Environmental Sustainability Commitment and Financial Performance of Firms Listed on the Johannesburg Stock Exchange, South Africa

By

OBEY DZOMONDA

Submitted in fulfilment of the requirements for the degree of

DOCTOR OF COMMERCE

in

BUSINESS MANAGEMENT

in the

FACULTY OF MANAGEMENT & LAW

(School of Economic and Management)

at the

THE UNIVERSITY OF LIMPOPO

SUPERVISOR: PROFESSOR O.O. FATOKI

April 2021

ABSTRACT

The current work assessed the link between environmental sustainability commitment and financial performance of firms listed on the Johannesburg Stock Exchange (JSE). Broadly, the researcher aimed to establish whether environmental sustainability commitment as measured by energy efficiency, water efficiency, waste management, carbon emission reduction, material efficiency, green products and services innovation, environmental compliance and stakeholder engagement do affect financial performance. Furthermore, the study tested the moderation effect of industry type on the link between environmental sustainability commitment and financial performance. The study was quantitative in nature with a case study research design. The longitudinal design was adopted where the researcher collected panel data from 2011-2018. The population of the study included all firms listed on the JSE Responsible Investment Index in South Africa. The sample constituted of 32 firms listed on the FTSE/JSE Responsible Investment Index in South Africa.

The researcher employed panel regression analysis model to analyse the data. Specifically, the Feasible Generalised Least Squares regression model was utilised in this study. Financial performance was treated as the dependant variable and was measured using return on equity (ROE), return on assets (ROA), earnings per share (EPS), share price and Tobin's q. The independent variables of the study included components of environmental sustainability; energy efficiency, water efficiency, waste management, carbon emission reduction, material efficiency, green products and services innovation, environmental compliance and stakeholder engagement. Control variables such as firm size and liquidity were used in the study.

Mixed findings emerged from the statistical tests. The findings on the relationship between energy efficiency and financial performance suggested that energy efficiency has no significant effect on financial performance as measured by ROE, ROA and Tobin's Q. Conversely, a significant and negative link was established when energy efficiency was tested against EPS and share price. A significant positive relationship was established between water efficiency and EPS as well as share price. The results further revealed that being water efficient may not significantly affect financial performance when ROE, ROA and Tobin's Q are used. The results showed no significant relationship between waste management and all dependent variables. The findings indicated that carbon emission reduction was positively and significantly related to EPS and share price. Nevertheless, it was discovered that the nexus between carbon emission reduction and measures of financial performance such as ROE, ROA and Tobin's Q was positive but insignificant. In terms of material efficiency and financial performance, the findings indicated that material efficiency had an insignificant effect on ROE, ROA, share price and Tobin's Q. Nevertheless, a significant and negative relationship was established between material efficiency and EPS. Considering green products and services innovation and performance, the findings established a significant negative relationship between green products and services innovation and share price. However, the results further indicated that the link between green products and services innovation and ROE, ROA, EPS as well as Tobin's Q was insiginificant. The findings exhibited that environmental compliance was negatively related to ROE and Tobin's Q yet positively related to EPS and share price. An insignificant relationship was established between environmental compliance and ROA. Stakeholder engagement was found to be positively related to EPS. It was also found that the effect of environmental sustainability commitment on financial performance did not differ based on the industry type. The findings rather showed that firms within each industry had specific environmental sustainability commitment and financial performance combinations which were unique to that industry. It was also found that industry type significantly moderates the relationship between environmental sustainability commitment and financial performance. It was concluded that firms can enhance their financial performance from environmental investments which are unique to certain industries as determined by key stakeholders in that sector. Recommendations were made to different stakeholders such as the government, corporate managers and organisations which provide environmental reporting guidelines to play an active role in promoting environmental sustainability commitment among firms.

Keywords: environmental sustainability commitment; financial performance; firms; sustainable development; Johannesburg Stock Exchange; South Africa

DECLARATION

I declare that the thesis hereby submitted to the University of Limpopo, for the degree of Doctor of Commerce in Business Management has not previously been submitted by me for a degree at this or any other university; that it is my work in design and in execution, and that all material contained herein has been duly acknowledged.

Dzomonda Obey 20 April 2021

ACKNOWLEDGEMENTS

Writing this thesis has been an interesting yet challenging experience in my life. It was indeed a journey in a jungle, which required me to come up with a roadmap if I had to reach my destination on time. Indeed, coming up with a clear strategy helped me to account for every second of my time as I knew that it was allocated towards completing a certain section of my thesis. Hence, there was no time to spare. Nevertheless, goal attainment may prove to be an elusive agenda without the assistance of some people. Even though I had it all on my shoulders, I wish to thank everyone who contributed to this piece of work in several ways.

First of all, I owe gratitude to my supervisor Professor Olawale Fatoki. Without his help, I would not have completed this thesis on time. He was instrumental in the whole process from battling to come up with a research topic up to the full thesis. I would like to submit that my research skills improved significantly from the constructive feedback he provided me during my research journey.

I am thankful to my family for their unconditional support. It has been a hectic period, but they never stopped to support me financially and emotionally. To my wife, I want to say thank you so much for your unwavering support during this hectic journey.

A special thank you also goes to Dr Masocha for providing me with some advice and words of encouragement. I also wish to thank Mr Silas Mukwarami for taking me through the Stata software and all the panel data models. At first it seemed impossible but through our discussions, it became simpliefied.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APENDICES

CHAPTER 1

INTRODUCTION TO THE STUDY

"Boosting economic growth does not mean locking the world into a high emissions and unsustainable future, we must ensure that fiscal and structural policy reforms are compatible with climate and environmental policies" (Gurría, 2017:3).

1.1 INTRODUCTION

The issue of environmental sustainability commitment has become a famous topic recently (Global Reporting Initiative (GRI), 2016; Soytas, Denizel & Usar, 2016; Amacha & Dastane, 2017; Trumpp & Guenther, 2017; Riaz, Saeed, Baloch & Khan, 2019) and it is highly emphasised in the sustainable development goals (SDGs) on both agenda 2030 and 2063 (Martí-Ballester, 2017). Sustainability can be summarised into three pillars which are economic, society and the environment (Rishi, Jauhari & Joshi, 2015; Nguyen, 2016; Masocha & Fatoki, 2018). Economic sustainability centres on the ability of the business to remain profitable in order to sustain its day to day activities, and the social sustainability pillar explains a balance attained by the social systems in terms of culture, peace, wellbeing and justice (Social Sustainability Policy, 2016). The focus of the current study is on environmental sustainability practices of firms listed on the Johannesburg Stock Exchange (JSE). The JSE is a market where all securities can be traded by investors from all over the world. These include different shares and currency derivatives. Gautam (2017) defines environmental sustainability as a balance between resource use and regeneration rate attained when the pollution is matched to the capacity of the environment. The environment plays a key role as it supplies all the resources required to sustain all human activities (Mohiuddin, 2014; Ganda, 2016; Trumpp & Guenther, 2017). There is a serious need to adopt a proactive stance towards protecting the environment (Fraj, Matute & Melero, 2015; Valero-Gil, Rivera-Torres & Garcés-Ayerbe, 2017). As such, pressure is burgeoning every day for businesses to consider environmental sustainability seriously (Rajala, Westerlund & Lampikoski, 2016; Kiron, Unruh, Kruschwitz, Reeves, Rubel & Felde, 2017; Masocha & Fatoki, 2018; Xue, Boadu & Xie, 2019).

Firms are responding slowly to the call for environmental sustainability compliance and reporting (Higgs, 2015; Kim & Im, 2017; Ernst & Young Global, 2018). Some firms are involved in fraudulent activities in order to escape environmental commitment (Kim & Im, 2017; Whetman, 2017), while others are involved in greenwashing (Griese, Werner & Hogg, 2017; Khandelwal, Sharma & Jain, 2019). On that backdrop, it is noted that the number of highly sustainable firms remain low as compared to firms that do not commit to environmental sustainability initiatives (Kiron et al., 2017). In fact, the issue of environmental sustainability is at crossroads as firms are still indecisive on whether to invest in sustainability or not (Kiron et al., 2017). The issue of slow environmental sustainability commitment emanates from lack of motivation as firms view environmental sustainability commitment as costly (Putz, 2017). However, "if corporations can be convinced that environmentally friendly practices are in fact profit increasing, then even the most environmentally indifferent, but profit-seeking firm would go green" (Putz, 2017:3). The unsatisfactory environmental sustainability commitment among firms is worrying given that firms utilise more energy in their production processes than households (Martí-Ballester, 2017). A report by International Energy Agency (IEA) (2015) indicates that between 2008 and 2013, manufacturing, construction and energy firms emitted approximately 66.72% of total global carbon emissions. Furthermore, South Africa tops the list of greenhouse gas emitters globally as approximately 95% of its electricity comes from coal (Girmay & Chikobvu, 2017). Singh (2016) notes that there is an energy efficiency gap in most firms in South Africa. Promoting environmental sustainability commitment among firms goes a long way in cutting down energy consumption, water pollution, waste and greenhouse gas emissions as they have the innovative ability to come up with clean, smart and efficient technology (IEA, 2015).

The issue of sustainability commitment and performance are key aspects for listed firms to increase the value of their shares, and hence attract investors (Zhang, 2016; Johannesburg Stock Exchange, 2020). This is so because of the emergence of responsible investing where institutional investors assess the sustainability of a business before committing their investments (Zhang, 2016). Firms actively committed to environmental sustainability can achieve improved growth and cost savings, hence a health financial standing (IEA, 2015). Nevertheless, the relationship between environmental sustainability commitment and financial performance remains indistinct (Jabbour, Da Silva, Paiva & Santos, 2012; Lu & Taylor, 2015; Horváthová, 2016; Soytas, Denizel & Usar, 2016; Miroshnychenko, Barontini & Testa, 2017; Riillo, 2017; Hussain, Rigoni & Cavezzali, 2018; Xue et al., 2019). Some studies point out that environmental sustainability commitment positively influences the financial performance of a firm through operational efficiency which consequently reduce costs (Albertini, 2013; Endrikat, Guenther & Hoppe, 2014; Muhammad, Scrimgeour, Reddy & Abidin, 2015; Whelan & Fink, 2016; Amacha & Dastane, 2017; Manrique & Martí-Ballester, 2017). Conversely, another strand of literature posits that environmental sustainability initiatives deplete funds that could have been used to fund other profitable investments, hence, negatively affecting financial performance (Vijfvinkel, Bouman & Hessels, 2011; Fujii, Iwata, Kaneko & Managi, 2013; Lee, Cin & Lee, 2016; Putz, 2017). Surprisingly, another strand of scholars indicate that environmental sustainability commitment has no significant effect on financial performance (Qiu, Shaukat & Tharyan, 2016; Riillo, 2017).

