earlier study by Burritt *et al.* (2010) EMA use is associated with innovation of process but not product innovation. The level of

dedication to research and development drives the effect of strategy on innovation. Nevertheless, no statistically substantial relationship was discovered between EMA use and strategy. Industry was the primary motivator for the use of EMA.

In a study carried out by Phan, Baird and Su (2017) the findings showed a moderate level of PEMA use and a limited level of the use of MEMA. The usefulness of the EMS and managerial support were discovered to have an impact on the use of EMA. Furthermore, entities that used EMA to a greater degree, particularly MEMA, were associated with increased levels of environmental performance. The research results extend backing to the promotion of EMA propagation in practice.

A study conducted by Iredele, Ogunleye and Okpala (2017) determined that the listed firms show a low level of adoption of EMA practices and also found that EMA practices have no substantial effect on the financial performance of these companies. However, based on Okegbe and Ofurum (2019) findings, it was concluded that environmental-related cost management has a positive influence on the profitability of consumer goods firms. Mokhtar, Jusoh and Zulkifli (2016), discovered that the execution of environmental management accounting by the public listed firms was moderate and these listed firms focused on environmental cost-effectiveness activities. Ismail, Ramli and Darus (2014) study revealed that Malaysian businesses have adopted EMA practices to a reasonable extent, and it overcame the issue of conventional management accounting which does not account for environmental hidden costs. According to Shakkour *et al.* (2018), most companies often overlook large environmental costs.

Albelda (2011) findings suggest that by emphasizing the four EMAS important elements, management accounting practices serve as a coordinator system for environmental sustainability. Commitment to continuous enhancement of environmental performance, comply with environmental regulations, interaction with stakeholders, and employee participation are among these elements. Accounting serves as both a facilitator and a barrier to further accountability-based environmental management, according to the facts. While Gunarathne and Lee (2015) study found

that the hotel studied had strengthened its EMA practices in a quick, cost-cutting attempt due to lack of funds.

In Tanc and Gokoglan (2015) study on the impact of environmental accounting on strategic management accounting in manufacturing firms, the researcher determined that the application of environmental accounting adds value to the business, increases social responsibility, and gives the company a competitive advantage.

Muller, Mendelsohn and Nordhaus (2011) findings showed that marinas, sewage treatment, solid waste combustion, stone quarrying, and oil and coal-fired power plants have damages relating to air pollution more than their value-added but the leading contributor with the largest external cost was said to be coal-fired power plants. The study concluded that it is actually possible to have national accounts which include pollution. The study conducted by Yuhang, Jiayi and Zhuokai (2019) relating to cost accounting of environmental degradation through pollution loss method showed that it is difficult to manage loss orchestrated by pollution, and thus, the cost of pollution control usually differs from the loss caused by pollution. The study carried out by Araoye *et al.* (2018) showed that the impact of pollution cost is irrelevant to economic growth and encouraged an increase in fines and penalty of oil spillage and gas flaring to discourage oil and gas companies from polluting the environment.

Jing and Songqing (2011) found that due to how complex environmental costs are, the process of decision is more challenging in the specific application. It was further stated that using activity-based costing could assist in provision of accurate and detailed information on environmental costs. According to Tsai, Lin and Chou (2010), activity-based costing assists managers in understanding accounting information concerning the activities of environmental protection and the proportion of environmental costs in the overall cost of product. Thus, assist the manager in making an accurate and objective decision. Rakos and Antohe (2014) stated that an environmental cost is a useful tool that provides correct information for decision-making in economic activities and the publication of annual reports. Mazahrih (2019) conducted a study that investigated the relationship between incorporating the environmental costs into the accounting information system and enhancing decision making process. The

researcher's findings showed a positive relationship between the variables and also highlighted that the inability to integrate would result in loss of opportunities. The researcher further stated that there are companies that do not show their environmental costs information, and which disclose inadequate environmental cost information, but this does not affect decision making. Mieseigha and Ihenyen (2014) investigated strategic business decision and environmental cost accounting information and found that these variables were related. Thus, found that environmental cost accounting information is important in strategic business decision making.

2.3.2 Review on Plastic Pollution

Krueger, Harms and Schlosser (2015), described synthetic polymer as the kind of plastic that takes longer to degrade and as it keeps piling up in the environment, it is causing harm and pollution. However, If the synthetic polymer is replaced with bioplastics such as polyhydroxy alkenoates or polylactide, this might somehow ease the tension in the environment. Eriksen *et al.* (2014) highlighted that even though the southern hemisphere has less population compared to the northern hemisphere, their plastic waste is in the same range. Thompson (2017), reviewed the evidence on plastic pollution floating in the ocean. The study concluded that plastic pollution is a global environmental problem which affects the environment with plastic remains polluting sea creature from the equator to shoreline and sea surface to the deep sea. Viool *et al.* (2019), highlighted on how difficult it is to address marine plastic litter especially in terms of prevention and clean-up costs. Above all, the assessment revealed that marine plastic pollution affects the national economy by impacting the core economic sectors or, through the need to remove waste which require more resources and expenditure.

Windsor *et al.* (2019) study focused on the effect of plastics and how plastics are transported across marine, terrestrial and freshwater environments. Results obtained earlier during the study showed that rivers are pruned to plastic pollution as they connect with flood-plain, benthic, terrestrial, riparian and transitional ecosystems. The

study also showed that plastic may pollute the ecosystem in small fragments and macro fragments and identified some opposing effects within natural systems.

Abbott and Sumaila (2019) conducted a study on the reduction of marine plastic pollution as this is a growing problem for scientists and policymakers. However, economists are not focusing much on the issue. The researcher concluded that countries with high marine plastic pollution can reduce plastic outflows by tackling the design and producer's decisions on production. Thus, addressing the rate of consumption and disposal decisions of consumers. These approaches must be done in a smart way to the realities of social norms, local institutions and markets for recyclables. Furthermore, policymakers have a critical role to play in making sure these approaches are in motion.

According to Jia, Evans and van der Linden (2019), policy interventions to reduce plastic pollution should not only reflect economic costs and benefits but also behaviour. Both individuals and businesses should be encouraged to work together in addressing plastic pollution. The study highlighted that even though the recycling rate of plastic packaging has increased, companies are not fully encouraged to assist in reducing plastic pollution and compliance fees are low to force plastic producers in adopting an eco-friendly method.

Nielsen *et al.* (2020) conducted a study that investigated politics of plastics, it was highlighted that plastic has many benefits. However, the plastic product is being recognized as a core environmental problem. The researchers followed a plastic life cycle and discovered that discussions on plastics are focused more on disposal and pollution at the end of its life cycle with emphasis on marine pollution. The researcher's findings revealed that the plastics life cycle is political but undeclared yet. Scientific evidence revealed problems with sustainability at all phases of the plastics life cycle which are marine pollution and plastic waste.

Barnes (2019) established a link between income per capita and mismanaged plastic waste, and further determined empirical backing for environmental Kuznets curve using plastic pollution data. The findings of the research work revealed that the

mismanagement of plastic waste is the key contributor to plastic pollution in the ocean. It further confirmed the environmental Kuznets curve on plastic waste which are mismanaged, a relationship between engineering and scientific research output, and plastic waste mismanagement.

Xanthos and Walker (2017) conducted a study that reviewed international-marketed policies and strategies to reduce microbeads and plastic bags. It was determined that some countries still lack the implementation of strategies to cut plastic bag pollution. Most nations have developed a policy to sanction the sale and use of microbeads. Bans and levies are policies in place to reduce plastic bag pollution. According to Wagner (2017), levies and plastic bag ban drastically reduced the usage of single-use plastic bags and has motivated the consumers to use reusable bags.

A study conducted by Dauvergne (2018) determined that turnovers in the plastic companies exceed US\$600 billion globally on annual basis and this will continue to increase. The study also highlighted that it will be difficult to reduce marine plastic pollution from packaging tyres, consumer products and clothing because of resistance to anti-plastic norms and higher costs.

Gionfra (2018) investigated plastic pollution in soil and found that microplastic pollution on land is said to be higher than in the ocean. The study showed that plastics are being used for agricultural purposes which further results in soil pollution. Wang, He and Sen (2019) study discovered that large number of tiny plastics are found in the Chinese coastal environment. Furthermore, due to the fact that China is the largest producer of plastic globally, they are working on reducing the manufacture of plastic and pollution resulting from plastic waste in the ocean. A study conducted by Naidoo, Glassom and Smit (2015) found that microplastic levels were measured in five waterways along the city of Durban shoreline and nearby beaches. Thus, plastics were identified and purified from nearshore sediment, surface water and beach sediment in each waterway. The Bayhead area of Durban Harbour possesses the largest average plastic concentrations, with an amplifying concentration pattern away from the city centre discovered. According to Matsuguma *et al.* (2017), microplastic pollution began in 1950 when sediment cores from Japan, and its huge amount improved markedly

toward the outer surface in the 2000s. The profusion of microplastics rose towards the surface in all sediment cores from Malaysia, Thailand, Japan and South Africa, indicating the global occurrence of an upsurge in microplastic pollution over time.

Satapathy (2017) conducted a study that analysed limitations to recycling of plastic in the plastic industry and proposed a methodology to be used in handling those barriers. The study determined the following barriers: financial aids, lack of awareness, lack of proper government policies, and low demand for recycled products. It was concluded that for the successful adoption of recycling, all these barriers need to come together so as to overcome the problems. A study conducted by Khan, Ahmed and Najmi (2019), aimed at exploring the insight of consumers with regards to plastic waste recycling. The findings showed that awareness consequences, subjective norms and convenience influence the consumer's perception. Moreover, consumers are more likely to be involved in recycling activities if they see others do it and if they are informed of the environmental effect of plastic waste. Thus, the ease of recycling motivates them to actively participate in recycling activities.

A study carried out by Lau *et al.* (2020) revealed that immediate and concerted action, integrating pre-and post-consumption approaches, can mitigate the rising pattern of environmental plastic pollution. The study further found out that approximately 78% of plastic waste can be eradicated by 2040 through the use of existing information and technology. Helinski, Poor and Wolfand (2021) investigated plastic pollution technology called receptacles, booms and watercraft vehicles which can assist in reducing plastic waste in freshwater. It was discovered that although these devices can assist in the reduction of plastic waste in freshwater, management of plastic waste at the source is also required to clean our oceans and waterways in the long run. While Schmaltz *et al.* (2020) identified 52 technologies that fall into one of two categories: prevention or collection of plastic pollution, 59% specifically focused on retrieving macroplastics waste already in waterways. Even though these means of collecting plastic pollution are admirable, their current capacity and widespread implementation pale in comparison to their potential and the scope of the plastic pollution problem.

Avery-Gomm *et al.* (2012) discovered that most of seabirds have consumed an average amount of plastic. Plastic consumption in these fulmars is one of the highest ever recorded. When compared to previous North Pacific studies, our findings show an increase in plastic ingestion over the last 40 years. Chae and An (2018) reviewed articles on plastic pollution in the soil environment and found that earthworms are generally used as the test species in investigations of soil plastic pollution effects on organisms.

Beaumont *et al.* (2019) found a positive correlation between marine plastic pollution and adverse effects on a wide variety of ecological subjects and ecosystem services from a national to international scale. Furthermore, it is clearly seen that the cost of marine plastic pollution affects the economy and the welfare of the society. Costs discovered were associated with facilitating green operation and fishing in an environmentally friendly manner.

According to a study by Shen *et al.* (2020) biodegradable plastics (BPs) have the potential to effectively protect and improve the environment, as well as significantly promote the development of environmental protection. However, it appears that producing BPs is much easier than treating them. The performance of BPs is heavily contested. There is no definitive answer as to whether BPs can be a viable solution to the waste disposal problem and global plastic pollution.