One of the reasons for the inconclusiveness of the findings emanate from lack of a robust theoretical framework to link environmental sustainability commitment to firm performance (Trumpp & Guenther, 2017). The major weakness in existing studies is that they have measured environmental sustainability and financial performance with few variables. For instance, Nyirenda (2014) measured environmental sustainability with only energy efficiency, water management and carbon emission reduction and used only one measure of financial performance. These variables are insufficient to fully measure both environmental sustainability and financial performance (Trumpp & Guenther, 2017). Hence, it is pertinent for studies attempting to solve this conundrum to use more comprehensive environmental sustainability variables (Trumpp, Endrikat, Zopf & Guenther, 2015; Bergmann, Rotzek, Wetzel & Guenther, 2017) and a multi-dimensional measure of financial performance (Maditinos et al., 2006; Chen, Ong & Hsu, 2016; Boakye, 2018). Neeveditah, Karishma and Devi (2017) buttress this point and argue that when a firm attains energy efficiency, it automatically leads to a significant reduction in wastes, carbon emissions and water use which enables it to cut costs. Another weakness of existing studies is that they have overlooked the conditions or circumstances which affect the relationship between environmental sustainability commitment and financial performance. It is crucial to uncover such underlying factors to resolve the inconclusiveness of findings (Mazzi, Toniolo, Manzardo, Ren & Scipioni, 2016; Tang, Walsh, Lerner, Fitza & Li, 2018). Factors such as organisational capabilities, proactive environmental strategies, regional context and the industry context may influence the strength of the relationship between environmental sustainability and financial performance (Endrikat, Guenther & Hoppe, 2014; Lu & Taylor, 2016). Hence, it is advisable for researchers to incorporate one of these factors as possible moderating variables on the relationship between environmental sustainability commitment and financial performance. To that effect, the current study is one of its kind to take into consideration industry context and treat it as a moderator variable in the relationship between environmental sustainability commitment and financial performance. This was intended to understand if industry/sector type may strengthen or weaken the relationship.

Studies that have investigated the effect of environmental sustainability commitment on financial performance are limited in developing countries (Manrique & Martí-Ballester, 2017). The nexus between environmental sustainability variables (energy consumption, water consumption, waste management, carbon emission reduction, environmental compliance, material efficiency, stakeholder engagement and green products and services innovation) and financial performance has not been tested empirically on firms listed on the JSE in South Africa. This study also adopted a multi-dimensional measure of financial performance informed by the stakeholder theory. The financial model incorporated both accounting and market-based measures of financial performance which have never been adopted by existing studies that assessed the relationship between environmental sustainability commitment and financial performance. Adopting the multi-dimensional measure of financial performance informed by the stakeholder theory enabled the researcher to empirically test the applicability of the stakeholder theory in promoting environmental sustainability. This was achieved by testing how each of the stakeholders such as shareholders, employees, suppliers and investors among others react to environmental sustainability commitment through different financial measures. Against this backdrop, it is within the scope of this study to create a new and robust model that sufficiently links environmental sustainability commitment to firm financial performance of JSE listed firms.

1.2 PROBLEM STATEMENT

South Africa is on the brink of a sustainability threat if environmental variables such as energy, water, waste and carbon emission are not efficiently managed (Dube, 2017; Girmay & Chikobvu, 2017; James, 2017). Additionally, South Africa ranks 142 out of 180 countries compared in terms of environmental and ecosystem protection (Environmental Performance Index (EPI), 2018). This shows that South Africa's environmental performance is weak. Acute water shortages in South Africa pose a serious threat to business profitability (James, 2017) and problems related to waste have become rampant in several cities in South Africa (Dube, 2017). In South Africa, 95% of electricity is generated from coal, which makes the country one of the top greenhouse gas (GHG) emitters in Africa (Girmay & Chikobvu, 2017). The author of this study believes that it is through a vibrant, innovative and flexible business sector that the environmental sustainability issue can be effectively addressed in South Africa and globally.

In spite of their key potential role to solve the environmental conundrum in South Africa, firms still lag behind and lack serious commitment towards adopting environmental sustainability practices in their businesses (Jansson, Nilsson, Modig & Hed Vall, 2017; Kim & Im, 2017; Ernst & Young Global, 2018). Given the new trend of customers and investors who like to be associated with environmentally friendly businesses, firms should seriously engage in environmental sustainability issues (Johnson & Schaltegger, 2016). The IEA (2015) indicates that firms consume on average 13% of total global energy use, which is relatively high. The IEA (2015) further remarks that firms have the potential to cut off their total energy demand by 30% if they can practise efficient methods of energy consumption. Higgs (2015) notes that non-compliance with environmental standards is very high among firms. Worryingly, the business sector is blamed for causing 70% of global pollution on average (Johnson, 2015). Other studies such as Dube (2017) document that in England and Wales firms' contribution to waste and pollution is 60% and

80%, respectively. In South Africa, large firms contribute excessive amounts of carbon emissions annually. For example, Eskom emitted approximately 224.70 while Sasol emitted approximately 61.77 million tonnes of carbon by the end of 2010 period (Carbon Disclosure Project, 2014). Firms consume 40% and 45% of total water and energy consumption respectively (Higgs, 2015). Individual firms may have small environmental damage but when the impact is aggregated for all firms, it becomes clear that firms need to rethink on their environmental sustainability commitment strategies urgently (Higgs, 2015). Regardless of the above problems, empirical research about environmental sustainability commitment and firm financial performance is sparse in existing literature (Nguyen, 2016; Manrique & Martí-Ballester, 2017). In South Africa, Nyirenda (2014) examined environmental management practices of a JSE listed mining company. However, the study used only three environmental sustainability measures (energy efficiency, water management and carbon emission reduction) and return on equity as the only firm financial measure. Using limited environmental variables and financial measures can be insufficient to provide a robust explanatory power on the relationship (Trumpp & Guenther, 2017). The study improves the environmental sustainability construct by adding new variables such as environmental compliance, material efficiency, stakeholder engagement and green products and services innovation, which have been neglected in existing literature. These variables are outlined in the Global Reporting Initiative guidelines under the EN category. The study also adopts a multi-dimensional model of financial performance which incorporates both the accounting measures of financial performance (return on equity; return on assets; earnings per share) and market-based measures (Tobin's Q and share price). Such a comprehensive financial model has been missing in existing literature in South Africa. Using a multi-dimensional measure of financial performance can help managers of listed companies to clearly assess the effect of environmental investments on performance of their entities.

1.3 AIM OF THE STUDY

This study aims to examine the nexus between environmental sustainability commitment and financial performance of firms listed on the JSE. Broadly, the researcher aims to establish whether environmental sustainability activities such as waste management, energy efficiency, water efficiency, carbon emission reduction, environmental compliance, material efficiency, green products and services innovation as well as stakeholder engagement affect financial performance.

1.4 OBJECTIVES OF THE STUDY

The study is based on the following objectives:

- To examine the relationship between energy efficiency and the financial performance of firms listed on the JSE.
- To analyse the relationship between water efficiency and the financial performance of firms listed on the JSE.
- To evaluate the relationship between waste management and the financial performance of firms listed on the JSE.
- To investigate the relationship between carbon emission reduction and the financial performance of firms listed on the JSE.
- To assess the relationship between material efficiency and the financial performance of firms listed on the JSE.
- To establish the relationship between green products and services and the financial performance of firms listed on the JSE.
- To interrogate the relationship between environmental compliance and the financial performance of firms listed on the JSE.
- To determine the relationship between stakeholder engagement and the financial performance of firms listed on the JSE.
- To determine if the effect of environmental sustainability commitment on financial performance differ based on the industry type.

- To assess the moderating effect of industrial context on the relationship between environmental sustainability commitment and financial performance among firms listed on the JSE.
- To propose a framework for analysing environmental sustainability and financial performance of firms listed on the JSE.

1.5 HYPOTHESES

Hypothesis 1

H1$_0$: There is no relationship between energy efficiency and the financial performance of firms listed on the JSE.

Ha1$_a$: There is a significant positive relationship between energy efficiency and the financial performance of firms listed on the JSE.

Hypothesis 2

H2$_0$: There is no relationship between water efficiency and the financial performance of firms listed on the JSE.

H2$_a$: There is a significant positive relationship between water efficiency and the financial performance of firms listed on the JSE.

Hypothesis 3

H3$_0$: There is no relationship between waste management and the financial performance of firms listed on the JSE.

H3$_a$: There is a significant positive relationship between waste management and the financial performance of firms listed on the JSE.

Hypothesis 4

H4$_0$: There is no relationship between carbon emission reduction and the financial performance of firms listed on the JSE.

H4$_a$: There is a significant positive relationship between carbon emission reduction and the financial performance of firms listed on the JSE.

Hypothesis 5

$H5_0$: There is no relationship between materials efficiency and financial performance of firms listed on the JSE.

$H5_a$: There is a significant positive relationship between materials efficiency and financial performance of firms listed on the JSE.

$H6_0$: There is no relationship between green products and services and financial performance of firms listed on the JSE.

$H6_a$: There is a significant positive relationship between green products and services and financial performance of firms listed on the JSE.

Hypothesis 7

$H7_0$: There is no relationship between environmental compliance and financial performance of firms listed on the JSE.

$H7_a$: There is a significant positive relationship between environmental compliance and financial performance of firms listed on the JSE.

Hypothesis 8

$H8_0$: There is no relationship between stakeholder engagement and financial performance of firms listed on the JSE.

$H8_a$: There is a significant positive relationship between stakeholder engagement and financial performance of firms listed on the JSE.

Hypothesis 9

$H9_0$: Industry/sector type does not moderate the relationship between environmental sustainability commitment and financial performance among firms listed on the JSE.

H9a: Industry/sector significantly moderates the relationship between environmental sustainability commitment and financial performance among firms listed on the JSE.

1.6 DEFINITION OF CONCEPTS

Sustainable development

The Bruntland Report (1987:187) defined sustainable development as “development that meets the present needs without compromising the ability of future generations to meet their needs.” In this study, sustainable development is defined as attaining current human needs without compromising the ability of the environment to cater for future generations.

Environmental sustainability commitment

Environmental sustainability is defined as the ability of business systems to balance activities that enhance human welfare with environmental needs (McGinn, 2009). On the other hand, environmental sustainability commitment is defined as measures a firm can take to proactively mitigate environmental damage resulting from its business operations (Vasanth, Selvam, Lingaraja, Miencha & Raja, 2015). In this study, environmental sustainability commitment is defined as strategies designed by firms to minimise environmental damage by attaining energy efficiency, water efficiency, waste reduction, carbon emissions reduction, material efficiency, green products and services innovation, environmental compliance and stakeholder engagement.

Energy efficiency

International Energy Agency (2015) defines energy efficiency as optimising energy consumption by adopting systems that eliminate overuse thereof. In this study, energy efficiency is defined as proactive approaches employed by a firm to attain sustainable energy use.