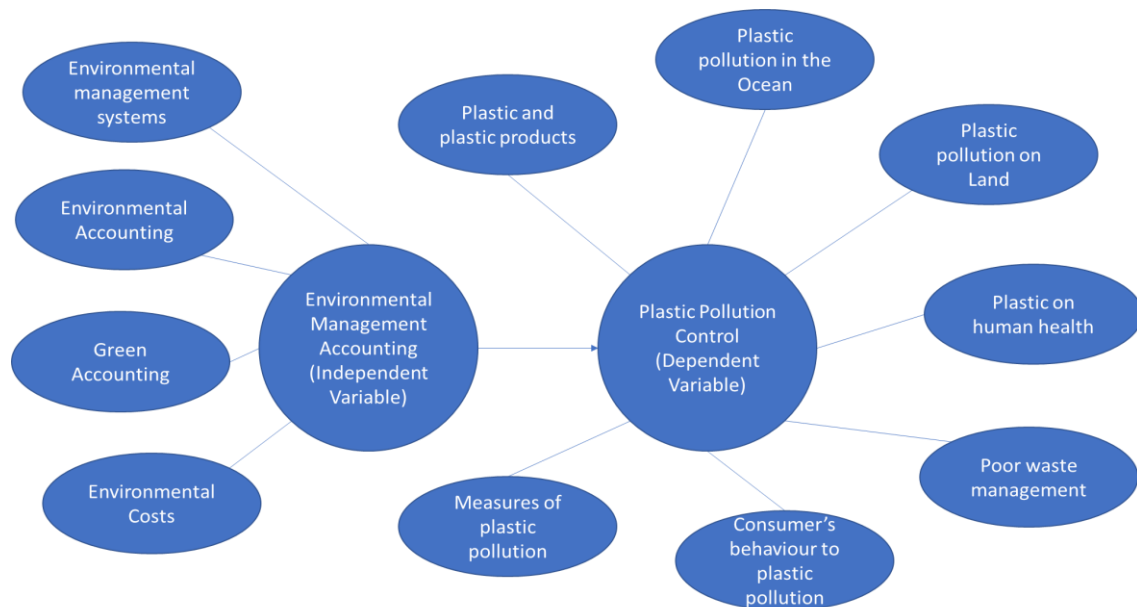
Marks, Miller and Vassanadumrongdee (2020) found Thailand's inability to eliminate plastic waste in the ocean was attributed to lack of rewards to implement governmental change, scalar disengages in waste management, and inadequate public and private ownership over plastic waste.

Results obtained by Phelan *et al.* (2020) indicated that improved waste management is critical for such Indonesian coastal communities. Furthermore, accountable supply chains, as well as non-plastic options, are required. Production companies cannot concentrate solely on low-cost packaged goods without accepting accountability for the results anymore. Island nations and nearby marine ecosystems will continue to be

flooded with plastic pollution unless they have access to compostable, environmentally friendly products and a plastics recycling system.

2.4 Conceptual Framework

Figure 2.2 Conceptual Framework



Source: Author's design (2020)

2.5 Theoretical review

2.5.1 Environmental Cost Reduction Theory

According to (Araoye *et al.* 2018), environmental cost reduction theory implies that the lowest environmental costs will be achieved if there is zero impact on the environment. The theory considers defining environmental costs before providing environmental cost information.

2.5.2 Stakeholders Theory

According to Michelon *et al.* (2016), stakeholder theory state that organizations are connected by a variety of stakeholders both internal and external. The concerns of

these stakeholders need to be recognized and addressed for the continual existence of the organization. The general idea behind stakeholder theory is that a company's success is dependent on how well it manages all of its interactions with its stakeholders (Iredele and Ogunleye 2017). Chen and Roberts (2010), stated that this theory opposes other theories because it focuses on the relationship between the organization and its stakeholders including the environment. Overall, stakeholder theory recognizes that different stakeholder groups have different views on how a business should be conducted (Maama and Appiah 2019).

Stakeholder theory is thought to be an interpretable theory in environmental management accounting. It entails recognizing and identifying the relationship that exists between the company's behaviours and their implications on its stakeholders. The stakeholder theory perspective considers the company's environment, which includes consumers distributors, staff members, and other categories of community (Ofoegbu, Odoemelam and Okafor 2018).

2.5.3 Resource dependency theory

Chen and Roberts (2010) highlighted that resource dependency theory is not worried about social expectation but focused on the effects of the environment on organization and attempt to explain those effects. This theory specifies that organizations must work hand in hand with other entities to acquire resources they do not have. Moreover, firms rely on the environment for survival and growth because they are not self-sufficient.

2.5.4 Monetary accounting theory of environmental pollution

The monetary accounting theory of environmental pollution involves measuring the monetary flow of environmental pollution in current economic accounting, especially expenditure on environmental protection. The theory also evaluates environmental degradation costs based on physical accounts and the economic cost of pollution accidents (Araoye *et al.* 2018).

2.5.5 Institutional theory

The institutional theory focuses on the connection among the organization and its environment, particularly with firmness and continued existence of the organization. This theory stresses how firms can integrate ingrained norms and rules to increase solidity and improve their chances of survival. Furthermore, complying with these norms and rules leads to legitimacy and to receive assistance and attract resources (Chen and Roberts 2010);((Michelon *et al.* 2016). According to (Muhammad Jamil *et al.* 2015), this theory investigates how organizational pressures such as the government, professional bodies and the society surround companies from organizational structure and actions. Thus, the isomorphic concept is important in the institutional theory and generally involves the following mechanisms: coercive pressures, imitative pressures and socially contracted pressures. According to Chaturangani and Madhusanka (2019), the theory is useful because it addresses the institutional factors in the conduct of businesses and their workers. According to institutional theory, the external and organizational environments, such as legislation, principles, cultural practices, common understandings, standards, and social expectations have strong influence on organizational behaviours and practices (Wang, Wang and Wang 2019).

2.5.6 Legitimacy theory

Michelon *et al.* (2016) highlighted that legitimacy theory defines companies as social creatures whose survival lies in the willingness of the people to support them. According to Chen and Roberts (2010), this theory concentrate more on whether the organization's value system and society's value system are consistent with one another. It further focuses on whether an organization's objectives connect with beliefs of the society. However, legitimacy theory does not state how the congruency could be attained or how to formulate action.

The concept of organizational legitimacy is the foundation of legitimacy theory. It gives a company the responsibility to carry out its operations in accordance with the interests of society. Hence, organizations strive to conduct business within the standards and expectations of their surrounding communities (Ofoegbu, Odoemelam and Okafor 2018). According to Maama and Appiah (2019), the theory of legitimacy depends

directly on the concept of a social contract. This concept concentrates on how organizations rely on their environment, the differing expectations of the community, and how a company seeks to rationalize its presence in society by legitimizing its activities.

2.5.7 Contingency theory

This theory was introduced in the 60s and remains at the heart of management accounting research. The basic tenet of this theory is that the application of Management Accounting Systems varies based on the situation of each company. (Mokhtar, Jusoh and Zulkifli 2016). According to Christ and Burritt (2013), contingency theory is commonly used theoretical method to modern management accounting research, a discipline developed by EMA. Even though this theory gained a lot of attention in general accounting management literature ten years ago, the utilization of contingency theory in EMA studies was claimed to be weak. However, a study conducted by Qian, Burritt and Monroe (2011), highlighted that as contingency theory emphasizes on competence and practical of the company, most environmental accounting researchers have not used it because it appears that it is widely accepted that ecological actions and transformations are driven or imposed by a larger social system within which organizations operate.

2.6 Theoretical Framework

This study will be based on stakeholder theory and environmental cost reduction theory. The reason for choosing both theories is because they are both suitable for this study. Plastic wastes pollute the environment by affecting land, ocean, and humans after disposal. Different stakeholders are pressuring firms to conduct their businesses responsibly and ethically by reducing their environmental impact on the environment caused by their economic activities. The problem of plastic waste in South Africa is forcing different parties to take action in minimizing the impact of plastic pollution on the environment. According to Iredele and Ogunleye (2018), reducing the negative impacts of firms' activities on nature and accounting for them is the duty of firms. Subsequently, this has contributed to the advent of EMA practices. It is crucial in decision-making to give accurate cost information. The awareness and necessity to

care for the environment will result to environmental costs to be recognized, precisely estimated, and disclosed regularly with companies' overheads before distribution to products or processes.

Such theories are connected to the issue that occurs between the organization and other stakeholders, including the environment, in which an organization strives to operate within the best interest of these stakeholders.

2.7 Summary of literature and Identification of gap

Articles relating to this topic are scarce, however, there are articles relating to the use and implementation of environmental management accounting in the South African hotel sector, the impact of plastic pollution, and possible solution to plastic pollution. Many scholars focused more on the disclosure of environmental accounting information, environmental costs, and other environmental issues such as emissions. Other researchers looked at environmental accounting and sustainable development, the role of environmental accounting, and strategic cost management. There is no existing study which specifically relates to this topic conducted in Durban using food and beverage manufacturing firms as a case study. Therefore, there is a need to conduct a study that looks at how environmental management accounting can contribute to reducing plastic pollution which is one of the environmental issues faced by South Africa. The researcher will use the food and beverages manufacturing firms because most of the pollution caused by plastic is from single-use plastic used for the carriage and packaging of food and beverage.

CHAPTER THREE

RESEARCH METHOD

3.0 Introduction

The previous chapter provided an overview of the literature on environmental management accounting and plastic pollution. The chapter explained concepts that are related to the variables as well as theories. The previous chapter discussed previous studies conducted by other researchers. This chapter will discuss how the research is to be carried out, as well as how data will be obtained and analyzed. The chapter focuses on the following areas: the research design, targeted population, sample and sampling techniques, research instruments for data collection, data collection procedures, and data presentation and analysis procedures.

3.1 Research Design

The most suitable technique for defining valid research is to follow the research paradigm (Rahi 2017). The study follows a positivist research paradigm. The positivist paradigm states that genuine occasions can be watched observationally and clarified with a coherent examination. This paradigm is commonly associated with quantitative and experimental research (Ryan 2018a). Positivists can predict the future with certainty once the cause-effect relation between the phenomena is established. Since the positivist technique focuses primarily on experimental research and hypothesized relationships about the cause-and-effect relationship among occurrences are placed forward in a propositional or debatable form. Afterwards the researcher collects verifiable research which is analyzed and expressed in the terms of a theory that seek to explain the influence of the independent variable on the dependent variable (Rehman and Alharthi 2016).

A quantitative method was used in this study. According to Skhosana (2011), this research approach deals with numbers and anything quantifiable in a systematic process of investigating a phenomenon and their relationship. A quantitative approach can be used to answer research questions about relationships between quantitative

measures in order to understand, estimate, and regulate a phenomenon. According to Apuke (2017), the quantitative research approach describe the problem by gathering data in statistical form and analysing it using statistical approaches. The advantages of this approach are as follows: the use of statistical data as a time-and resource-saving tool and the use of scientific methods for data collection and analysis make it possible to generalize this type of approach (Daniel 2017). This approach is appropriate because the researcher will analyse data quantitatively by using statistics.

For this study, primary data was used. Primary data includes information gathered by the researcher specifically for the research assignment. This data has not been compiled nor published by anyone; it is collected by the researcher at first-hand (Ajayi 2017). Kabir (2016) stated that this data has not yet been authored and is more consistent, accurate, and unbiased. Thus, human beings have not changed or modified this data; consequently, its authenticity is better than secondary data which has already been published by another source.

The researcher chose the commonly used method to collect primary data i.e., Survey. When using survey, participants are approached by the researcher directly, telephonically or by using mail. Despite the fact that this technique takes time and requires hard work and cash, the data gathered is of high accuracy, recent, and direct to the point (Kabir 2016). The survey method used in this study included sending closed-ended structured questionnaires to the selected food and beverage manufacturing firms in Durban. The quantitative aspect was based on data collected from the five Likert scale closed-ended questionnaires. The questionnaires will be self-completed; therefore, the respondents will be required to read and answer the questions themselves.

3.2 Targeted Population

The population involves all members that share similar traits which distinguish them from other groups. In simple terms, the population includes members of a particular group that the investigator plans to study (Levy and Lemeshow 2013). Food and beverage manufacturing firms based in the Durban area will be used to conduct the study. The focus of this study is on food and beverages manufacturing companies

considering the fact that the major cause of plastic pollution is from the single-use plastics for packaging food, fruits, etc., and also the plastic carrier bag. There are approximately 55 food and beverages manufacturing firms formally operating in Durban (Robbins and Velia 2015). The researcher planned to study the entire population as it is relatively small.

3.3 Sampling Technique

There are two sampling techniques considered for this study. These techniques are non-probability sampling and probability sampling.

- Non-probability sampling: A technique that does not offer a basis for forming an opinion about the likelihood that components in the universe will be included in the study sample. It is useful if the researcher has limited resources, time, and labour force.
- Probability sampling (also referred to as random sampling): This technique allows every item in the universe to have an equivalent chance of appearing in the sample (Etikan and Bala 2017).

The non-probability sampling technique was chosen for this study. The researcher used a convenience sampling technique. According to Etikan, Musa and Alkassim (2016), convenience sampling is a type of nonprobability sampling in which participants that meet the necessary criteria are selected. Examples such as convenient access, geographic location, availability at a specific time, or willingness to participate are included in the study. It is inexpensive, simple, and the subjects are easily accessible. The primary goal of such a sampling method is to gather data from participants who are conveniently reachable to the researcher. Convenience sampling frequently aids in overcoming many of the constraints of research (Taherdoost 2016).