Water efficiency

Water efficiency is defined as the minimisation of water usage achieved by maximising re-usage and recycling thereof (Zamfir, Mocanu & Grigorescu, 2017). The current study defines water efficiency as the adoption of proactive and lean strategies to avoid the unsustainable use of water.

Waste management

Bartolacci, Zigiotti and Diem (2015) define waste management as practices implemented by a firm to handle waste in a way that minimises environmental pollution. In this study, waste management is defined as the adoption of proactive strategies such as recycling, reuse and reduction by a firm to eliminate waste from the source and end of pipe destinations.

Carbon emission reduction

According to Rokhmawati (2015), carbon emission reduction is an act of cutting down activities and processes that emit hazardous gases into the atmosphere. The current study defines carbon emission reduction as the minimisation or elimination of business activities that emit carbon dioxide.

Financial Performance

According to Verma (2017), a firm's financial performance is a measure of how well a business is or has met its financial objectives. In this study, firm financial performance is defined as the effectiveness and efficiency in which a firm attains its financial goals.

Return on equity (ROE)

According to Kennon (2017), return on equity is well understood as profits divided by the shareholders' equity. In this study, ROE is defined as how well shareholders' equity was utilised to generate the net profit.

Return on assets (ROA)

According to Ong, Teh and Ang (2014), return on assets provides information on how effective the management was in utilising assets to make profit for the business. In this study, ROA is defined as returns generated by the assets of the firm within its financial year.

Earnings per share (EPS)

EPS shows the amount of earnings allocated to shareholders (Madugba & Okafor, 2016). In this study, EPS is defined as an indication of the value of a firm's shares.

Tobin's Q

The q ratio is defined as the market value of a firm divided by the replacement cost of the firm's assets (Fu, Singhal & Parkash, 2018). In this study, Tobin's Q is defined as a ratio explaining investors' valuation of the future performance of the firm.

Share price

A share price is the price at which a single share of a firm is worth (Kurniaty, Handayani & Rahayu, 2018). In this study, a share price is defined as the price at which investors are willing to pay for the firm's single share based on the perceived value of that business.

Johannesburg Stock Exchange (JSE)

The JSE is a market where securities can be traded in South Africa (Johannesburg Stock Exchange, 2019).

Firm

Ilaboya and Ohiokha (2016) define a firm as any entity established with the aim of selling something for a profit. For the purpose of this study, the word firm is used to mean companies that are listed on the JSE.

1.7 PRELIMINARY LITERATURE REVIEW

1.7.1 Theoretical Framework

This study focuses on environmental sustainability commitment. As such, the shareholder theory, stakeholder theory and the legitimacy theory are used to explain environmental sustainability commitment among firms.

1.7.1.1 Shareholder Theory

The shareholder theory was propounded by Friedman (1970). According to Friedman (1970), a firm exists only to make profits and maximise shareholder wealth. To that effect, Friedman (1970) argues that the firm has no obligation whatsoever to cater for the society. As the firm exists to satisfy the profit maximisation goal, the managers should primarily be concerned on things that can positively increase the profits of the firm and increase the returns for shareholders. The shareholder theory further argues that shareholders should earn a return for their stake in the business, which involves a degree of some risk. Considering social responsibility, Friedman (1970) is of the view that it should be treated as a secondary issue where managers can decide what to offer the society only if the profits for that year are sufficient. Ideally, Friedman (1970) conceptualised social responsibility as a waste of shareholders’ money and something that should be avoided as it also reduces the profits of the firm.

However, the shareholder theory has generated intense debate among academics and practitioners. Different views have been forwarded in existing literature criticising the shareholder theory. Other scholars strongly criticise the theory based on its failure to take into consideration the fact that a business does not operate in a vacuum, but in a society that also needs to be taken into consideration.

1.7.1.2 Stakeholder theory

The stakeholder theory propounded by Freeman (1984) is a strategic management concept which argues that corporate managers should strive to respond and consider the interest of key stakeholders in their business network. On that note, it is argued that a business does not operate in a vacuum but rather in a network with different stakeholders all concerned with how the corporate conducts its business activities (Uwuigbe, Teddy, Uwuigbe, Emmanuel, Asiriuwa, Eyitomi & Taiwo, 2018). According to Freeman (1984), a stakeholder is a set of people or organisations who have an interest in the business. A group of stakeholders can include customers, suppliers, shareholders, the local community, the media, government, employees and the natural environment (Ganda, 2016). Mohiuddin (2014) remarks that the natural environment has become an important stakeholder as it supplies all the resources needed by firms. Incorporating the environment into corporate policies and strategies helps a firm to integrate the interest of stakeholders (Ganda, 2016).

The stakeholder theory forms a crucial base theory of this study. It sets precedence to understand environmental sustainability commitment among firms by responding to stakeholder interests. It clearly explains the importance of incorporating stakeholders' interests such as the natural environment to avoid lawsuits and penalties.

1.7.1.3 Legitimacy theory

Dowling and Pfefeer (1975) define legitimacy as the way the society perceives an organisation as desirable or appropriate as determined by how it conducts business. Dowling and Pfefeer (1975) argue that the legitimacy of a firm is determined by the society in which the business operates. As such, stakeholders tend to favour or associate with businesses they perceive as legitimate. It follows therefore, that businesses should behave in ways that enhance their legitimacy from the perspective of its key stakeholders. From the points raised by the legitimacy theory, it calls for firms to commit to the environmental sustainability call as a way to justify its actions on its key stakeholders. This makes the legitimacy theory an important theory for this study (Treviño, Nieuwenboer, Kreiner & Bishop, 2014; Reisig & Bain, 2016; Maleka, Nyirenda & Fakoya, 2017).

The issue of environmental sustainability has dominated the agendas of environmental concerned bodies (Vasanth et al., 2015). There is concern over the rate in which natural resources are being extracted from, and waste is being deposited on the environment without considering the regeneration and absorptive capacity of the environment (Mohiuddin, 2014). A series of summits and acts have been put in place since 1968 to force organisations and businesses to respond to environmental sustainability issues. These include the Kyoto protocol 1997, the World summit on Sustainable Development in Johannesburg in 2002 and the Earth summit 2012 in Riode Janeiro, Brazil, among others.

According to Goi (2017), businesses should strive to produce environmentally friendly products using clean technology. On that note, Canepari (2017) believes that firms can improve their environmental sustainability by leveraging on product stewardship, clean technology and pollution prevention. These then act as proactive measures to environmental sustainability, which reduces the costs associated with pollution and waste from the production process. On the other hand, the GRI report (2015) emphasises the importance of sustainability reporting by businesses. The report further stresses that firms should detail reports on how they are dealing with environmental sustainability issues. Higgs (2015) concurs and asserts that firms should formulate environmental sustainability blueprints which make sustainability reporting easier. Environmental sustainability factors to be used in this study are energy efficiency, water efficiency, waste management and carbon emission reduction.

1.8 METHODOLOGY OVEVIEW

This section provides an overview of the methodology which was adopted for this study. The ideology of positivism was deemed suitable for this study. The deductive approach was also adopted since the study intended to test the applicability of the stakeholder theory in promoting environmental sustainability among listed firms. The researcher opted for a quantitative research approach and used a case study research design. This is because the researcher intended to collect data from several listed firms. The longitudinal design was adopted where the researcher collected panel data from 2011-2018. All firms listed on the JSE were considered as the population of this study. These firms were readily available on the database of the JSE website. The choice to consider JSE listed firms was that these are critically scrutinised in terms of sustainability engagement and reporting. A sample of top 32 FTSE/JSE listed firms was considered. This list was considered because these firms excel in terms of Environmental Social and Governance (JSE, 2020). Hence, this assisted the researcher to access all the data required to test the hypotheses of the study. This study utilised secondary data, which is annual financial statements of firms listed on the JSE. Statistically, secondary data was used as it gave the researcher an opportunity to collect panel data for the sample companies for eight years. Data was analysed using the Panel regression analysis model. Specifically, the Fixed Generalised Least Squares model was used run the data based on five models which were the ROE, ROA, EPS, share price and the Tobin’s Q. The Fixed Generalised Least Squares model was used because it suppresses heteroscedasticity and serial autocorrelation.

The dependent variable of the study included financial performance variables such as ROE, ROA, EPS, share price and Tobin’s q. These dependent variables were chosen on the basis that they represent the interests of different stakeholders such as shareholders, employees, customers, managers and investors as highlighted by the stakeholder theory. Using these five financial measures helped to understand different stakeholders’ attitudes towards a firm’s environmental sustainability behaviour. The independent variables of the study included components of environmental sustainability: energy efficiency, water efficiency, waste management, carbon emission reduction, environmental compliance, material efficiency, stakeholder engagement and green products and services innovation. Control variables such as firm size and liquidity were used. Industry type was treated as a moderator variable. To ensure the validity of the study, the researcher evaluated whether the data in the sustainability reports was in line with the research problem and aim of the study. To ensure reliability, the researcher used data specifically from the sustainability reports as they are carefully prepared to provide reliable information. The study also adhered to ethical considerations involved in using secondary data by ensuring that there was no re-identification of firms considered and sensitive information generated from study findings was treated as highly confidential and not used against any firm.

1.9 SIGNIFICANCE OF THE STUDY

Environmental sustainability is highly emphasised in both the United Nations agenda 2030 and the African Union agenda 2063 for sustainbale developement, which makes this study relevant. This study contributes to knowledge in several ways, including theoretically, empirically, methodologically and practically. It also contributes immensely towards policy formulation. The next section will provide a robust discussion of each of these contributions.

1.9.1 Theoretical Contribution

The major weakness in existing studies is lack of a robust theoretical framework to measure environmental sustainability and financial performance (Trumpp et al., 2015; Galant & Cadez, 2017; Trumpp & Guenther, 2017; Bergmann et al., 2017). There is a tendency for studies to use few variables that lack the rigour of a theoretical framework. The author of this study has noted that environmental sustainability has been measured mostly using either waste management, energy efficiency and water management. This study contributes theoretically by adding new variables such as materials efficiency, environmental compliance, green products and services innovation and stakeholder engagement to measure environmental sustainability. The study will also contribute theoretically by adopting a multi-dimensional measure of financial performance as recommended in existing literature (Maditinos et al., 2006; Chen et al., 2016; Boakye, 2018). This entails enhancing the financial model by measuring financial performance using a set of accounting and market-based measures. This has been lacking in existing studies. Hence, this study will be the first of its kind to develop such a model, which enriches the theoretical model linking environmental sustainability and financial performance.

1.9.2 Empirical contribution

There is a discrepancy in existing empirical findings regarding environmental sustainability commitment and the financial performance nexus. The mixed findings include naratives based on positive, negative and insignificant relationship between environmental sustainability commitment and financial performance (Jabbour et al., 2012; Lu & Taylor, 2015; Miroshnychenko et al., 2017; Boakye, 2018). This creates a sufficient research gap for this study. For instance, in South Africa, Nyirenda (2014) examined environmental management practices of a JSE listed mining company. However, the study used only three environmental sustainability measures (energy efficiency, water management and carbon emission reduction) and return on assets as the only firm financial measure. The novelty of this study is that it will produce new empirical findings on variables that have never been tested before in South Africa. New environmental sustainability variables such as materials efficiency, environmental compliance, green products and services innovation and stakeholder engagement will be linked to the enhanced financial performance model. The relationships among each environmental sustainability variables (materials efficiency, environmental compliance, green products and services innovation and stakeholder engagement) have never been tested empirically in South Africa.

1.9.3 Methodological Contribution

Another contribution made in this study is to enrich the environmental sustainability construct by treating it as a multi-dimenisonal construct (Trumpp et al., 2015; Bergmann et al., 2017). This is one of the ways to resolve the inconclusiveness in existing literature as most studies used only one or two factors to measure environmental sustainability which is insufficient (Putz, 2017; Trump & Guenther, 2017). As such, a concise measure of environmental sustainability is required to resolve the existing debate. Each of the environmental sustainability variables such as energy efficiency, water efficiency, waste management, carbon emission reduction, materials efficiency, stakeholder engagement as well as green products and services innovation influence each other and enhance the environmental sustainability construct, unlike when one variable is used. Pampanelli, Found and Bernardes (2014) agree and explain that successful initiatives in waste management can result in approximately 5%-10% energy savings, which simultaneously lead to improved profitability. When restrictive and efficient waste management practices are put in place, a firm can cut costs in the other areas and, collectively, it results in positive environmental performance.

This study further contributes methodologically by acknowledging the importance of adopting a multi-dimensional measure of financial performance. The financial performance construct was not given much attention in existing studies linking environmental sustainability to financial performance. Most studies used either ROA or ROE neglecting other forward-looking measures such as Tobin's Q and share price. "Poorly chosen performance measures routinely create the wrong signals for managers, leading to poor decisions and undesirable results" (Maditinos et al., 2006:3). In this case, it might mean rejecting environmental sustainability initiatives citing that they weaken financial performance, yet only basing on an underdeveloped financial performance measure. Hence, this study methodologically resolves this conundrum by adopting a multi-dimensional construct of financial performance, which incorporates ROE, ROA, EPS, Tobin's Q and share price, which have never been done in South Africa. More importantly, the financial performance model designed in this study is informed by the stakeholder theory. On that note, each financial ratio adopted in this study is linked to each key stakeholder of the firm. It is therefore, inferred that each set of financial ratios reflects different stakeholders' attitudes towards a firm's approach towards environmental sustainability commitment. To that effect, the financial model should be defined in the confines of stakeholder satisfaction. Having done that, it becomes easy for researchers to construct effective financial performance measures that best reflect stakeholders' perception of the firm and attain sustainable competitive advantage (Maditinos et al., 2006; Selvam, Gayathri, Vasanth, Lingaraja & Marxiaoli, 2016; Fan, Pan, Liu & Zhou, 2017; Haninun, Lindrianasari & Denziana, 2018).

1.9.4 Practical Contributions

There is currently low participation by firms on environmental sustainability issues. One of the reasons is that managers do not see clear benefits of investing in environmental sustainability initiatives. Furthermore, several managers are driven by the profit maximisation motive, which makes them reluctant to invest in projects which might reduce the profitability of the business. If it can be established that environmental sustainability commitment positively influences financial performance, this can go a long way in motivating more firms both listed and unlisted to consider environmental sustainability initiatives seriously. As the findings of this study will establish that environmental responsible behaviour by firms can gain them green trust, image and overall profitability, this will enlighten corporate managers on the potential positive financial benefits attainable by investing in environmental sustainability initiatives. Furthermore, other benefits such as positive business valuation by green customers and investors should not be forfeited by firms as they are crucial for future business growth. Since this study focused on the top 30 firms FTSE/JSE, the outcome of this study will encourage other laggards in environmental sustainability commitment that they can benefit immensely from being environmentally responsible firms. Small and medium enterprises listed on the Alternative Exchange (AltX) are likely to benefit greatly from the findings of this study. Since these are high growth-oriented firms endeavouring to attract more capital and get promoted into the JSE main board, the findings of this study will help them identify the areas they can improve on to attract green oriented investors, customers and suppliers to attain the desired growth. Stakeholders such as investors, the government and other organisations interested in the environmentally friendly behaviour of listed firms may find the findings of this study of utmost importance. In the case of investors, the findings of this study will guide them in decision making on which firms to invest in. With the emergence of responsible investing in South Africa and globally, it follows that both individual and institutional investors will derive much value from the findings of this study.

1.9.5 Policy Contribution

It was deduced from literature that environmental policies in developing countries are weak and suffer lack of implementation. South Africa is not immune to such shortfalls. In South Africa, a plethora of environmental policies have been developed since 1989. Nevertheless, the level of environmental damage in South Africa is relatively high as compared to other countries globally. This has caused the environmental sustainability challenge where firms continue to strain the environment through emissions and dumping of waste in undesignated areas. There is a paucity of studies which have investigated the extent to which exceling in environmental compliance may influence the performance of listed firms in South Africa. To that effect, the findings of this study could be useful in shaping the environmental policy framework in South Africa where the government can adopt the recommendations to mitigate the environmental sustainability conundrum. This could benefit parties such as practitioners, consultants, corporate financial policy makers, industrial policy makers and the government.

1.10 STRUCTURE OF THE RESEARCH

The study will consist of 8 chapters as outlined below;

CHAPTER 1

This chapter introduced the entire study. The chapter outlined the background of the study, problem statement, aim and objectives which informed the research methodology adopted in this study. The chapter also provided an in-depth significance of the study which outlined the importance of conducting the present study.

CHAPTER 2

This chapter outlines the theoretical framework and literature review guiding this study. The shareholder theory, stakeholder theory and the legitimacy theory are discussed as the main theories guiding this study. Environmental sustainability is discussed in detail by outlining each environmental variable: energy efficiency, water efficiency, waste management, carbon emission reduction, environmental compliance, materials efficiency, green products and services innovation as well as stakeholder engagement.

The chapter then outlines the international environmental policy framework after which the South African perspective is outlined.

CHAPTER 3

The major purpose of this chapter is to discuss firms' environmental sustainability behaviour and commitment. Furthermore, the chapter discusses the environmental sustainability strategy and environmental sustainability culture. The chapter concludes by outlining factors that drive firms towards sustainability commitment.

CHAPTER 4

This chapter outlines and discusses different financial measures adopted in this study. These include accounting-based and market-based financial performance measures. The choice of these measures of financial performance was informed by the stakeholder theory.

CHAPTER 5

Chapter 5 discusses the relationship between environmental sustainability variables and financial performance. Each environmental sustainability measure is linked to the firm financial performance. The discussion is organised into studies that showed a positive relationship, followed by those that showed a negative relationship, and lastly, with those where no relationship was established.

CHAPTER 6

This chapter presents the research methodology of the study. The chapter gives an in-depth discussion of the research design, population and sampling methods, data and collection methods, measurement of variables, data analysis, aspects related to reliability and validity as well as ethical considerations.

CHAPTER 7

Chapter 7 presents the research findings followed by a robust discussion based on the findings of other studies. Research findings are presented in the form of tables and charts. The findings are presented descriptively first where elements such as mean, standard deviatiation, minimum and maximum values are presented. Henceforth, the chapter presents correlation analysis followed by diagnostic tests. The chapter then presents panel regression results where the key variables of the study are tested.

CHAPTER 8

This chapter provides conclusions and recommendations of the entire study. Additionally, it also provides a unique model designed by the researcher to link environmental sustainability commitment to financial performance.

1.11 SUMMARY

Chapter one basically introduced the entire study by providing a baseline for key variables of the study. It also provided the justification for conducting this study by pinpointing several ways in which this study will be useful to readers or consumers of the findings generated in this study. The chapter showed that the issue of environmental sustainability has become a global challenge and a pressing issue that requires urgent but sustainable solutions. Regardless of the seriousness of the environmental problems at hand, it was discovered that most firms are laggards when it comes to incorporating environmental sustainability into their main strategy. This emanates from lack of clear benefits and motivation as well as a weak policy framework to force firms to be environmentally responsible. A brief review of literature showed that there is no consensus on the studies that have tried to investigate how environmental sustainability commitment may influence financial performance. Existing studies attribute this inconclusiveness to the use of too little or insufficient measures of both environmental and financial measures. Environmental sustainability was conceptualised as consisting of variables such energy efficiency, water efficiency, waste management, carbon emission reduction, material efficiency, environmental compliance, green products and services innovation as well as stakeholder engagement. A multi-dimensional approach to firm financial performance was adopted in this study. It was also crucial to lay a foundation in terms of theoretical underpinnings of the study. Hence, a brief discussion of theories such as the shareholder theory, stakeholder theory and legitimacy theory was provided. Another crucial element discussed in this chapter was the methodology adopted in this study. This provided a clear picture and a roadmap for readers to understand how the researcher collected and analysed the data to obtain the expected outcomes. The chapter concluded by providing the significance of undertaking a study of this nature. The chapter that follows will discuss the theoretical framework and the literature review guiding this study.

CHAPTER 2

SUSTAINABLE DEVELOPMENT, ENVIRONMENTAL SUSTAINABILITY AND ENVIRONMENTAL LEGISLATION

2.1 INTRODUCTION

This chapter aims to outline and discuss the theoretical framework guiding this study. On that note, the shareholder theory, stakeholder theory and legitimacy theory will be discussed and evaluated. Henceforth, the chapter will unpack the concept of sustainable development. Sustainable development is at the crux of this study because it sets the foundations and guidelines that shape firms' sustainability behaviour. Sustainable development is discussed along the pillars of economic, social and environmental sustainability. More emphasis will be placed on environmental sustainability, which is the focus of this study. Environmental sustainability is discussed along its key elements which are; energy efficiency, water efficiency, waste management, carbon emission reduction, materials efficiency, green products and services innovation, environmental compliance and stakeholder engagement. The chapter will also provide an outline of the key international environmental agreements which unfolded during the sustainable development agenda. These agreements are then linked to international environmental frameworks or organisations which provide environmental sustainability disclosure guidelines. The last section of the chapter discusses environmental legislation in South Africa. This is intended to track how environmental legislation has evolved and its effectiveness in regulating environmental sustainability commitment among firms in South Africa. The next section will present the theoretical framework of this study.

2.2 THEORETICAL FRAMEWORK

This study focuses on environmental sustainability. Theories deduce certain assumptions which can be used as a basis for an argument. Rather, they are not based on normative statements but on well-grounded set of assumptions that shape researchers' conceptualisation of reality in different fields of study. Nevertheless, theories are not an end themselves but a means to an end. To that effect, theories can be tested to evaluate their applicability in explaining a particular phenomenon. As such, the stakeholder theory and the legitimacy theory are used to explain environmental sustainability commitment among firms. The shareholder theory is used in this study as a background theory from which its weaknesses led to the origin and adoption of the stakeholder theory. The subsequent section will discuss each of these theories separately.