The sample size of this study was 32 food and beverage manufacturing firms multiplied by the 4 chosen respondents (financial managers, management accountants, factory accountants, and chief accountants). As the population was small, the researcher used firms that were at their disposal and willing to take part in

the study. Henceforward, this study used a sample size of 128 respondents from the food and beverage manufacturing firms in Durban. This number of the selected manufacturing firms provided the researcher with enough data needed to conduct the study and achieve the objectives.

3.4 Participants of the Research

When a study with humans is conducted, some people do the research, and people who provide information are referred to as subjects or study participants. Study participants are used by the researcher for observations. The participants of this study included financial managers, management accountants, factory accountants, and chief accountants in each food and beverage manufacturing firm. The participants are the respondents who were asked to complete the questionnaires and they had been selected due to the nature of their work position. The researcher asked the participants to volunteer in the study.

The process of recruiting the respondents involved the researcher approaching them online using emails and briefing them on what the study is about. The respondent's email address was obtained from their website and every potential participant identified was invited to participate via email. The questionnaires are written in English and followed by a page of consent that outlines and provides the respondent with a concise introduction of the questions and study. A link to questionnaires was given if a participant chooses to take part in the study with confidentiality and anonymity ensured. This was done after the respondent has clicked yes to proceed, read, and understood the consent page. A follow-up email was sent a week after the electronic distribution of questionnaires to remind the participants.

3.4 Data Collection Method

According to Kabir (2016), data collection is a process of gathering and measuring information on variables being studied. The researcher does so in a structured manner that allows one to answer stipulated research questions, test hypotheses, and evaluate results. Moreover, the goal for gathering data is to collect high-quality evidence which can then be translated into comprehensive data analysis.

To achieve the objectives of the study, structured questionnaires with closed-ended questions were used for data collection. According to (Roopa and Rani 2012), the main source of quantitative primary data collection is a questionnaire. A questionnaire enables the organized gathering of quantitative data resulting in data that is internally reliable and suitable for evaluation. They are powerful tools for obtaining a wide variety of data from a larger group of people. The researcher used structured questionnaires because they are time-consuming and are suitable for a quantitative study. Furthermore, this type of questionnaire is made up of closed or prompted questions with predetermined responses. With pre-coded answers, the researcher must predict all possible answers.

The quantitative aspect is based on data derived from closed-ended questionnaires from the Likert scale. The ranking of the Likert scale is as follows: (1) Strongly disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly agree. Closed-ended questions include a collection of responses that require respondents to pick one or more responses from, and these are limited to the provided answers(Roopa and Rani 2012).

3.5 Data Collection Plan

The researcher began to collect data upon approval from the Durban University of Technology (DUT), Faculty of Accounting and Informatics Research Committee, and Ethics review committee. The data collection instrument for this study is research questionnaires which are shown in Annexure 1 of the thesis. Questionnaires were issued to the 128 respondents in the entire food and beverage manufacturing firms with an expectation of 4 respondents in each selected manufacturing firm. So as shown in the table below, the total sample size and questionnaires distributed were 128.

Table 3.1 Target Population and Sample Size

Respondent Category	Number in each Selected firm
financial managers	1
management accountants	1
factory accountants	1
chief accountants	1
Total	4
Total questionnaire to be distributed = 32 X 4 = 128	

The researcher used the QuestionPro tool for the questionnaires and emailed the link together with online cover letters and consent forms to the respondents. The online cover letter informed the potential participant of the purpose of the study. If they choose to take part, the respondent clicked “yes” to consent and proceeded to complete the questionnaire after reading all the important details. The questionnaires were self-administered and can be taken by the participants from the comfort of their homes or the office. The questionnaires (with consent forms and cover letters) were also hand-delivered at the respondent’s workplace where possible. In case of a low response rate from email questionnaires, a follow-up email was sent. In a case where the response rate was low, the researcher's hand-delivered questionnaires. An email reminder after two weeks of the original distribution was sent to the participants.

Questionnaires are divided into 4 sections and written in English:

Section A: Consists of biographic information e.g., type of employment, employment experience, and highest qualification obtained. This section will be the respondent’s profile for geographic purposes.

Section B: Consists of questions relating to the application and understanding of environmental management accounting.

Section C: Consists of questions about measures of plastic pollution control.

Section D: Consists of questions that relate to environmental management accounting and plastic pollution control.

The data collected will be stored electronically in the researcher's flashdrive and Dropbox with proper encryption for 5 years, after that it will be discarded in full compliance with the DUT Ethical Clearance Committee instructions.

3.6 Data Analysis Techniques

In quantitative approach, data obtained from the questionnaires or other tools must be examined and discussed. Data was analysed using descriptive statistics. This involves simple percentages, bar graphs, and simple tables. To analyse quantitative data, the researcher used Statistical Package for Social Science (SPSS). Data obtained from the Likert scale questionnaires will be coded using numerical values in SPSS. For ordinal data, the measuring scales used will be 1 (strongly disagree) to 5 (strongly agree). For the nominal data, the codes were one (1) which represented "Yes" and (2) which represented "No".

3.7 Pilot Test

To avoid cases where the respondents do not understand the directions or questions to respond to, a trial test was done before starting the actual data collection. Whitehead *et al.* (2016), posits the general rule of thumb for a pilot study to be a minimum of 12 respondents. Therefore, 12 participants were used to conduct a pilot study. These 12 participants were purposively selected across the sample. A purposive sampling technique is found appropriate to allow the researcher to use her judgment to select a suitable representative. These 12 comprised of 3 financial managers, 3 management accountants, 3 factory accountants, and 3 chief accountants. These did not constitute part of the target 128 respondents. The link to the online letter of consent was sent to the respondents at first and if they agree to participate, the link to QuestionPro was sent to the study respondents via email for ease of completion. This test allowed the researcher to know how long it takes the respondent to complete the survey and the feedback allowed the researcher to identify specific questions that need revision before the actual data collection.

Some respondents pointed out a few spelling and grammatical errors. These errors were corrected. A discussion was held on Zoom meetings to further enquire whether the respondents understood what the purpose of the questionnaires was. Every comment was favourable. Respondents believed that the questionnaire tried to seek and to comprehend their organization's use of the EMA practices towards plastic pollution control as well as their attitude toward environmental issues. The researcher was satisfied with the feedback received on the observation of questionnaires from the pilot test.

3.8 Pre-Testing

Prior to administration of the questionnaire, pre-testing was done to assess the questionnaire by three academics who are in a similar field of study from the DUT Management Accounting department. Pre-testing was carried out to ensure that the questionnaires are free of errors and the questions are clear. The researcher allowed changes suggested by the academics to increase the quality of questionnaires.

3.9 Reliability and Validity

The measurement of reliability and validity was developed to measure the likelihood and accuracy of the researcher's result. This also assists in demonstrating the severity and usefulness of the researcher's study (Anon 2017). Heale and Twycross (2015), described validity as an extent to which an idea is evaluated correctly in a study while reliability refers to the uniformity of a degree. Validity refers to the degree whereby the research study accurately represents or evaluates the particular idea that the researcher is attempting to measure. Validity is associated with the study's accomplishment in assessing whatever the researchers set out to assess.

The following are types of validity measurement, construct, content, criterion, internal and external validity (Middleton, 2019). Reliability can be measured by test/retest, interrater, parallel forms and internal consistency (Heale and Twycross 2015).

Content validity was used to measure the accuracy of the study. The questionnaires covered all the relevant aspects that the study aimed to measure. This was observed through conducting a pilot study. To ensure the reliability of the respondent, internal

consistency will be exercised which estimates the reliability by organizing questions in a questionnaire that evaluate the same notion. The Cronbach's alpha coefficient for all factors measured was 0.05 and above which is considered to indicate moderate (acceptable) reliability.

3.10 Approach to Research Objectives

This section provides an outline and brief justification of the approach to be implemented to accomplish the listed research objectives. The researcher used a quantitative research approach to achieve all the objectives of the study.

3.11 Justification for the Methodology

In this study, a quantitative research method was used because it allowed the researcher to test the hypothesis, look at the cause and effect and make a prediction. Furthermore, this approach allowed the researcher to answer all the research questions.

3.12 Limitations and Delimitations

The results of this study were limited to food and beverages manufacturing firms. These results were then utilized to generalize the impact of EMA on plastic pollution control in the manufacturing sector. The limitation of this study to food and beverages did not in any way affect the potency of the findings of the study.

3.13 Anonymity

The identity of the participants was kept anonymous throughout the study. The researcher used codes to identify the respondents.

3.13 Ethical Consideration

According to Dudovski (2018), a research paper that does not include the ethical considerations section is set for failure. In this study, the participants were up-to-date

about the aim of the study, who or what organization is finding it, how findings will be used, who would get access to the findings and the implications of taking part in the research work. Informed consent is defined as providing the respondent with sufficient information and assurance about being the subject study. Furthermore, allowing the individuals to learn about the consequences of participating and fully agreeing to all terms without being influenced (Dudovskiy 2018).

Consequently, all food and beverage manufacturing firms that participated in the research study, including the pilot study, were asked to sign a consent letter in accordance with the Institutional Research Ethics Committee (IREC) at the Durban University of Technology. It was an agreement to take part in the study that emphasized the respondent's duties and obligations and the researcher's obligations.

Confidentiality was exercised in such a manner that no primary data collected will be shared with any other person. All the completed questionnaires were stored safely after the research has been completed. The researcher was respectful of the respondent's rights and reported the research fully and honestly.

3.14 Chapter Summary

This chapter highlighted research methods that were used to conduct the study, and how data was collected and analyzed. It also highlights the validity and reliability of the study and ethical considerations. The next chapter presents the finding of the study.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION OF FINDINGS

4.0 Introduction

The previous chapter addressed how the study was conducted and how data was collected and analyzed. The findings of the study, interpretation and discussion are presented in this chapter. The purpose of the study was to investigate the application of environmental management accounting practices on plastic pollution control in food and beverage manufacturing firms in Durban, Kwa-Zulu Natal. The results are presented in graphs (figures) and tables and divided into different sections to fulfil the study's main objective. The results are presented and interpreted in accordance with the study objectives, and they are discussed in light of the relevant literature on the research objectives. A total of 128 respondents took part in the study. However, 4 questionnaires were incorrectly completed. Data from survey questionnaires were collected and analyzed using the Statistical Package for the Social Sciences (SPSS).

4.1 Analysis of respondent's demographic details

The demographic details of the survey questionnaire were analyzed using bar charts, a type of descriptive analysis. Eight categories of demographic information were elicited from the survey respondents. The eight categories are explained in the sub-sections below.

4.1.1. Job Designation

The survey respondents were asked to indicate their Job Designation. The analysis showcased that 31 (25%) were financial managers, 32 (25.8%) were Management accountants, 31 (25%) were Factory accountants, while 30 (24.2) were Chief accountants. The respondent's Job designation is indicated in Figure 4.1.

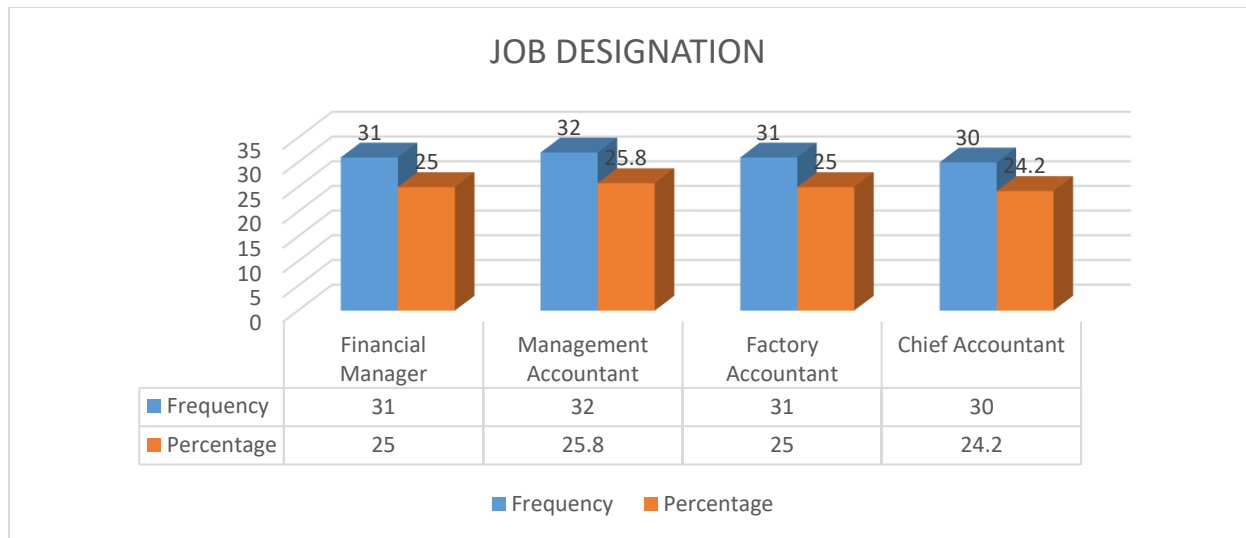


Figure 4.1: Job designation

4.1.2 Employment Experience

Employment experience reveals the number of years of experience of the respondents. On the employment experience of the respondents, the analyzed data revealed that 11(8.9%) 0-5 years, 25(20.2%) 6-10 years, 36(29%) 11-15 years, 36(29%) 16-20 years, while 16(12.9%) greater than 21 years. The result indicated that over 70% of respondents had more than 10 years of work experience. This indicates that the old and experienced employees can start training the next generation of employees who will take over when they retire or get retrenched (Nzuza 2015). The respondent's employment experience is indicated in Figure 4.2.