2.2.1 Shareholder Theory

The shareholder theory was propounded by Friedman (1970) and posits that a firm exists only to make profits and maximise shareholder wealth. To that effect, Friedman (1970) argues that the firm has no obligation whatsoever to cater for the society. As the firm exists to satisfy the profit maximisation goal, managers should primarily be concerned on things that can positively increase the profits of the firm and increase the returns for shareholders. The shareholder theory further argues that shareholders should earn a return for their stake in the business, which involves a degree of some risk. Considering social responsibility, Friedman (1970) is of the view that it should be treated as a secondary issue where managers can decide what to offer the society only if the profits for that year are sufficient. Ideally, Friedman (1970) conceptualised social responsibility as a waste of shareholder's money and something that should be avoided as it also reduces the profits of the firm. The principles of the shareholder theory were further advanced by Jensen and Meckling (1976), who endorsed Friedman's ideology by submitting that shareholders own and control the business and managers are just agencies responsible for growing the investments injected into the business by its owners.

2.2.1.2 Criticisms of the shareholder theory

The shareholder theory has generated intense debate among academics and practitioners. Different views have been forwarded in existing literature criticising the theory. Other scholars such as Yosifon (2018) and Palladino (2019) strongly criticise the theory based on its failure to take into consideration the fact that a business does not operate in a vacuum, but in a society that also needs to be taken into consideration. In principle, a business should consider the needs of its key stakeholders if it wishes to survive in the market. By focusing only on profits, this makes the shareholder theory void and morally unappealing. Such an act exposes businesses to a myriad of risks associated with community demonstrations and products boycott from dissatisfied customers who prefer to buy from socially and environmentally responsible businesses. Overall, the stakeholder theory is blamed for perpetrating unethical conduct among corporate managers. It puts pressure on managers to focus mainly on making profits above all things. This makes managers to end up resorting to window dressing financial statements to appear profitable, bribery and corruption. Additionally, Friedman’s (1970) doctrine that shareholders have the power to determine how the firm should be run and what managers should do to maximise profits creates governance problems that have seen several companies crumbling globally. Overall, the shareholder theory tends to focus only on the short term gains that can permanently ruin the image of the firm in the era where firms are expected to actively participate in community welfare and environmental protection (Danielson, Heck & Shaffer, 2008; Stout 2012; Lazonick 2014; Harrison, Freeman & Abreu, 2015; Bower & Paine, 2017; Yosifon, 2018; Palladino, 2019). The weaknesses of the shareholder theory pointed above prompted the development of the stakeholder theory. This theory is discussed in detail in the next section.

2.2.2 Stakeholder Theory

The stakeholder theory as propounded by Freeman (1984) is a strategic management concept which argues that corporate managers should strive to respond and consider the interest of key stakeholders in their business network. On that note, it is argued that a business does not operate in a vacuum but rather in a network with different stakeholders all concerned on how the corporate conducts its business activities. Freeman (1984) argues that a firm should go beyond profit maximisation and consider building relations with its key stakeholders. His view is against the traditional shareholder theory that only prioritises the shareholders of the entity leaving some other parties' interests unattained. Rokhmawati, Gunardi and Rossi (2017) warn that firms that do not incorporate stakeholders' interests in their strategies risk business failure in the long run. According to Freeman (1984), a stakeholder is defined as an individual or group of people who can affect or be affected by the business' operations. However, Miles (2012) notes that the term stakeholder has been defined differently by a plethora of authors. Dodson, Azevedo, Mohiuddin, Defavari and Abrahão (2015) assert that organisations should do stakeholder analysis in order to identify key stakeholders and their interests in the organisation. Stakeholder analysis assists a firm to clearly identify and manage different needs of all key stakeholders to avoid future conflicts and lawsuits. Dodson et al. (2015) argue that stakeholder analysis is important in order to accommodate special cases such as the natural environment, which is in most cases, neglected because it does not reflect in company financial statements. Stakeholders can be grouped into either primary or secondary stakeholders (Dodson et al., 2015). Primary stakeholders are defined as parties that have a direct link and influence the day to day running of the business. These include; customers, suppliers, shareholders, investors and customers (Ganda, 2016). Bad relations or conflicts with this inner circle affects business transactions instantly. Secondary stakeholders include parties that are indirectly linked to the business, but their actions influence the business. Among others, these include; the government, the media and other regulatory bodies. The different stakeholders mentioned above are discussed in the following section.

I. Customers as stakeholders

Customers form a crucial component of all profit-making organisations (Ganda, 2016). This makes customers one of the sensitive stakeholders of an organisation (Park & Ghauri, 2015). Recently, customers have become environmentally aware (Mbasera, Du Plessis, Saayman & Kruger, 2016). As such, the 21st century customers favour firms that are environmentally friendly (Johnson & Schaltegger, 2016). Customers now require firms to be transparent and honest in the manner in which they report and engage in environmental sustainability issues (Whelan & Fink, 2016). Rokhmawati et al. (2017) note that there is a certain category of customers who prioritise environmental aspects of a product over everything else. The same study further remarks that some customers mostly in developed countries prefer to buy only from firms with environmental certificates. This can have negative implications on exporting firms that do not incorporate customers' interests in their business strategy. In South Africa, retail stores such as Woolworths have started selling organic food as a response strategy to environmentally sensitised customers. Hence, businesses need to adhere to customer specifications in relation to producing environmentally friendly products as well as engaging them on their particular strategies to incorporate such in the production process. Lavorata (2014) warns firms to adopt practices that favour the interests of customers lest they fail in the market. In agreement, Rokhmawati et al. (2017) indicate that firms that ignore customers' interests are likely to miss their financial targets, and that customers are likely to spend more on firms that incorporate environmental sustainability in their production process and products. Park and Ghauri (2015) concur and remark that customers can easily become loyal to a firm's product offerings if the firm exhibits responsible behaviour. In that case, customers can go to an extent of endorsing the firm and refer others, which builds long time value for the business.

II. Suppliers as stakeholders

Recently, suppliers have become inclined towards environmental sustainability that they prefer to associate or supply only those players in the supply chain who are environmentally sensitive (Kiron et al., 2017). It has emerged that some suppliers mostly in developed countries prefer their supply chain partners to have environmental certificates (Gallego-Álvarez, Segura & Martínez-Ferrero, 2015). Therefore, not paying heed to suppliers' needs is detrimental to the survival of a business. Vermeulen, Niemann and Kotzé (2016) are of the view that it is mandatory for a firm to conduct research to assist it in identifying and mapping supplier needs to build long-term relationships. It is crucial to maintain a healthy firm-supplier relationship to stabilise the flow of resources in the business. Suppliers usually prefer to associate themselves with supply chain partners who observe business ethics and certain legal requirements in that particular industry. If they are not happy, suppliers can easily switch and supply other firms that might be possible competitors. Hence, firms should endeavour to build loyalty and trust with its key suppliers (Palma-Mendoza, Neailey & Roy, 2014; Vermeulen et al., 2016; Xu, Huo & Sun, 2014).

III. Investors as stakeholders

Investors are people who invest their capital in a certain firm for expected future returns. As such, investors are interested in investing in profitable companies that guarantee them a good return for their investment. It follows that the decisions taken by the firm for which an investor has vested interest will affect their long-term investment in that firm. Recently, most investors have paid heed to the call for environmental sustainability commitment (Esty & Cort, 2017). As a result, investors are interested in investing in firms that excel in environmental performance (Ganda, 2016). Because of the mounting pressure on firms to commit to environmental sustainability, investors see it credible to invest in firms that are environmentally responsible (Park & Ghauri, 2015). They are prepared to buy shares on such firms even at a higher price because they anticipate future appreciation of the stock price. In support of the above assertion, Miralles-Quirós, Miralles-Quirós and Gonçalves (2018) assert that investors highly regard firms that respond to environmental demands. A study by Kiron et al. (2017) reveal that 75% of the surveyed investment companies indicated that sustainability commitment is one of the key things that shape their investment decisions in a particular firm, and that investors are now well informed about environmental sustainability than they were three years ago. Hence, firms need to incorporate sustainability in their businesses lest they lose potential investors. In fact, environmental sustainability commitment has become one of the risk factors considered by many investors before they can commit to fund a certain project. There has been a burgeoning of green bonds recently to support environmental sustainability inclined projects (Climate Bonds Initiative, 2016).

IV. Employees as stakeholders

Employees are also some of the most crucial stakeholders of a business. This is because they are directly involved in the operations of the business. Hence, employees expect the management to meet some of their expectations. For instance, employees expect an attractive reward package, good working conditions and health considerations. More importantly, employees have a set of values that they use to evaluate any organisation of their choice. Fraj et al. (2015) allude that recently, a significant number of employees now believe in working in a firm that incorporates green practices in its strategy. Since this tally with their values and belief systems, the employees tend to derive motivation and a sense of belonging in such organisational settings. Firms with a high environmental performance history tend to attract more potential employees than those without (Whelan & Fink, 2016). Whelan and Fink (2016) found that firms that incorporate sustainability practices in their business strategy increase employees' productivity, improve work engagement and a reduction in turnover intentions. Another strand of researchers argues that employees feel mostly safe in firms incorporating green buildings in their workplaces (Bozovic-Stamenovic et al., 2015). This gives them assurance that their health and safety is guaranteed.

V. Governments as stakeholders

The government act as the main decision maker in terms of policy and the legal framework (Ganda, 2016). It therefore, has the right to withdraw certain operating licenses from firms that do not comply (Mnguni & Tucker, 2012). The government can use legislation in terms of desired packaging, type of industrial buildings, certification, subsidies and taxes (Cuerva, Triguero-Cano & Córcoles, 2014). Ganda (2016) explains that governments can make use of market-oriented strategies to encourage firms to protect the environment. A firm does not have power to change policies and certain acts passed on by government but has to adapt or perish. Globally, most governments are moving towards the green revolution where they force individuals and firms to adopt green methods of production and consumption (Ganda, 2016). Given a series of environmental sustainability summits attended by several governments, it is the responsibility of the government to closely monitor and ensure that each sector and its constituencies meet the environmental sustainability targets agreed on at each summit. In the event that a country does not comply and cooperate, it tarnishes its image among other states prompting punishment in terms of sanctions and isolation in terms of trade. Hence, governments world over have started pilling pressure on firms to incorporate the natural environment in their strategies and business models.