Figure 4.2: Employment experience

4.1.3 Age Group

The study respondents were asked to indicate their age category. The analyzed data revealed that 13(10.5%) were 21-30 years, 38(30.6%) were 31-40 years, while 73(58.9%) were older than 40 years. The respondent's age group is indicated in Figure 4.3.

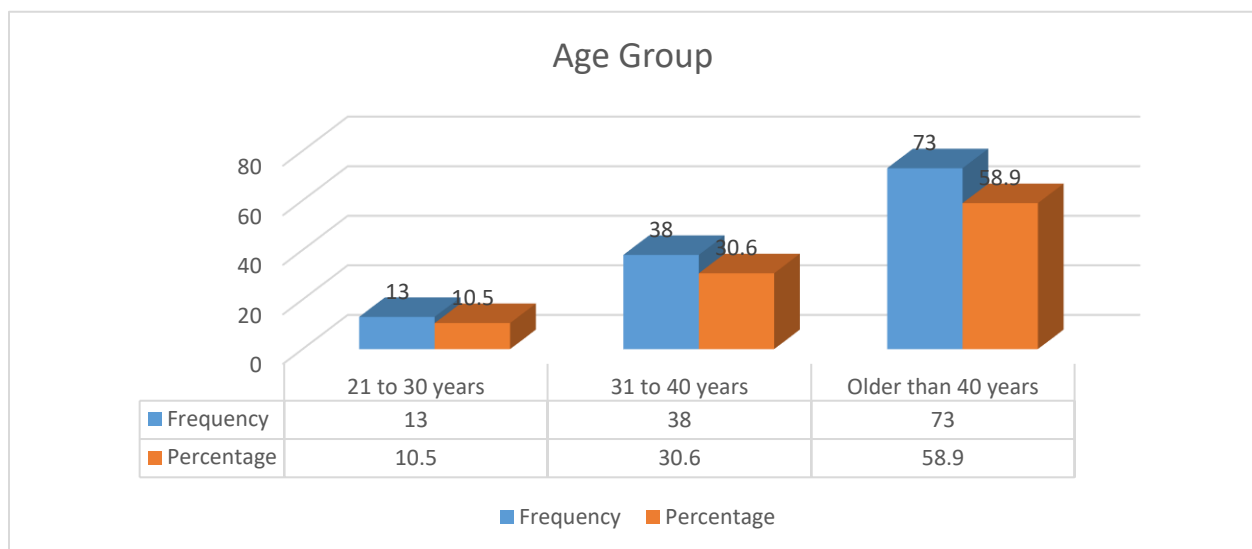


Figure 4.3: Age group

4.1.4 Marital Status

The survey respondents were asked to indicate their marital status. The analyzed data revealed that 35(28.2%) were single, 60(48.4%) were Married, 18(14.5%) were Divorced, while 11(8.9%) were Widowed. The respondent's marital status is indicated in Figure 4.4.

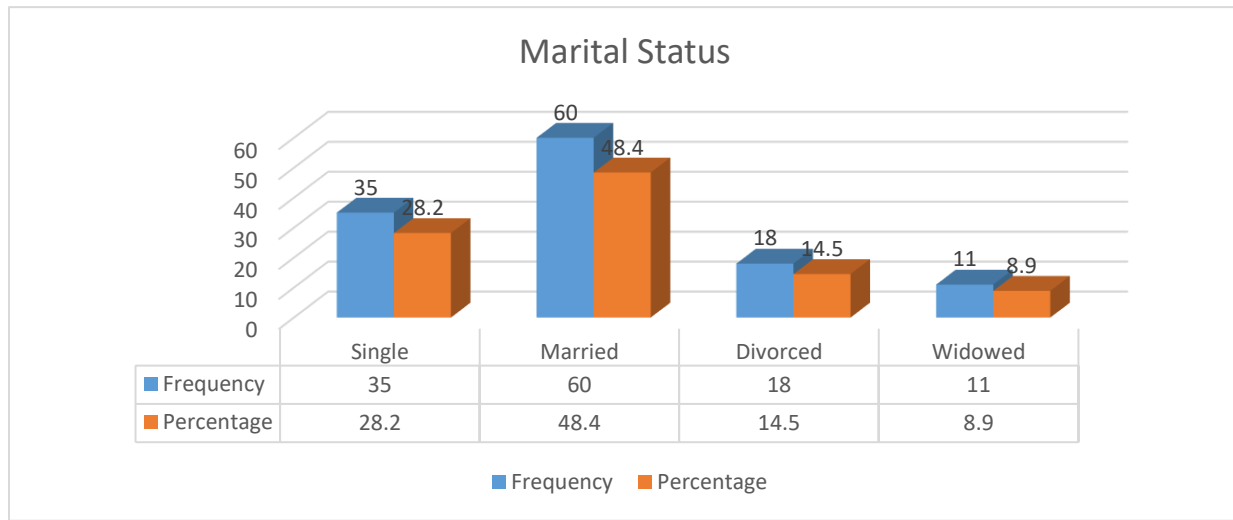


Figure 4.4 Marital status

4.1.5 Qualifications

On the level of qualification of the survey respondents, the analyzed data revealed that 16(12.9%) holds Diploma/ Bachelor's Degree, 54(43.5%) Honour's degree/Btech, 29(23.4%) Master's degree while 25(20.2%) holds a doctorate degree. The respondent's qualifications are indicated in Figure 4.5.

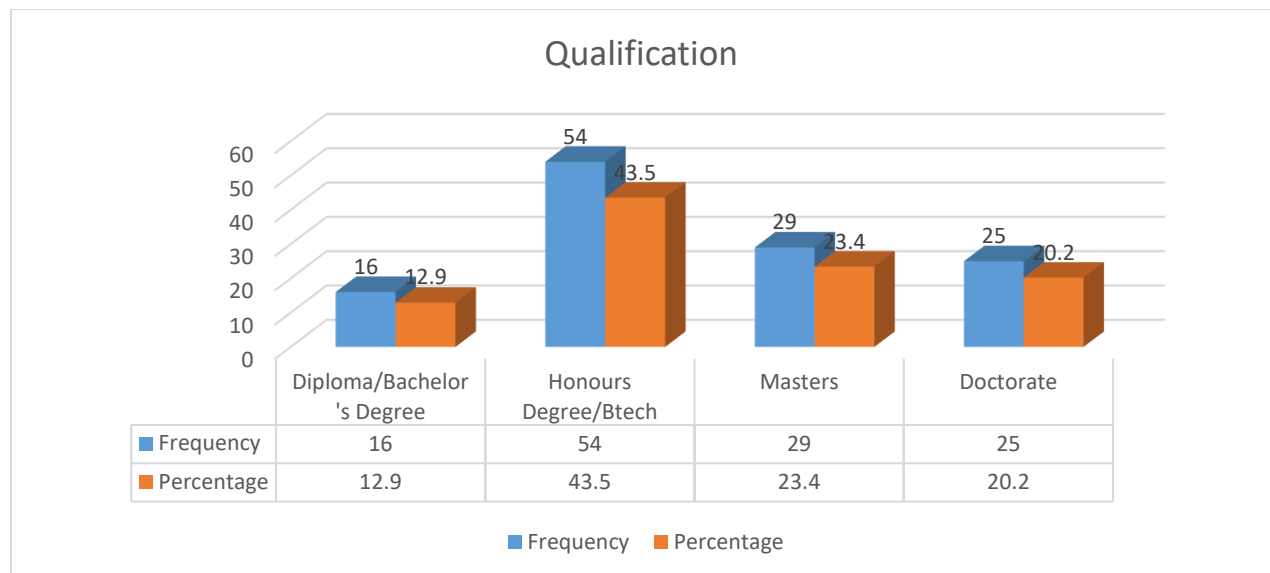


Figure 4.5: Qualification

4.1.6 Firm Scale

The survey respondents were asked to indicate their Firm Scale. The analyzed data revealed that 57(46%) were small, 39(31.5%) were Medium while 28(22.6%) were Large. The respondent's Firm Scale is indicated in Figure 4.6.

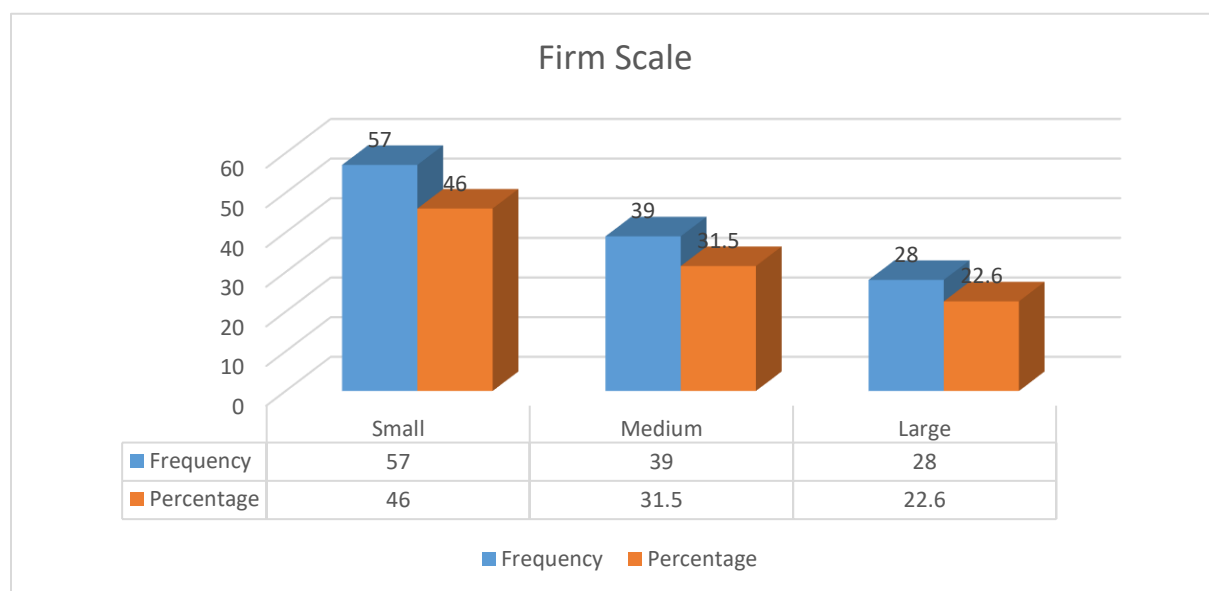


Figure 4.6: Firm scale

4.1.7 Environmental Costs

The survey respondents were asked to indicate their Environmental costs. The analyzed data revealed that 87 (70.2%) indicated Yes, while 37 (29.8%) indicated no. The respondent's environmental costs are indicated in Figure 4.7.