VI. Environmental pressure groups

Environmental pressure groups have become well recognised and well represented recently (Tortajada, 2016). Environmental pressure groups consist of individuals and non-profit organisations rising up to force firms to take responsibility of their environmental damage (Perez, Grafton, Mohai, Hardin, Hintzen & Orvis, 2015). This group uses a series of methods such as demonstrations, lobbying, environmental research, legal action and boycotts, among others to achieve their mission (Mohiuddin (2014). Due to rising concerns over environmental strain, this group is well respected globally and their concerns are taken seriously by governments in their respective countries (Perez et al., 2015). Therefore, a firm ought to work hand in hand with environmental pressure groups lest it risk litigation cases and being dragged into disrepute.

VII. Natural environment as stakeholder

The natural environment has been neglected for many years. As indicated by Whelan and Fink (2016), many firms believe that a firm exists only to make profit. Mohiuddin (2014) argues that the natural environment should also be categorised under primary stakeholders since it has become an important stakeholder as it supplies all the resources needed by firms. Incorporating the environment into corporate policies and strategies helps a firm to integrate the interests of the rest of its key stakeholders (Ganda, 2016). Firms failing to take the natural environment into consideration risk facing penalties and lawsuits (Dodson et al., 2015). Firms should not disturb the natural circle in the natural environment as it has serious effects on humans. Dodson et al. (2015) assert that the natural environment forms part of a firm's business environment, hence, failure to consider it as a stakeholder is costly.

2.2.2.1 Criticisms of Stakeholder Theory

The Stakeholder theory has been criticised by various researchers in existing literature. Orts and Strudler (2002) believe that the Stakeholder theory broadly defines what constitutes stakeholders of a firm. According to Orts and Strudler (2002), the theory could have been appropriate if the stakeholders were trimmed by removing the government, community and the environment from the stakeholder list. Bowie (2007) concurs and asserts that the Stakeholder theory's stakeholder list is overly stretched. Another study by Starik (1995) argues that other elements such as the environment should not be imposed on a firm as a stakeholder as proposed by the Stakeholder theory but should also be applied across to everyone as all human activities are directly or indirectly linked to the environment.

Another study by Cortfield (1998) argues that the Stakeholder theory is flawed in that it encourages self-serving behaviours by managers who end up using resources to further their interests in the name of stakeholder engagement. This is costly to the firm because the cash outflows and investments does not generate any tangible gains for the firm as the resources are misplaced. To buttress the above assertion, Maher and Anderson (2000) are of the view that the Stakeholder theory may be used as justification for weak organisational performance by management. In most cases, the mangers will report that poor financial performance in that year or period was because of cash outflows to cater for stakeholders' needs yet the problem is actually management incompetency. A study by Mansell (2013) questions the usefulness of the stakeholder theory. The study cites that the theory violates the principles of a free market economy.

2.2.2.2 Conclusions on the Stakeholder theory

The Stakeholder theory forms a crucial base theory of this study. It sets precedence to understand environmental sustainability commitment among firms by responding to stakeholder interests. The Stakeholder theory is also credited for excelling in being descriptive, instrumental and normative. The normative aspect of the theory makes it one of the strongest theories to shape the ethical behaviour of a firm (Hasnas, 2007). "When viewed as the normative theory the stakeholder theory asserts that regardless of whether the stakeholder management leads to improved financial performance, managers should manage business for the benefit of all the stakeholders" (Hasnas, 2007: p.118). The Stakeholder theory has also proved to be a robust theory as it has been used across other fields. Duckworth and Moore (2010) further express that the Stakeholder theory has been instrumental in establishing the foundations of international standards such as the ISO 26000 and GRI. These international organisations use the Stakeholder theory to emphasise the importance of incorporating stakeholders' interests such as the natural environment to avoid lawsuits and penalties.

2.2.3 Legitimacy Theory

Dowling and Pfefeer (1975) define legitimacy as the way the society perceives an organisation as desirable or appropriate as determined by how it conduct business. For legitimacy to exist, there should be congruence between the values of the firm and that of the society. Any disparity between the two may result in conflicts between the two systems, which may create unfavourable operating conditions for the business. It follows that the expectations of the society are deep rooted in the social contract which, in most cases, is very delicate. The delicacy of the social contract emanates from the fact that social needs and expectations are not static but evolve over time. This entails that firms' activities and behaviour should always adjust to cater for the new social contract. Any breach of the social contract carries negative implications for the firm, which are difficult to resolve in the short run. This means the firm should operate within the norms and belief systems of the society less it risks business failure. Firms should also take certain actions to justify their existence. Such actions include; adhering and respecting the society's values and belief systems that in turn award the firm endorsement and positive publicity, which is essential for business sustainability. Noteworthy, it is imperative for a firm to keep itself abreast with changing society values, norms and beliefs as well as stakeholder needs so as to maintain a positive image and legitimacy (Burlea & Popa, 2013; Ching & Gerab, 2017; Wei, Shen, Zhou & Li, 2017).

Dowling and Pfefeer's (1975) conceptualisation of organisational legitimacy is in line with the strategic approach to legitimacy. This approach is also linked to a plethora of studies that have validated in using various studies and contexts (Ashforth & Gibbs, 1990; Lindblom, 1994; Tregidga, Milne & Kearins, 2006; Aerts & Cormier, 2009). The strategic approach to organisational legitimacy argues that legitimacy can be manipulated in a positive way. It further explains that firms have a privilege to choose a set of strategies to assist them in appealing to the broader society that their activities are in line with what is expected. To that effect, firms can use stakeholder communication and other related activities to enhance firms' legitimacy. This approach forms the baseline of this study as it has been widely adopted across the field (Burlea & Popa, 2013).

Besides Dowling and Pfefeer's (1975) conceptualisation of legitimacy, other scholars such as Suchman (1995) have also forwarded their different understanding of the concept. According to Suchman (1995), legitimacy is a general concept which is difficult to comprehend as it gets different meanings based on the perspectives of firms and the society. This emanates from the fact that legitimacy is based on perceptions, which are socially constructed. To that effect, what the firm may perceive as ethical behaviour, acceptable values and norms may be totally different from how the society perceives such. Nevertheless, since legitimacy is a long-term phenomenon, a firm may still learn to adjust towards what the society perceives as good moral behaviour (Suchman, 1995).

Besides different conceptualisations of organisational legitimacy, Dowling and Pfefeer (1975) and Suchman (1995) agree that organisational legitimacy is social constructed.

Perceived legitimacy creates long term relationships between a firm and its stakeholders (Ching & Gerab, 2017). As such, stakeholders tend to favour or associate with businesses they perceive as legitimate (Maleka et al., 2017). It follows therefore, that businesses should behave responsibly in order to improve their legitimacy from the perspective of key stakeholders and the society. Burlea and Popa (2013) submit that firms have to prove their legitimacy by respecting and adhering to society's values and expectations lest they risk business failure or lawsuits. The same study further alludes that firms can disclose and report on how they are dealing with social and environmental challenges to improve their legitimacy rating by the society. The legitimacy behaviour of firms is shaped by its management and pressure from the society for firms to account for their actions and damages to the environment and the social sphere (Burlea & Popa, 2013). Firms should endeavour to continuously engage their stakeholders to avoid conflicts which can consequently reduce the firm's legitimacy (Whelan & Fink, 2016). On that note, firms can also improve their legitimacy by publishing quality and credible information in their sustainability reports (Araya, Mas & Garrido, 2014; Chiu & Wang, 2015).

2.2.3.1 Conclusions on Legitimacy theory

The legitimacy theory remains one of the widely adopted theories in studies related to environmental sustainability. Moreover, unlike other theories, the legitimacy theory clearly outlines some innovative strategies that firms can use to gain trust from their stakeholders. To this end, most companies are involved in voluntary disclosures as an application of the Legitimacy theory. Such voluntary environmental disclosures are linked to enhanced environmental performance and superior corporate image. This makes the Legitimacy theory an important theory for this study. This theory has been used by a plethora of studies to explain what motivates firms to invest in sustainability initiatives and generally as a strategic tool for a firm to maintain key relations and gain a positive image from the society. One compelling idea derived from the legitimacy theory is that the society has a bearing on the demise or success of a firm. Hence, firms ought to act and operate within the legitimacy dictates prescribed by the society if they are to enhance their legitimacy (Guthrie, Cuganesan & Ward, 2007; Mousa & Hassan, 2015; Reisig & Bain, 2016; Ching & Gerab, 2017; Maleka et al., 2017). The next section discusses the concept of sustainable development.

2.3 THE CONCEPT OF SUSTAINABLE DEVELOPMENT

The concept of sustainable development has evolved over a long time (Amacha & Dastane, 2017). The first formal definition of sustainable development is linked to The Bruntland Report (1987). The commission successfully published a report termed "Our common future." This report defined sustainable development and henceforth became widely adopted. The Bruntland Report (1987:187) defined sustainable development as "development that meets the present needs without compromising the ability of future generations to meet their needs." Another definition of the concept was proposed by Bartlett (2012), who defines sustainable development as development that prioritses future generations in terms of future resource security. The main argument of Bartlett's (2012) definition was that The Bruntland Report (1987) emphasised primarily on meeting the current needs mostly instead of focusing on the future generations. Hence, Bartlett (2012) is of the view that the future should be the focus of the sustainable development definition. The Bruntland Report's (1987) definition of sustainable development has also been criticised by other researchers. One of the critics was that the definition is ambiguous (Giddings, Hopwood & O'brien, 2002), focusses mainly on economic development with no regards for the environmental issues of sustainable development (Murphy & Price, 2005) and does not take into consideration ethics (Vucetich & Nelson, 2010). Nevertheless, the Bruntland Report (1987) remains useful and has been adopted widely as a formal definition of sustainable development. It has since shaped fruitful dialogue around the concept of sustainable development among influential policy makers in the world. More importantly, it emphasises the limitations of the natural environment to meet the insatiable human needs. Hence, the need for sustainable behaviour towards scarce resources (Ong, Teh & Ang, 2014; Amacha & Dastane, 2017; Muralidharan & Pathak, 2018).

In South Africa the concept of sustainable development has received massive attention and the government has showed commitment to it. As such, it came up with the National

Framework for Sustainable Development in 2008 to help the country participate actively in sustainable development initiatives (Department of Environmental Affairs, 2008). Through this framework, South Africa endeavours to balance consumption and the regeneration capacity of the environment to attain resource security for future generations (Department of Environmental Affairs, 2008). This definition is strictly aligned to the concept of sustainable development to ensure that the country does not lag behind in relation to other global players in heeding the sustainable development agenda. Recently, the South African National Development plan 2030 also emphasise environmental sustainability commitment by different stakeholders. This is driven by the will to protect the environment which has been neglected for the past decades where human activities such as mining, pollution of water bodies, carbon emissions and excessive extraction of natural resources went on uncontrolled.

In an endeavour to understand sustainable development, it is also crucial to define sustainability. Kocmanova, Hrebicek and Docekalova (2011:543) define sustainability as “corporate strategy that monitors long-term corporate growth, efficiency, performance and competitiveness by incorporating economic, environmental and social performances into corporate management.” Sustainability “defines companies that create value at the level of strategies and practices to move towards a more sustainable world, with a formula of profitability on a human scale, that through the connection with all groups of interest (Stakeholders) and the natural environment, face the challenge of minimizing waste from operations and reorienting their portfolio of competences towards sustainable and competitive technologies” (Castrillón & Mares, 2014:60).