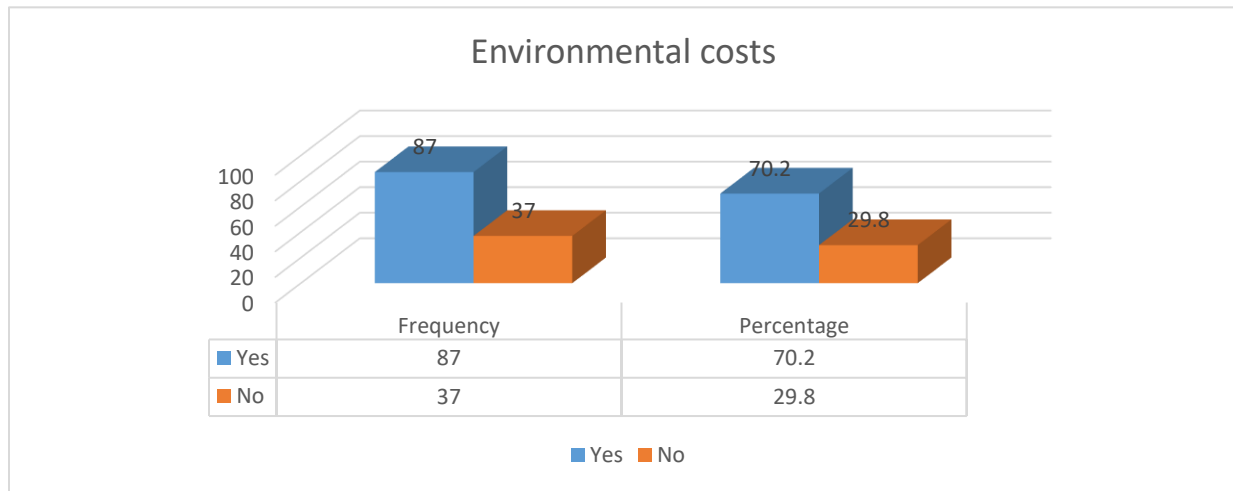


Figure 4.7: Environmental costs

4.1.8 Environmental Activities

The survey respondents were asked to indicate their investment in environmental activities. The analyzed data revealed that 84 (67.7%) of the respondents suggested that they invested in environmental activities while 40 (32.3%) indicated that they had no investment in environmental activities. The respondent's Environmental Activities are indicated in Figure 4.8.

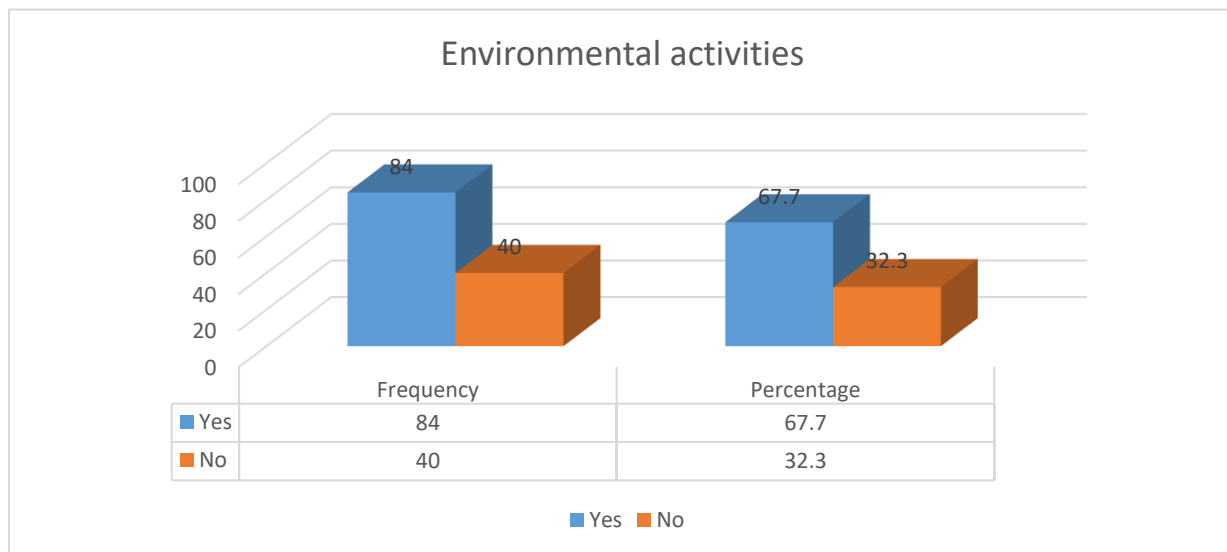


Figure 4.8: Environmental activities

4.2 Exploratory Factor Analysis (EFA)

Factor analysis is a set of statistical procedures for determining the number of separate concepts required to account for the pattern of correlation between a set of measures. Furthermore, the factor analysis is conducted to identify how many distinct constructs the set of measures assesses (Fabrigar and Wegener 2011). Exploratory factor analysis is a type of factor analysis that enables the researcher to investigate the main dimensions in order to generate theory or a model from a comparatively huge set of latent variables, which is frequently characterized by a set of items. In EFA, the researcher has no anticipations about the amount or nature of the variables, and the study is exploratory in nature, as the name suggests. The other major type of factor analysis is confirmation factor analysis (CFA), which is a type of structural equation modelling that enables the user to test a suggested theory or model. CFA has assumptions and expectations about the variety of factors and theories or models best suited based on normative theory. In the EFA process, a correlation matrix should be used to show the relationships between

individual variables (Williams, Onsman and Brown 2010). According to Samuels (2017), exploratory factor analysis (EFA) is a technique that could be used in SPSS to validate survey question scales. The goal of an EFA is to classify a multidimensional set of data using fewer variables. Following the validation of a questionnaire, a procedure known as Confirmatory Factor Analysis can be used.

In this study, items with loadings of 0.40 and higher were obtained. According to Hair *et al.* (2009), an item with a factor loading of 0.40 and above is considered important, and 0.50 and above is practically significant. The Kaiser-Meyer-Olkin (KMO) (Kaiser 1974) measure of convergent validity is the ratio of correlations and partial correlations, which indicates how much correlation is a component of variance shared by all factors instead of variance shared by particular two variables. The KMO index is advised whenever the case-to-variable ratio is less than 1:5. The KMO index has a 0 to 1 scale, with 0.5 deemed appropriate for factor analysis. The desired KMO values equal to 0.70 and greater. (Williams, Onsman and Brown 2010; Watkins 2018).

The Cronbach's alpha coefficient for each scale was also calculated to measure the internal consistency of factors.

Table 4.1 Exploratory Factor Analysis

Items	Item factor loadings						
	1	2	3	4	5	6	7
ERA_1	0.730						
ERA_2	0.852						
ERA_3	0.792						
ERA_4	0.821						
ERA_5	0.806						
INF_1	0.691						
INF_3	0.743						
INF_4	0.800						

INF_5	0.806						
INF_6	0.800						
INF_7	0.629						
PEM_2	0.564						
PEM_3	0.751						
PEM_4	0.734						
PPC_2	0.505						
PPC_7	0.588						
PPC_8	0.740						
EMA_9	0.520						
EMA_10	0.555						
INF_2		0.599					
INF_8		0.667					
INF_9		0.681					
PPC_1		0.624					
PPC_3		0.572					
PPC_4		0.500					
PPC_6		0.566					
ERA_6		0.567					
EMA_7			0.838				
EMA_8			0.839				
BTS_7			0.584				
CES_1				0.667			
CES_2				0.589			
CES_3				0.590			
CES_4				0.580			
BTS_5					0.798		
RPW_3					0.476		

EMA_4					0.459		
BTS_1						0.628	
BTS_6						0.478	
CES_5						0.634	
EMA_1							0.572
EMA_3							0.494
RPW_1							0.685
Cronbach's @	0.925	0.869	0.751	0.719	0.542	0.803	0.500
Eigen value	14.952	3.548	3.309	2.793	2.569	2.235	2.032
Variance	28.212	6.694	6.224	5.270	4.847	4.217	3.833

KMO = 0.774; $\chi^2 = 5449.334$; df = 1378; P < 0.001

The illustration in Table 4.1 represents items retained for the seven factors. Overall, the Cronbach's alpha coefficient for all factors is greater than 0.70, except for factor five and seven which 0.542 and 0.500 indicating moderate (acceptable) reliability (Ekolu and Quainoo 2019).

The Eigenvalue factor one which measures environmental information is 14.952 which explained 28.2% of the variance. The second factor which measures plastic pollution control has an Eigenvalue of 3.548 with a variance explained by 6.7%. The third factor, with an Eigenvalue of 3.309, measures environmental management accounting which explained 6.2% of the data. The fourth factor which measures corporate environmental strategy has an Eigenvalue of 2.793 and explained 5.3% of the data. Factor five which measures plastic waste reduction shows an Eigenvalue of 2.569 and explained a 4.8% variance of original data. The Eigenvalue of the sixth factor which measures barriers to sustainability is 2.235 and explained 4.2% of the data. The seventh factor which

measures environmental-related activities has an Eigenvalue of 2.032 with 3.8% of variance explained.

The factor loadings revealed that nearly all the items retained in each construct have loadings greater than 0.50, indicating that they are outstanding. The following four items were below 0.50: EMA_3, EMA_4, BTS_6, and RPW_3. The KMO test result of 0.77 indicates that the study sample size of 124 is sufficient. The Bartlett test of sphericity which explains why EFA was carried out is statistically significant at $P < 0,001$.

4.3 Analysis of Research Questions

Five research questions were formulated and answered in this study. Each of the research questions was answered using inferential statistics such as Pearson's correlation coefficient and linear regression. The subsections below showcased the outcome of the statistical analysis.

4.3.1 Relationship between environmental management accounting and Corporate environmental strategy

Research question one of this study was formulated to establish the relationship between environmental management accounting and corporate environmental strategy in food and beverage manufacturing firms. According to Gunarathne, Lee and Hitigala Kaluarachchilage (2021), EMA is a link between internal orientated management accounting and corporate environmental strategies which provide managers with the necessary information to plan, implement, make a decision and control organizational environmental practices. The outcome of the statistical analysis is illustrated in Table 4.2.

Table 4.2 Correlation between environmental management accounting and Corporate environmental strategy

Construct A	Construct B	Pearson's correlation (r)	p-value
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Environmental Management Accounting	Corporate Environmental Strategy (CES)	-.199*	<.05
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*Correlation is significant at the 0.05 level (2-tailed)

The result of the Pearson's correlation coefficient illustrated in Table 4.2 established a statistically significant relationship between environmental management accounting and corporate environmental strategy in the food and beverage manufacturing firms at ($r = -.199$, $p < 0.05$). The negative correlation implies an inverse relationship between the two constructs. In other words, as the environmental management accounting system continues to improve in cushioning the effect of plastic pollution in the firms, less attention will be focused on the corporate environmental strategy to address the same problems.

These results are inconsistent with the finding of a previous empirical study conducted by Latan *et al.* (2018) which revealed a positive relationship between corporate environmental strategy and corporate environmental performance through the use of EMA. Similarly, Solovida and Latan (2017) suggest that the greater the emphasis on the environment in corporate strategy, the greater the impact on the use of EMA. However, most studies were conducted on ISO 14001 certified listed companies. Thus, the studies did not focus on a specific sector but compared corporate environmental strategy and corporate environmental performance. An early study by Xiaomei (2004) stated that a rapid increase in the number of companies receiving ISO 14001 certification has aided the global development of EMA. In developing countries, empirical research on the relationship between environmental management accounting and corporate environmental strategy is scarce.

A regression analysis was further conducted to establish the level of influence between the two constructs. The result of the linear regression is showcased in Table 4.3.

Table 4.3 Linear regression between environmental management accounting and Corporate environmental strategy

Variables in the equation	B	Beta	t	p-value	R ²	F	Df	p-value
Constant	16.003		14.232	<.05	.039	5.008	1; 122	<.05
Environmental management accounting	-.228	-.199	-2.238	<.05				

DV – Corporate Environmental Strategy (CES)

The results of the regression analysis summarized in Table 4.3 indicate an R² value of 0.039 which suggests that environmental management accounting accounts for 3.9% of the variance in corporate environmental strategy and there is a significant linear relationship between environmental management accounting and corporate environmental strategy, $F(1, 122) = 5.008, p < .05$. The independent variable, environmental management accounting, is a significant predictor of corporate environmental strategy, $B = -0.199, p < 0.05$.

4.3.2 Influence of environmental information on plastic pollution control in the food and beverages firms

Research question two was designed to establish a relationship between environmental activities and plastic pollution control in food and beverage manufacturing firms. The outcome of the statistical analysis is presented in Table 4.4.

Table 4.4 Correlation between Environmental Information and Plastic Pollution Control

Construct A	Construct B	Pearson's correlation (r)	p-value
Environmental Information	Plastic Pollution Control	.729**	<.0005

**Correlation is significant at the 0.01 level (2-tailed)

The result of the Pearson's correlation coefficient illustrated in Table 4.4 established a statistically significant relationship between environmental information and plastic pollution control in the food and beverage manufacturing firms at ($r = .729$, $p < 0.0005$). The result shows a positive correlation which indicates a direct relationship between the two constructs. When construct A increases, construct B also increases in a fixed proportion. Practically, this means that when the disclosure of environmental information improves, plastic pollution control also improves.

Reporting environmental information is an important tool for environmental management. Thus, environmental information disclosure would have a significant positive impact in terms of protecting the public's right to be informed, take part, monitor, and enhance the quality of environmental management in developing countries (Kosajan *et al.* 2018). (Zhang 2017) highlighted that the disclosure of environmental accounting information is the result of adapting to societal needs and the progression of time. According to Ji (2017), reporting environmental information is crucial as it can effectively minimize energy consumption, pollution and promote the development of the cause to protect the environment.

Many companies issue environmental or sustainable development reports to ensure that all stakeholders have accurate information about the company's action toward reducing their effect on the environment (Istrate *et al.* 2017). The strongest influence on environmental information disclosure comes from government regulations, legal documents, and environmental management agencies, followed by pressure from

stakeholders such as environmental protection organizations and environmental interdisciplinary management agencies (Nguyen *et al.* 2020). According to Feng *et al.* (2021), reporting environmental information is critical in motivating municipal governments to disclose precise information about the environment.

Based on similar prior studies we can conclude that disclosure of environmental information assists management with better plastic pollution control.

A regression analysis was then performed to determine the degree of influence between the two constructs. The result of the linear regression is presented in Table 4.5.

Table 4.5 Linear regression between Environmental Information and Plastic Pollution Control

Variables in the equation	B	Beta	T	p-value	R ²	F	df	p-value
Constant	7.834		4.847	<.0005	.532	138.751	1; 122	<.0005
Environmental information	.340	.729	11.779	<.0005				

DV – Plastic pollution control

The results of regression analysis summarized in Table 4.5 indicate an R² value of 0.532 which suggests that environmental information accounts for 53.2% of the variance in plastic pollution control. The R² value indicates how much of the total variation the dependent variable (plastic pollution control) can be explained by the independent variable (Environmental information). In this case, there is a significant linear relationship between environmental information and plastic pollution control, F (1,122) = 138.751; P < 0.0005. P < 0.0005 is less than 0.05 and indicate that the independent variable

(environmental information) significantly predicts the dependent variable (plastic pollution control), $B = 0.729$, $P < 0.0005$.

4.3.3 The relationship between corporate environmental strategy and plastic pollution control.

Research question three was developed to establish a relationship between corporate environmental strategy and plastic pollution control in the food and beverage manufacturing firms. The outcome of the statistical analysis is shown in Table 4.6.

Table 4.6 Correlation between corporate environmental strategy and plastic pollution control

Construct A	Construct B	Pearson's correlation (r)	p-value
Corporate Environmental Strategy	Plastic Pollution Control	.385**	<.0005

**Correlation is significant at the 0.01 level (2-tailed)

The result of the Pearson's correlation coefficient illustrated in Table 4.6 establishes a statistically significant relationship between corporate environmental strategy and plastic pollution control in food and beverage manufacturing firms ($r = .385$, $p < 0.0005$). The positive correlation indicates a direct relationship between the two constructs. This means that, as corporate environmental strategy improves within an organization, the more they will be able to address or control plastic pollution.

A study by Aragón-Correa and Sharma (2003) on corporate environmental strategy highlighted that proactive corporate environmental strategies is a type of pollution prevention technology investment (rather than reactive investment in pollution control).

As a result, it only resulted in environmental and competitive improvements linked to the development of specific strategic managerial and manufacturing processes. However, Wagner and Schaltegger (2004) found that firms with pollution-prevention-focused corporate environmental strategies outperform in terms of both environmental and economic performance. Additionally, advancements in corporate sustainability are more likely.

Mårtensson and Westerberg (2016) suggest guidelines for developing a long-term environmentally sustainable strategy that minimizes ecological influence while also providing a foundation for competitive advantage in a world where environmental concerns are becoming progressively essential in different decision-making cases. In practice, a strategy that concentrates on reducing the environmental impact of a production system is achieved by using raw material productively, lessening the use of harmful/toxic materials and integrating waste into a recirculation system. According to the empirical results obtained by Wang, Li and Qi (2020), companies that are not involved in the production of goods can easily change their ecological strategies compared to those that do. Thus, pressure placed by different stakeholder on organizations in developed countries may greatly affect the company's environmental strategies. The findings have significant relevance considering the fact that an eco-friendly industry transition is deemed necessary in the manufacturing sector, particularly in highly polluting companies. More so, these companies should implement environmental strategy changes in the future.

Therefore, this study concludes that having corporate environmental strategies within the organization can lead to better plastic pollution prevention measures. According to Fraj-Andrés, Martínez-Salinas and Matute-Vallejo (2009), The competitive advantage gained from developing ecological strategies and ecological products motivates a company's ability to instill the value of environmental protection throughout the company.

A regression analysis was further conducted to establish the level of influence between the two constructs. The result of the linear regression is showcased in Table 4.7.

Table 4.7 Linear Regression between corporate environmental strategy and plastic pollution control

Variables in the equation	B	Beta	t	p-value	R ²	F	df	p-value
Constant	14.848		5.919	<.0005	.149	21.286	1; 122	<.0005
Corporate environmental strategy	.824	.385	4.614	<.0005				

DV – Plastic Pollution Control

Predictor (Constant) – Corporate environmental Strategy

The results of the regression analysis summarized in Table 4.7 indicate an R² value of 0.149 which suggests that corporate environmental strategy accounts for 14.9% of the variance in plastic pollution control. The R² value indicates how much of the total variation the dependent variable (plastic pollution control) can be explained by the independent variable (Corporate environmental strategy). In this case, there is a significant linear relationship between corporate environmental strategy and plastic pollution control, F (1,122) = 21.286; P < 0.0005. P < 0.0005 is less than 0.05 and indicate that the independent variable (corporate environmental strategy) significantly predicts the dependent variable (plastic pollution control), B = 0.385, P < 0.0005.

4.3.4 Influence of barriers to environmental sustainability on environmental management accounting.

Research question four was formulated to establish the relationship between environmental sustainability and environmental management accounting in food and beverage manufacturing firms. The outcome of the statistical analysis is illustrated in Table 4.8.

Table 4.8 Correlation between barriers to environmental sustainability and environmental management accounting

Construct A	Construct B	Pearson's correlation (r)	p-value
Barriers to sustainability	Environmental Management Accounting	.250**	<.0005

**Correlation is significant at the 0.01 level (2-tailed)

The results of the Pearson's correlation coefficient illustrated in Table 4.8 establish a statistically substantial relationship between barriers to environmental sustainability and environmental management accounting in food and beverage manufacturing firms at ($r = .250$, $p < 0.0005$). The positive correlation indicates a direct relationship between construct A and constructs B. In other words, as barriers to sustainability improve, the easier it will be to adopt environmental management accounting practices in food and beverage manufacturing firms.

Balasubramanian and Shukla (2020) argue that barriers to environmental sustainability include a shortage of environmental professionals and environmental/green suppliers, lack of appropriate resources, high implementation costs and lack of knowledge and poor understanding. Accounting to Ghisetti *et al.* (2017), the presence of financial barriers and specific difficulties in accessing external sources of funding are significant threats to the environmental capacity of European Union manufacturing SMEs. The lack of stable and

competitive markets, as well as a credible institutional context, raises the uncertainties and risks associated with Environmental Innovation investments, reinforcing the stringency of external financing constraints. Álvarez Jaramillo, Zарtha Sossa and Orozco Mendoza (2019) reviewed 50 highest cited articles between 2013 to 2017 to examine the challenges that SMEs face when incorporating sustainable development measures. The most common barriers are shortage of funds, high initial investment cost of adopting sustainable measures and lack of expertise.

According to Kapardis and Setthasakko (2010) companies are being forced to determine ways to enhance environmental performance in the process of their economic growth. Environmental management accounting (EMA) was specifically developed to detect and record the financial and non-financial costs of environmental activities in businesses. EMA integrates environmental issues into traditional accounting systems. The study further determined that limitations to the development of EMA included lack of building organizational learning, insufficient environmental knowledge and skills, and management's inability to use environmental information. These impediments have an impact on corporate environmental performance as well as the path to environmental and social sustainability. Iredele and Ogunleye (2017) classified barriers to EMA as follows: management barrier, institutional barrier, an attitudinal barrier and financial barrier. Financial barrier (includes lack of resources, non-consideration of environmental costs, and efficiency of financial consideration) was found to be the main barrier in implementing environmental management accounting in South Africa. A further examination of financial barriers revealed that EMA practices in South Africa are severely hampered by the cost implications of its implementation considering the large sums of money required to integrate EMA into business processes and accounting systems. A prior study by Muhammad Jamil *et al.* (2015) also found that inadequate funds, limited resources, the competence of financial consideration and inattention on environmental cost are obstacles to EMA practices.

Barriers to environmental sustainability and barriers to environmental management accounting are similar. These explain the positive correlation between the two variables. When barriers to environmental sustainability are dealt with, the easier it will be for the company to implement environmental management accounting practices.

A regression analysis was further conducted to establish the level of influence between the two constructs. The result of the linear regression is showcased in Table 4.9.

Table 4.9 Linear regression barriers to environmental sustainability and environmental management accounting

Variables in the equation	B	Beta	t	p-value	R²	F	df	p-value
Constant	6.404		4.303	<.0005	.063	8.149	1; 122	<.05
Barrier to Sustainability	.442	.250	2.855	<.05				

DV – Environmental Management Accounting

Predictor (Constant) – Barriers to Sustainability

The results of the regression analysis summarized in Table 4.9 indicate an R² value of 0.063 which suggests that environmental management accounting accounts for 6.3% of the variance in barriers to sustainability and there is a significant linear relationship between barriers to sustainability and environmental management accounting, F (1, 122) = 8.149, p<.05. The independent variable, barriers to sustainability, is a significant predictor of environmental management accounting, B= 0.442, p< 0.05.

4.3.5 The role of environmental activities on plastic waste reduction in the food and beverages firms.

Research question five was formulated to establish the relationship between environmental activities and plastic waste reduction in the food and beverage manufacturing firms. The fifth research question was developed to investigate the relationship between environmental activities and plastic waste reduction in food and beverage manufacturing. The fifth research question was developed to investigate the relationship between environmental activities and plastic waste reduction in food and beverage manufacturing. The outcome of the statistical analysis is presented in Table 4.10.

Table 4.10 Correlation between environmental Activities and Plastic Waste Reduction

Construct A	Construct B	Pearson's correlation (r)	p-value
Environmental Activities	Plastic Waste Reduction	-.187*	<.05

*Correlation is significant at the 0.05 level (2-tailed)

The result of the Pearson's correlation coefficient illustrated in Table 4.2 established a statistically significant relationship between environmental activities and plastic waste reduction in the food and beverage manufacturing firms at ($r = -.187$, $p < 0.05$). The negative correlation implies an inverse relationship between the two constructs. In other words, as environmental activities continue to improve, less attention will be focused on plastic waste reduction.

Tapang, Bassey and Bessong (2012) conducted a study that showed a significant relationship between environmental activities and the profitability of oil and gas companies. Therefore, proper handling of environmental activities is required if organizational profitability is to be maintained. According to Willis *et al.* (2018) recycling,

litter prevention and illegal dumping programs are environmental activities that relate to plastic waste reductions. These environmental activities assist in reducing waste loads in the environment. The environmental damage caused by plastic waste, as well as the money spent by municipalities to remove the waste is large. Kengatharan, Suganya and Sulochani (2020) established a negative relationship between corporate social responsibility (CSR) activities (economic activities, social activities, and environmental activities) and a firm's performance. The results of the study indicated that the organization needs to focus more on CSR activities in order to attract more customers to buy their product, which will improve the company's value and shareholder earnings in the near future.

Eze *et al.* (2019) states that to a lesser extent, some businesses engage in corporate social responsibility activities. Some businesses are not sufficiently involved in environmental sustainability practices such as minimizing the environmental impact of their production activities and providing community waste disposal bins. Thus, they are unwilling to change their policies in order to be more accountable and to take into account the environmental effects of their products. Lea and Nguyenb (2020) obtained results that indicated that companies acknowledge the significance of establishing environmental management systems for environmental protection and sustainable development. Even though waste monitoring is critical for production and business operations, most businesses are not prepared to conduct it. The act of carrying out environmental activities is primarily motivated by legal or mandatory environmental requirements.

Therefore, this explains the negative correlation between environmental activities and plastic waste reduction. Food and beverage manufacturing firms invest in environmental activities to create a good company reputation or image and it is not meant to reduce plastic waste.

A regression analysis was then performed to determine the degree of influence between the two constructs. The result of the linear regression is showcased in Table 4.3.

Table 4.11 Linear regression between environmental Activities and Plastic Waste Reduction

Variables in the equation	B	Beta	t	p-value	R ²	F	df	p-value
Constant	12.104		17.763	<.0005	.035	4.398	1; 122	<.05
Environmental activities	-.133	-.187	-2.097	<.05				

DV – Plastic Waste Reduction

Predictor (Constant) – Environmental Activities

The results of the regression analysis summarized in Table 4.3 indicate an R² value of .035 which suggests that environmental activities account for 3.5% of the variance in plastic waste reduction and environmental activities and plastic waste reduction have a considerable linear relationship., $F(1, 122) = 4.398$, $p < .05$. The independent variable, environmental activities, is a significant predictor of plastic waste reduction, $B = -0.187$, $p < 0.05$.