These three pillars of sustainable development will be discussed in detail in the next section. According to Nguyen (2016), sustainability can be summarised in terms of three pillars which are; economic, society and the environment.

2.4 DIMENSIONS OF SUSTAINABLE DEVELOPMENT

Some early researchers have understood sustainable development through the triple bottom line concept (Amacha & Dastane, 2017). This line of thought was propounded by Elkington (1997; 2004). The affiliates of this concept are of the view that sustainable development is attained when systems and businesses pay equal attention to economic, social and environmental sustainability. These then become key performance indicators of business performance instead of only focusing on the profit. The TBL submits that the economic, social and environmental pillars are interrelated in some way. For instance, for businesses to be successful in their economic activities, they need natural resources from the environment and human capital from the society (Elkington, 1997; 2004). When one of these pillars is not given attention, then the sustainable development agenda is weakened (Amacha & Dastane, 2017).

According to the Global Reporting Index (GRI) (2019:48), “the economic dimension of sustainability concerns the organization’s impacts on the economic conditions of its stakeholders, and on economic systems at local, national, and global levels”. Economic sustainability centres on the ability of the business to remain profitable in order to sustain its day to day activities. Other scholars are of the view that economic sustainability describes the firm’s ability to be profitable and contribute to shareholder value. Another strand of literature submits the view that economic sustainability explains the ability of a firm to meet its financial goals and pay taxes and its employees. It is crucial for a firm to be economically sustainable for it to remain a going concern and cater for future generations (Marques, Mendonça & Jabbour, 2010; Arowoshegbe & Emmanuel, 2016; Masocha & Fatoki, 2018; Sarango-Lalangui, Álvarez-García & del Río-Rama, 2018). This study defines economic sustainability as the ability of the firm to generate sufficient revenue, which can enable it to operate as a going concern. It is crucial for a firm to be economically sustainable. Attaining economic sustainability can enable the firm to attain other pillars such as social and environmental sustainability.

The social sustainability pillar explains a balance attained by the social systems in terms of culture, peace, wellbeing and justice (Social Sustainability Policy, 2016). Sarango-Lalangui et al. (2018) define social sustainability as the equilibrium attained between the business’ activities and the needs of the society. In that light, a business attains social sustainability when it demonstrates fairness towards the society in terms of the wages it pays its employees, community engagement programmes and other related initiatives aimed at improving social wellbeing (Arowoshegbe & Emmanuel, 2016). This encompasses social responsibility and ethical behaviour of the business towards the community in which it conducts its operations. Social sustainability is key for business longevity (Sy, 2016). Recently, most communities have become aware of their rights due to the vastness of information made possible by the proliferation of technology. This has made communities to have a strong bargaining power that their petitions for socially undesirable deeds by businesses can see a firm close its operations (Arowoshegbe & Emmanuel, 2016). The social sustainability pillar has recently gained prominence as firms are beginning to engage in initiatives aimed at gaining legitimacy. Without approval from the community, doing business can become an elusive idea. The focus of this study is on environmental sustainability practices of JSE listed firms. As such, environmental sustainability will be discussed in the following section.

2.4 ENVIRONMENTAL SUSTAINABILITY

The concept of environmental sustainability has evolved over the past couple of decades (Ong et al., 2014). The concept has been defined differently in existing literature (Ong et al., 2014; Amacha & Dastane, 2017). McGinn (2009) defined environmental sustainability as capability of firms to balance activities, which enhance human welfare with environmental needs. Goodland and Daly (1996) define environmental sustainability as initiatives aimed at creating a balance between resource extraction rate, disposal of waste and absorption capacity and the regeneration rate of the environment. When such a balance is attained, it becomes easy to meet the current needs without putting a strain on the environment, which has negative impacts on the future generations. The Organisation for Economic Co-operation and Development (OECD) (2017) defines environmental sustainability based on the following criteria: regeneration, substitutability, assimilation and irreversibility. According to OECD (2017), resource extraction should not exceed the regeneration capacity of the environment, while substitutability means that non-renewable resources should be used efficiently in quantities, which can be balanced off with renewable resources. In terms of assimilation, it calls for firms to avoid exceeding the assimilation capacity of the environment of the waste disposed by human activities and finally, human activities should be controlled to avoid permanent damage to the environment. In this study, environmental sustainability is defined as proactive strategies designed by firms to minimise environmental damage by attaining energy efficiency, water efficiency, waste reduction, carbon emissions reduction, material efficiency, green products and services innovation, environmental compliance and stakeholder engagement.

The issue of environmental sustainability has dominated the agendas of environmental concerned bodies globally (Ong et al., 2014; Vasanth et al., 2015). Discussions about the environmental sustainability intensified post 2015 (Asongu, Le Roux & Biekpe, 2017). There is concern over the rate in which natural resources are being extracted from, and waste is being deposited on the environment without considering the regeneration and absorptive capacity of the environment (Mohiuddin, 2014). As such, nations came to the realisation that to mitigate the environmental problems, a holistic approach should be adopted where all nations globally unite and look for amicable ways to deal with this conundrum. Most developed countries have already started investing seriously on sustainability issues (Kiron et al., 2017). However, African states have been identified as laggards when it comes to the adoption of the environmental sustainability agenda (Cantore, Nussbaumer, Wei & Kammen, 2017). In addition, the issue of environmental sustainability policy is still underdeveloped in most developing countries. This makes it difficult to enforce laws and accountability among individuals, organisations and firms.

There is still heavy reliance on fossil fuels in Africa regardless of rising concerns over environmental damage (Asongu et al., 2017). As such, Africa is likely to experience the worst climate change disasters compared to other continents (Asongu et al., 2017). Most African states remain powered by fossil fuels which pose an environmental threat. With reference to Sub-Saharan Africa (SSA), environmental sustainability threat has been brought up by the rapid growth of the African continent, which has seen more fossil fuels being used to power growth, resulting in more carbon emissions (Asongu et al., 2017). Other scholars are of the view that environmental sustainability threat in Africa emanates from the rapid population growth, high demand for construction due to urbanisation as well as unmonitored volumes of waste (Iqbal, Hassan, Akhtar & Khan, 2018). This assertion holds true since Africa is regarded as one of the continents with the fastest growth in the world (World Economic Forum, 2016). Moreover, most of the continent's urban areas are still developing as a result of growth (World Economic Forum, 2016). Economic growth is associated with high usage of natural resources which may create a disequilibrium between the extraction rate and the regeneration rate of the environment (Dinç & Akdoğan, 2019). It is this rapid growth that is associated with massive environmental damage, especially in third world countries (Xue et al., 2019). This disequilibrium between economic growth and the environment has far reaching effects, which might be difficult to reverse (Juan, 2011; Ar, 2012).

African economies need to adopt and strictly enforce policies aimed at promoting the green growth revolution (Akinyemi, Alege, Ogundipe & Osabuohien, 2016). Green growth is attained when a firm reconciles its growth ambitions with the environment regeneration capacity (Akinyemi et al., 2016). Moreover, a sound policy framework is needed to initiate, implement and control the activities of different entities to attain environmental sustainability. There are numerous benefits to be had if African countries can align their policies towards environmental sustainability initiatives since there are many companies wishing to invest in renewable energy supply (Cantore et al., 2017). Issues related to lack of accountability, transparency and participation are among key factors hindering progress in the environmental sustainability agenda. On that backdrop, Asongu, Le Roux and Biekpe (2018) suggest that a more workable model to abate environmental sustainability crisis is that which can incorporate accountability, transparency and active participation by all citizens.

In this case, accountability implies that continents, states, organisations and individuals should account for their environmental damaging activities, while transparency implies that these identified parties should craft policies and reporting frameworks that can allow the general public to obtain information regarding environmental sustainability commitment by the state or organisations. Active participation by all citizens entails that environmental sustainability commitment should form part of the culture shared by all citizens where a zero tolerance to environmental damage is emphasised. Based on that, everyone can in their own capacity, safeguard the environment by reporting irresponsible behaviour and acting responsibly. As indicated by Kiron et al. (2017), the public can use social media to raise environmental concerns on irresponsible environmental behaviour.

Furthermore, the public can participate in the environmental protection call by leveraging on technology (Asong et al., 2018). Environmental sustainability factors to be discussed in this study are energy efficiency, water efficiency, waste management and carbon emission reduction, material efficiency, green products and services innovation, environmental compliance and stakeholder engagement.

2.4.1 Energy Efficiency

The South African National Standard SANS 50001:2011 defines energy efficiency in terms of the link between inputs and outputs. In the National Energy Act 34 of 2008 (section 1), energy efficiency is defined as "the 'economical and efficient production and utilisation of an energy carrier or resource." Other studies define energy efficiency as a clear strategy based on technology to eliminate wasteful ways of using energy among households, businesses and other government departments (Ganda & Ngwakwe, 2014). Accordingly, Zhang (2016) defines energy efficiency as all strategies employed by a firm to reduce energy intensity in its processes. Reduction in energy intensity entails limiting the energy requirements in each unit of a firm's products. In this study, energy efficiency is defined as proactive approaches employed by a firm to attain sustainable energy use, and. Energy efficiency is motivated by the drive to meet sustainable development goals. However, it is worrying that energy efficiency is still but an elusive goal to achieve (IEA, 2019).

Energy forms a crucial driver for the efficient functioning of all economies (Abosedra, Shahbaz & Sbia, 2015; Asongu, El Montasser & Toumi, 2016). The unsustainable use of energy results in the extinction of natural resources (Vasanth et al., 2015). On that note, the global consumption of energy is expected to increase rapidly between 2014 and 2035 (British Petroleum (BP), 2016a). This calls for serious measures to reduce energy consumption. Globally, fossil fuel powered energy amounted to approximately 81%-82% between 2008-2013 (IEA, 2015). This is worrying as it is linked to an estimated 60%-70% carbon emissions into the atmosphere. Energy inefficiency is a common phenomenon in the African continent, especially in Sub Saharan Africa, yet the continent is slow to invest in cleaner sources of energy (Asongu et al., 2017). Therefore, energy consumption should be handled in a manner that increases efficiency.

Issues of energy scarcity remain on record high, especially in SSA where on average, 5% of the population has access to energy which is way below the world average (Shurig, 2015). Given such a situation, the issue of energy security becomes critical to discuss and deal with (Akinyemi et al., 2016). Since energy is the lifeblood of all economic activities, constant supply of energy at an affordable price should be prioritised in nations' key agendas (Akinyemi et al., 2016). Energy efficiency is a prerequisite to energy security. This means that key strategies should be deployed around areas that can enable firms to attain energy efficiency. Energy efficiency can be attained by eliminating inefficiencies, which result in overconsumption of energy. Alternatively, as discussed in the next section, energy efficiency can be attained using renewable energy sources.