4.4 Chapter Summary

The presentation and interpretation of the findings is highlighted in this chapter. The results were explained and graphically presented according to the target group of food and beverage manufacturing firms in Durban, South Africa. The respondents' demographic information was provided in the descriptive statistics. According to the findings, improvements in environmental management accounting practices in relation to plastic pollution control do not result in improved corporate environmental strategy. However, the findings also revealed that corporate environmental strategies resulted in better plastic pollution control. The findings revealed that disclosing environmental

information can help reduce plastic pollution. The study discovered that the barriers to sustainability and the barriers to EMA practices are similar, implying that addressing the barriers to sustainability will have a positive impact on the adoption of EMA practices. It was also discovered that food and beverage manufacturing companies invested in environmental activities to build a good company reputation rather than to help reduce plastic waste.

The following chapter will present the conclusions and recommendations based on the primary context of this research.

CHAPTER FIVE

CONCLUSIONS, RECOMMENDATIONS, AND LIMITATIONS

5.0 Introduction

The findings of the study, as well as their interpretation and discussion, were presented in the previous chapter. The study results were explained and graphically presented based on the responses of the sample, which included food and beverage manufacturing firms in Durban, South Africa.

This chapter demonstrates how the research goal and objectives were met. This chapter focuses on the study's conclusions, limitations, recommendations based on the findings, and recommendations for future research. Plastic pollution is a global environmental issue that has gained the attention of different stakeholders such as the government, business owners and society in the previous two decades. Most companies are pressured to carry their business activities in a sustainable manner. Consumers are advised to buy reusable and environmentally friendly products to minimize the consumption of plastic products. According to Keit (2011), the issue of environmental sustainability in all firms will be achieved through the implementation of EMA practices. If this is not done, the South African government will not be able to achieve its goal of reducing plastic pollution to a manageable level. In this study it is revealed that although there is an indirect relationship between EMA practices and corporate environmental strategy in cushioning the effect of plastic pollution in food and beverage manufacturing firms, corporate environmental strategy improves plastic pollution control in these firms.

5.1 Summary of Findings

The study aimed at investigating the application of EMA practices on plastic pollution control in food and beverage manufacturing firms in Durban, South Africa. A component of this research is to look at factors that hinder the implementation of EMA in the food and

beverage manufacturing firms. Overall, the aim is to determine whether EMA practices assist in reducing plastic pollution in these firms. To achieve the aim of this study, the following objectives are tackled:

- To establish the relationship between environmental management accounting and corporate environmental strategy in the food and beverage manufacturing firms.
- To determine the influence of environmental information on plastic pollution control in the food and beverages manufacturing firms
- To establish the relationship between corporate environmental strategy and plastic pollution control.
- To establish the influence of barriers to environmental sustainability on environmental management accounting.
- To investigate the role of corporate environmental strategy on plastic pollution control in food and beverages manufacturing firms.

In order to achieve these objectives, research questionnaires were distributed to respondents in food and beverage manufacturing firms. The quantitative aspect was based on data obtained from closed-ended questionnaires from the Likert scale. This data was then analyzed using SSPS.

Chapter one highlighted the background information on EMA practices and plastic pollution. It further stated the problem, aim and objectives, scope, importance, and structure of the study. In South Africa, the adoption of EMA practices is limited and so are the studies relating to it. The implementation of EMA practices is needed as plastic waste accumulates in the environment and firms are pressured by stakeholders to carry their business practice in a way that does not negatively affect the environment.

Chapter two focused on the literature which is divided into the following: a conceptual, theoretical, and empirical review. This section explored concepts that relate to environmental management accounting and plastic pollution, and a conceptual framework was developed. An empirical literature review on studies that are similar to the topic was discussed to establish the existing gap in the application of EMA practices in the South African food and beverage manufacturing sector. The section further highlighted different theories.

Chapter three discussed the research methodologies that were employed to achieve the study's objectives. This section discussed the research approach used, targeted population, sample and sampling methods, data collection tools, statistical data analysis, validity and reliability, and ethical considerations.

Chapter four demonstrated the findings, understanding, and review of the results obtained while investigating the effect of the application of EMA practices on plastic pollution control in the food and beverage manufacturing firms in Durban, South Africa. Data collected analyzed using statistical analysis SPSS. The results were compared with the previous studies highlighted in chapter two. Although studies on the topic are limited, there were some similarities in the findings. This assisted the researcher in achieving the study's objectives.

The first research question was designed to investigate the relationship between environmental management accounting and corporate environmental strategy in food and beverage manufacturing firms. The Pearson's correlation coefficient was performed and revealed an inverse relationship between EMA and corporate environmental strategy ($r = -.199$, $p < 0.05$). This indicated that improvement in the application of EMA in addressing plastic pollution does not lead to improved corporate environmental strategy with regard to the same problem. Linear regression analysis showed an R^2 value of 0.039 which suggests EMA (independent variable) accounts for 3.9% of CES (dependent variable).

The second research question sought to establish a link between environmental information and plastic pollution control in food and beverage manufacturing firms. The Pearson's correlation coefficient showed a positive relationship between the two variables ($r = .729$, $p < 0.0005$). Linear regression analysis showed an R^2 value of 0.532 which suggests that environmental information (IV) accounts for 53.2% of the variance in plastic pollution control (DV). Overall, this indicates that when the disclosure of environmental information improves, plastic pollution control within the firm will improve.

The third research question was created to investigate the relationship between corporate environmental strategy and plastic pollution control in food and beverage manufacturing firms and through Pearson's correlation coefficient a positive relationship was determined between the two ($r = .385$, $p < 0.0005$). The R^2 value of 0.149 was obtained from the linear regression analysis which suggested that corporate environmental strategy accounts for 14.9% of the variance in plastic pollution control. Thus, a significant linear relationship between the two variables was discovered, $F(1, 122) = 21.286$; $P < 0.0005$.

The fourth research question was developed to investigate the relationship between barriers to environmental sustainability and environmental management accounting in food and beverage manufacturing firms. Pearson's correlation coefficient revealed a positive association at ($r = .250$, $p < 0.0005$). A further linear regression analysis carried out revealed a significant relationship between barriers to environmental sustainability and environmental management accounting, $F(1, 122) = 8.149$, $p < .05$.

The fifth research question was developed to investigate the connection between environmental activities and plastic waste reduction in food and beverage manufacturing firms. Pearson's correlation coefficient revealed an inverse relationship at ($r = -.187$, $p < 0.05$). However, a substantial linear relationship was discovered during the linear regression analysis, $F(1, 122) = 4.398$, $p < .05$.

The exploratory factor analysis (EFA) revealed that the seven factors extracted from the study had moderate reliability. For each factor, the Cronbach's alpha coefficient was

indicated as follows: factor 1 - 0.925, factor 2 – 0.869, factor 3 - 0.751, factor 4 - 0.719, factor 5 - 0.542, factor 6 - 0.803 and factor 7 - 0.500.

5.2 Recommendations

Based on the study's findings, the investigator made the following recommendations for the food and beverage manufacturing industry:

- **Integrate environmental issues with the company's strategic process.**

Environmental issues are becoming more common as strategic issues and many firms have started to integrate environmental issues with their strategic management processes. If human economic activity is to be viable, corporate strategic behaviour must take structural elements into account. Although, some firms integrate the two to gain a competitive advantage but this leads to developing strategies that can address the environmental issues. Environmental issues have an impact on many aspects of a company's operations, including manufacturing, input materials purchasing, energy consumption, branding, product design, disposal, and waste management. Therefore, the corporate environmental strategy will lead to better pollution control measures.

- **Integrate EMA practices into their accounting system.**

Companies should integrate EMA practices in their accounting system as the traditional management accounting systems has several drawbacks. This main drawback is the treatment of environmental costs as a general overhead cost/ hidden cost which made it difficult for managers to make effective decisions on issues concerning the environment. EMA was then established to solve the problem of conventional management accounting systems and provide adequate information on the environment for decision making. The application of environmental management accounting is important to any firm as it assists managers to control environmental costs. According to Mokhtar, Jusoh and Zulkifli (2016), EMA assists businesses in measuring the effect of their business activities on the environment and allocate costs or saving generated by environmental initiatives.

- **Disclosure of environmental accounting information as an environmental management tool to reduce plastic pollution.**

Based on the findings in Chapter 4, reporting environmental information improves plastic pollution controls. According to Liu *et al.* (2009), the disclosure of environmental accounting information, showing the status of environmental pollution, and revealing the utilization situation of environmental resources is an unavoidable requirement for controlling the current environmental issues. Overall, to be able to deal with the issue of plastic waste, companies must start disclosing environmental information in their financial reports.

- **Promoting environmental sustainability through EMA.**

Although the government take appropriate steps to promote environmental sustainability, companies must also acknowledge their negative effect on the environment. This can be done by implementing EMA practices. The findings of this study revealed that solving the barriers to sustainability in a company will ease the implementation process of EMA practices.

- **Invest in environmental activities to enhance plastic waste management.**

The study found a negative correlation between environmental activities and plastic waste reduction which indicated that most firms invested in environmental activities to build a good image rather than to reduce plastic waste. With an accumulating plastic waste in the environment, firms are encouraged to invest in environmental activities that reduce plastic waste. This can be done by using less plastic for packaging, manufacturing product using biodegradable plastics or any other alternative that is reusable or degrade easily (glass or paper), and supporting different plastic recycling designs.

- **The government should enforce the inclusion of EMA practices in company policy.**

According to Keit (2011), there is presently no straightforward format of the EMA report required in South Africa. As a result, there is lack of awareness about possible future advantages of cost savings, pollution control, and compliance with legislation. The government can achieve its goal of reducing plastic waste by requiring businesses to use EMA practices as their accounting systems.

5.3 Conclusions

From the findings of the study presented in Chapter 4, the study concludes that:

While environmental management accounting improves in solving plastic pollution, the corporate environmental strategy does not have the same effect in solving the same issue. Environmental information and plastic pollution control have a positive relationship. Improved corporate environmental strategy led to improved plastic pollution control. Barriers to environmental sustainability and barriers to EMA are similar, the study found a direct relationship between these variables. Environmental activities and plastic waste reduction have a negative correlation.

5.4 Limitations of the Study

The study was based on the food and beverage manufacturing firms in Durban. The findings in the study could not be applied to the entire population of the South African food and beverage manufacturing sector. The sample size was relatively small which led to the researcher using the entire population in Durban. The existing literature on the application of environmental management accounting is limited especially relating to plastic pollution control in South Africa as a whole. The research approach used in this study was not enough to provide an understanding of the extent to which the food and beverage manufacturing firms have adopted EMA practices.

5.5 Further Research Suggestions

There is need to expand the research to other South African provinces so that a precise comparison of EMA application on plastic pollution control across South Africa can be

made with the focus on the food and beverage manufacturing sector. Further research on the same topic using a mixed approach is recommended. Lastly, extend the research to the plastics manufacturing industry.

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Appendixes

Appendix 1: Questionaries

TOPIC: THE APPLICATION OF ENVIRONMENTAL MANAGEMENT ACCOUNTING PRACTICES ON PLASTIC POLLUTION CONTROL IN FOOD AND BEVERAGES MANUFACTURING FIRMS IN DURBAN, SOUTH AFRICA.

SECTION A: BIOGRAPHIC INFORMATION

1. Job Designation

☐ Financial Manager

☐ Management Accountant

☐ Factory Accountant

☐ Chief Accountant

2. Employment Experience

☐ 0 to 5 years

☐ 6 to 10 years

☐ 11 to 15 years

☐ 16 to 20 years

☐ > 21 years

3. Age Group

☐ 20 years or below

☐ 21 to 30 years

☐ 31 to 40 years

☐ older than 40 years

4. Marital Status

☐ Single

☐ Married

☐ Divorced

☐ Widowed

5. Highest level of qualification

☐ Diploma/ Bachelor's Degree

☐ Honours Degree/ Btech

☐ Masters

☐ Doctorate

6. Firm scale

☐ Small

☐ Medium

☐ Large

7. Existence of environmental costs

☐ Yes

☐ No

8. Investments on environmental activities

☐ Yes

☐ No

SECTION B: ENVIRONMENTAL MANAGEMENT ACCOUNTING PRACTICES IN A FIRM

INSTRUCTIONS TO RESPONDENTS:

1. Please select **ONLY ONE** response with a tick ✓ for each Likert Scale statement below.

2. Answer **ALL** the pre-coded statements in this section.

3. Please **DO NOT** leave any statement blank.

KEY: SD = Strongly Disagree (1); D = Disagree (2); N = Neutral (3); A = Agree (4); SA = Strongly Agree (5)

S/N	Statements	SD	D	N	A	SA
1.1	CORPORATE ENVIRONMENTAL STRATEGY OF FIRM:					
1.1.1	Environmental sustainability is important to our firm.					
1.1.2	Integrated environmental issues are incorporated into the company's strategic planning process.					

1.1.3	Environmental objectives are linked with the company's corporate goals.					
1.1.4	During the development of new products, environmental issues are always considered.					
1.1.5	The current financial management/costing system provide the company with data required to analyse environmental costs.					
1.2	ENVIRONMENTAL RELATED ACTIVITIES:					
1.2.1	The firm identifies environment related costs					
1.2.2	The firm allocate environment related costs to production processes					
1.2.3	The firm assign environment related costs to products					
1.2.4	The firm create environment related costs account					
1.2.5	The firm uses environmental related cost account.					
1.2.6	The firm improve environment related cost management					

1.3	PERSPECTIVES OF ENVIRONMENTAL MANAGEMENT ACCOUNTING:					
1.3.1	Environmental information is disclosed in the present management accounting information system					
1.3.2	Formal accounting procedures are available when dealing with a specific environmental issue					
1.3.3	The firm undertake environmental impact audits to assess the firms impact on the environment resulting from economic activities					
1.3.4	The firm report environmental information to external stakeholders					
1.4	FACTORS INFLUENCING THE ADOPTION OF ENVIRONMENTAL MANAGEMENT ACCOUNTING (EMA) PRACTICES					
1.4.1	The level of education affects the adoption of Environmental management accounting practices					

1.4.2	Experience assist in identifying suitable environmental management accounting practices					
1.4.3	The firm require resources to train the management staff to adopt environmental management accounting practices					
1.4.4	The number of years in which the firm has been in operation influences the adoption of environmental management accounting practices					
1.4.5	The size of the firm impact the adoption of EMA practices					
1.4.6	The complexity of an enterprises has an impact on the adoption of EMA practices					
1.4.7	Environmental management accounting practices are expensive to implement in a food and beverage manufacturing industry					
1.4.8	Environmental management accounting practices are complex to implement in a food and beverage manufacturing industry					
1.4.9	It is difficult to collect environmental costs					
1.4.10	It is difficult to allocate environmental costs					

1.4.11	The benefits of implementing Environmental Management Accounting outweigh the lack thereof					
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Please select the appropriate environmental management accounting tool(s) used in your firm:

☐ Environmental cost accounting

☐ Lifecycle costing

☐ Target costing

☐ Material flow assessment

☐ Energy flow assessment

☐ Lifecycle inventories

☐ Lifecycle analysis

☐ Flow cost accounting

☐ Input/output analysis

☐ Environmental life cycle budgeting

☐ Environmental life cycle target pricing

☐ Other

SECTION C: PLASTIC POLLUTION CONTROL

INSTRUCTIONS TO RESPONDENTS:

1. Please select **ONLY ONE** response with a tick ✓ for each Likert Scale statement below.

2. Answer **ALL** the pre-coded statements in this section.

3. Please **DO NOT** leave any statement blank.

KEY: SD = Strongly Disagree (1); D = Disagree (2); N = Neutral (3); A = Agree (4); SA = Strongly Agree (5)

S/N	Statements	SD	D	N	A	SA
2.1	PLASTIC POLLUTION CONTROL WITHIN THE FIRM:					
2.1.1	A majority of the product produced are short-lived products					
2.1.2	A majority of our short-lived products are made of plastic					
2.1.3	Plastic packaging are a major contributor to plastic waste					
2.1.4	The firm support different plastic recycling design					
2.1.5	The firm encourages environmentally friendly practices to customers					
2.1.6	Controlling plastic waste require an effort from the consumer as well					

2.1.7	There are procedure available to assess plastic waste incurred by the firm					
2.1.8	The firm invest to research to determine ways to reduce environmental impact of the firm associated with plastic waste					
2.2	RESASON FOR FIRMS TO REDUCING PLASTIC WASTE:					
2.2.1	The fear for the firm's sustainability in the future and its uncertainty					
2.2.2	The market pressure for products that are environmentally friendly					
2.2.3	Strict legislation and environmental crime law					
2.3	BARRIERS TO SUSTAINABILITY AND ADOPTION OF ALTERNATIVE METHODS:					
2.3.1	The are no incentive on economic polices					
2.3.2	Alternative methods (use of biodegradable plastic or paper) are expensive to implement					

2.3.3	Additional infrastructure is required to adopts new methods					
2.3.4	The firm prioritize more the production processes					
2.3.5	The firm prioritizes the products					
2.3.6	Concern about competitiveness influences the decision to adopt alternative methods					
2.3.7	Management resistance to change affect the decision to adopt alternative methods					

SECTION D: ENVIRONMRNTAL MANAGEMENT PRACTICES ON PLASTIC POLLUTION CONTROL

INSTRUCTIONS TO RESPONDENTS:

1. Please select **ONLY ONE** response with a tick ✓ for each Likert Scale statement below.
2. Answer **ALL** the pre-coded statements in this section.
3. Please **DO NOT** leave any statement blank.

KEY: SD = Strongly Disagree (1); D = Disagree (2); N = Neutral (3); A = Agree (4); SA = Strongly Agree (5)

S/N	Statements	SD	D	N	A	SA
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3.1	ENVIRONMENTAL INFORMATION AND ENVIRONMENTAL COSTS ASSOCIATED WITH PLASTIC POLLUTION					
3.1.1	The firm report environmental costs associated with plastic pollution					
3.1.2	Major environmental costs incurred by the firm relate to prevention of plastic pollution					
3.1.3	The firm tries to reduce the threat of plastic waste to the environment by implementing environmental management accounting tools					
3.1.4	The firm identify environmental costs relating to plastic using environmental management accounting tools					
3.1.5	The firm trace environmental costs associated with plastic using environmental management accounting tools					
3.1.6	The firm record environmental costs associated with plastic using environmental management accounting tools					
3.1.7	Environmental management accounting practices provide the expertise that enables the firm to track the impact of plastic waste caused by its processes or product					

3.1.8	Environmental management accounting tools provide the management with environmental information associated with plastic pollution that assist in decision making					
3.1.9	Environmental management accounting practices ensures that adequate resources are available to control costs of plastic pollution					

THANK YOU FOR YOUR PARTICIPATION!

Appendix 2: Permission to Conduct Research



Faculty Research Office
Durban University of Technology
Date December 3, 2020

Student: Smangele Nzama
Student Number: 21530475
Degree: Master of Accounting (Management Accounting)
Email: 21530475@dut4life.ac.za
Supervisor: Dr Odunayo Magret Olarewaju
Supervisor email: odunayoo@dut.ac.za

Dear Ms Nzama

ETHICAL APPROVAL: LEVEL 2

Your email correspondence in respect of the above refers.

Your proposal for a MSc in Financial Accounting, titled 'The application of environmental management accounting practices on plastic pollution control in Food and beverages manufacturing firms in Durban, South Africa', was submitted to two ethical reviewers and they had the following queries:

PG2a:

Sampling is not clear

Checklist:

Revise Q15, Q25 and Q26

Letter of Consent:

Letter of Information and Consent needs to be revised.

Gatekeeper Letter(s):

The existing gatekeeper letter needs to be amended as the student is not seeking permission to conduct research, but instead seeking consent to obtain the list of names of food and beverages manufacturing firms in Durban.

Others:

Please check the Questionnaire for grammar and spelling. Some heading are missing.

Please amend your documents as per their queries. Their decision was to amend to the supervisor satisfaction for approval of changes

When ethics approval is granted:

You are required to present the letter at your research site(s) for permission to gather data. Please also note that your research instruments must be accompanied by the letter of information and the letter of consent for each participant, as per your research proposal.

This ethics clearance is valid from the date of provisional approval on this letter for one year. A student must apply for recertification 3 months before the date of this expiry.

Appendix 3: Letter of Information



INFORMATION AND CONSENT FORM

FACULTY OF ACCOUNTING AND INFORMATICS

MASTER OF ACCOUNTING: MANAGEMENT ACCOUNTING

Dear Participant

I, Smangele Nzama, a master's student at the Durban University of Technology invite you to participate in the research study entitled "The application of environmental management accounting practices on plastic pollution control in Food and beverages manufacturing firms in Durban, South Africa". This study aims to examine how the application of environmental management accounting practices contribute to plastic pollution control.

Title of the Research Study: The application of environmental management accounting practices on plastic pollution control in Food and beverages manufacturing firms in Durban, South Africa.

Investigator/s/researcher: Smangele Nzama, ND: Cost and Management Accounting, BTech: Cost and Management Accounting.

Co-Investigator/s/supervisor/s: Odunayo Margret Olarewaju, PhD, CA(NIG), ACMA, CGMA and Omolola A. Arise, M Acc, BSc Hons (ACC)

Brief Introduction and Purpose of the Study: As South Africa is still a developing country, there is lack of awareness of environmental management accounting practices with regards to reporting environmental costs and managing costs associated with plastic pollution. The purpose of this study is to examine how the

application of environmental management accounting practices assist on plastic pollution control. Food and beverage manufacturing firms in Durban, South Africa will be used as a case study.

Outline of the Procedures: The participation in this project is voluntary and participants will be required to complete an online survey (QuestionPro). QuestionPro has been employed for effectiveness and efficiency purposes. After reading the letter of information and consent, should the participant choose to participate, they will need to click on the checkbox button which will redirect them to the questionnaires.

After two weeks of the electronic distribution of questionnaire, an email of reminder will be sent to the participants. The researcher will provide responses via emails to any questions that the respondents had asked.

Risks or Discomforts to the Participant: There are minimal risk for participants or discomforts expected from participating in this study.

Benefits: The following are the expected benefits from this study;

- The study will assist the food and beverage manufacturing industries to understand the factors encouraging better accounting sustainability.
- All stakeholders including the general society, will benefit through greener operations that is being conducted through responsible entrepreneurship.
- The benefit of the researcher will be research publications in accredited journals.

Reason/s why the Participant May Be Withdrawn from the Study: The respondent may refuse to participate or withdraw from the project at any time with no negative consequences.

Remuneration: The respondents will not receive any remuneration for participating in the study.

Costs of the Study: The respondents will not be expected to cover any costs towards the study.

Confidentiality: All information would remain confidential. The information will not be used for any other purpose other than this research study. There will be no identifying information mentioned in the write up of the dissertation.

Research-related Injury: There will be no injuries that will be suffered by the respondents through participating in this study.

Persons to Contact in the Event of Any Problems or Queries: Please contact me on 084 749 9991, my supervisor Dr Odunayo Margret Olarewaju on 031 373 5632 or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the Director: Research and Postgraduate Support, Dr. Linda Z. Linganiso on 031 373 2577 or researchdirector@dut.ac.za

Once again, your participation of this study is voluntary. You can opt not to participate or withdraw from the study at any time without adverse consequences. Confidentiality and anonymity of records identifying you as a participant will be maintained by the researcher and the University.

Thank you for participating.

Your assistance is greatly appreciated.

Sincerely,

Miss S Nzama

Student No.: 21530475

Cell No.: 084 749 9991

Appendix 4: Consent Form

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, **Smangele Nzama**, about the nature, conduct, benefits, and risks of this study.
- I have also read and understood the above written information (Participant Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during this research which may relate to my participation will be made available to me upon request.

By clicking on the checkbox, I give my consent voluntarily to participate in this study

☐

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Appendix 6: Turnitin Report

THESIS TO BE SUBMITTED			
ORIGINALITY REPORT			
14%	12%	8%	0%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS
PRIMARY SOURCES			
1	sajhrm.co.za Internet Source	<1 %	
2	hdl.handle.net Internet Source	<1 %	
3	ir.kabarak.ac.ke Internet Source	<1 %	
4	onlinelibrary.wiley.com Internet Source	<1 %	
5	www.tandfonline.com Internet Source	<1 %	
6	openscholar.dut.ac.za Internet Source	<1 %	
7	worldwidescience.org Internet Source	<1 %	
8	mafiadoc.com Internet Source	<1 %	
9	uir.unisa.ac.za Internet Source	<1 %	

Appendix 9: Letter from the language editor

DiTi OLAX Proof-reading Services

Cell: 0628849072
E-mail: modupeshola34@gmail.com

To whom it may concern

This is to certify that I have proofread the thesis by Smangele Nzama entitled: "The Application of Environmental Management Accounting (EMA) Practices on Plastic Pollution Control in Food and Beverages Manufacturing Firms in Durban, South Africa"

I have made any corrections to grammar and spelling which I felt necessary.

Regards,

Oladejo Olufemi Michael