2.4.1.1 Attaining energy efficiency through energy saving

As indicated by Zhang (2016), firms can attain energy efficiency by reducing energy intensity (EI), which is defined as the amount of energy used by a firm to produce a certain product at a given time. Attaining EI entails that firms produce the same volume of products or more with less units of energy. Another study by Kammen (2015) highlights the need for technologically savvy methods as well as policy refinement and alignment to attain energy efficiency. A plethora of researchers are of the view that firms can attain energy efficiency by investing in smart technology. Such smart technology enables firms to eliminate energy loss and wasteful consumption. To that effect, firms can save energy by approximately 20% if they can invest in technology and innovation. Smart technology serves as proactive measures to monitor wasteful activities and eliminate them at an early stage (Peura, 2013; Bergmann et al., 2017; Solnørdal & Foss, 2018).

The major energy consumption of firms emanates from purchasing electricity, office heating and powering machines and office appliances. Firms can save a lot of energy by switching off lights during the day, using fluorescent lights, switching off machines after use, and repairing faulty equipment. This stands as one of the cost-effective strategies that firms can use. It requires no capital investment but a stricter internal environmental policy, which is respected and implemented by all the firm's employees. This strategy is at the apex of the energy hierarchy and deemed the best amongst all as it eliminates energy wastage and overconsumption across the entire organisation. Essentially, it can also indirectly eliminate carbon emissions associated with electricity consumption.

2.4.1.2 Attaining energy efficiency through use of renewable sources of energy

Energy efficiency and sustainable development are intertwined (Dinç & Akdoğan, 2019). Failure to attain energy efficiency can compromise the attainment of sustainable development. This is because energy efficiency is correlated with environmental impact, which might negatively affect the wellbeing of the society (Dinç & Akdoğan, 2019). Therefore, attaining energy efficiency has a bearing on the future generations. A study by Martí-Ballester (2017) proposes energy rationing, use of renewable energy sources (RES), integration and sustainable management of energy sources. Investment in renewable energy sources can also be used to complement energy rationing technologies to give a firm sustainable and stable supply of energy (Owusu & Asumadu-Sarkodie, 2016). “Diversifying the energy matrix, particularly in favour of renewables, and improving the energy efficiency will not only help reduce the environmental impacts and the associated health costs of economic activity but they will also enable a country to reduce the import bills and to hedge the price volatility in energy markets which, in turn, will support sustainable growth in the long run” (Dinç & Akdoğan, 2019:1). Renewable energy sources include; wind turbine technology, solar thermal technology and photovoltaic technology, among others. Martí-Ballester (2017) underscores that sustainable management is the most crucial link on the energy efficiency strategies highlighted above. Sustainable management is needed to set energy efficiency goals and performance indicators for different departments in a firm. This can be attained using the following strategies depicted in the energy efficiency hierarchy.

Figure 2.1: Energy hierarchy

Source: International Energy Agency (2019)

Figure 2.1 presents an energy hierarchy, which shows how firms should behave and move towards the most desired state where they attain energy efficiency (IEA, 2019). As indicated in Figure 2.1, firms should move from the bottom of the hierarchy until they attain energy efficiency, which translates into energy saving. There are calls for the business fraternity to reduce the use of fossil fuels and switch renewable energy sources. The best state is when firms attain energy efficiency by reducing energy losses and switching off machines after use. Another possible loss of energy is observed in faulty machines and systems. Hence, IEA encourages firms to replace old machines with new ones that have energy efficiency features installed straight from the manufacturers.

2.4.1.3 South African Energy situation

South Africa is at the brink of a sustainability threat if environmental variables such as energy are not efficiently managed (Dube, 2017; Girmay & Chikobvu, 2017; James, 2017). Singh (2016) asserts that the historical low cost of energy in South Africa has resulted in firms consuming more energy through high energy intensive machines. South Africa is a high energy intensity country as it surpasses the world average (Singh, 2016). This is worrying since the high energy intensity is not matched with the current electricity generation capacity. South Africa's energy demand is high since the country is pursuing a rapid economic growth plan (Singh, 2016). Energy problems have emanated from that since Eskom has not put solid plans for that massive economic expansion and population growth, which means more energy demand. Based on current data, South Africa is second from Russia in terms of energy intensity when comparisons are made with other BRICS countries (Singh, 2016).

Alas, a major portion of electricity generation in South Africa comes from coal (Girmay & Chikobvu, 2017). Relying on coal and other fossil fuels does not only pose an environmental threat but also an energy supply threat to South Africa because such fossils are close to extinction. This was experienced in the 2008 load shedding in the entire country and again at the beginning of June 2018 where the energy stranded Eskom started implementing the load shedding programme in a bid to solve the energy crisis in the country. Analysts agree that South Africa is experiencing an energy crisis. Currently, Eskom is implementing load shedding level 4, which have seen more power cuts than in 2017. This has been met with mixed feelings as it disrupts business operations as well as other human activities.

Given the energy crisis in South Africa, the Energy Advocacy Report (2015) urges households, firms and government departments to use energy parsimoniously. On that note, Salvarli and Salvarli (2017) advise nations to shift from powering their energy sectors with fossils and resort to cleaner energy, which include; solar power, wind, biomass and nuclear power. Salvarli and Salvarli’s (2017) study further alludes that the use of fossil fuels is costly, yet it also pollutes the environment. However, this strategy confronts nations with a dilemma of either choosing efficiency over growth or growth over efficiency in the case of utilising fossil fuels as sources of energy. Proponents of the green revolution argue that adopting renewable energy has many benefits in the long run such as cost saving and environmental protection (Whelan & Fink, 2016). The use of cleaner sources of energy plays a critical role in decarbonising the atmosphere (Cantore et al., 2017). Carabin, Wehrle and Vidoni (2017) allude that due to environmental sustainability calls together with an increase in energy cost, there is a need for innovative technologies that can make it possible to attain energy efficiency while meeting the demand for energy. Another important barometer to control and help firms attain energy efficiency is an ongoing energy consumption audit to evaluate improvements or any discrepancies (Rokhmawati et al., 2017). The energy audits should be carried out on each stage of the production process to check possible areas where energy can be saved. In other instances, this should also be conducted on the firm's processes such as its supply chain to identify energy saving opportunities (Whelan & Fink, 2016). Governments can cut energy cost with a huge margin by attaining energy efficiency than building more supply sources.

2.4.2 Water Efficiency

To investigate water efficiency practices successfully, the departing point should be defining water efficiency. This is crucial as the definitions can shape sense making around the water sustainability construct to critically investigate different firms' sustainability reports. According to Food and Agriculture Organization of the United States (FAO) (2017), water efficiency is defined as the balance between the water consumption and the withdrawal rate. Other studies define water efficiency as the different strategies adopted by firms to eliminate water wastage. In other words, water efficiency refers to the minimal use of water in all human activities. Suffice to say the water input should be minimised whilst the output be it in production or domestic use is maximised (Al-Qawasmi, Asif, El Fattah & Babsail, 2019; United States Environmental Protection Agency, 2019). The definitions of water efficiency given above agree that water efficiency deals with the minimisation and economic use of water to avoid water shortage risk. This is achievable by adopting proactive strategies such as water recycling, reuse and reduction in water consumption. The current study defines water efficiency as the adoption of proactive and lean strategies to avoid unsustainable use of water by firms.

The issue of access to cleaner water and sanitation is represented by goal number six in the SDGs. It is imperative to ensure that sustainable goal number 6 is achieved since it is the key to achieving other goals (UN–United Nation. Sustainable Development Goals, United Nations, 2015; Cole, Bailey, Cullis & New, 2018; Al-Qawasmi et al., 2019). Water is a precious resource as all human life and other living organisms rely on it. Nevertheless, the water crisis is slowly becoming a global problem. The critical challenge is that water is a finite resource, yet the human needs are infinite. This creates a disequilibrium where human needs for water exceeds the water available for consumption. Even though 70% of the earth is covered by water, fresh water constitutes only 2.5% and 97.5% is salt water. Furthermore, only 0.5% of fresh water is accessible for human consumption. With rapid growth in population and other human activities, some regions have already started experiencing dry spells as the demand for water is far exceeding its supply. The acute water shortage is likely to affect food production if the challenge is not quickly abated (United Nations World Water Assessment Programme, 2016). The UN World Water Development Report (2016) reverberates the same sentiment by adding that the water challenge has serious implications on the labour market as well as most jobs can be cut because of water scarcity.

Water shortage is projected to be a serious challenge in South Africa as the country received the lowest rainfall in 2015 since 1904 (Piesse, 2016). On that note, the government warns that the country is likely to face a serious water shortage by 2030 if the issue is not dealt with effectively (Richards, 2018). Naturally, South Africa is a semi-arid country with an annual average rainfall far much below the world annual average rainfall (Askham & Van der Poll, 2017; Cole et al., 2018). Worse still, the country has one of the most erratic water evaporation rates in the world causing rivers and dams to dry up quickly (South African Department of Water Affairs (DWA), 2013). This qualifies South Africa to be among the 30 countries in the world with water scarcity problems.

According to Kurunthachalam (2014), acute water shortage is exacerbated by overuse, climate change and slow replenishment of natural waters. In South Africa, the water challenge is caused by the growing population, droughts and inefficient use of water (Cole et al., 2018). According to Sánchez-Hernández, Robina-Ramírez and De Clercq (2017), the water challenge in South Africa is being aggravated by the growing population where in most cities, the population growth of approximately 3.7% is far exceeding the water capacity. Recently, a water crisis has been felt in Cape Town where tap water became a luxury. This strongly signals the severity of the water crisis in South Africa. Water sustainability does not only focus on water scarcity but also the quality of water (Askham & Van der Poll, 2017). This calls for the nation and different players to adopt water efficiency strategies to save water.

2.4.2.1 Water efficiency strategies

It is crucial to adopt efficient methods of water consumption as all human species and the ecosystem depends on this scarce and precious resource. Unlike other resources, water does not have a substitute, which creates problems for survival if it is not managed efficiently. There is agreement in existing literature that water efficiency strategies such as water use minimisation, reuse, recycling and harvesting of rainwater for other purposes collectively enable a firm to attain water sustainability. Integrating sustainability in water use eliminates overconsumption and ensures that the future generations are not affected by water scarcity. It is well-documented that the attainment of other environmental sustainability indicators such as energy efficiency, waste reduction and carbon emission reduction depend on water efficiency. Hence, attaining water efficiency is a crucial step towards attaining sustainable development (Al-Qawasmi et al., 2019). Each of the strategies will be discussed in the next section.

2.4.2.1.1 Reducing water consumption

Water is used in most activities of the business. This ranges from drinking, use in toilets and in the production processes. Another stream of water is lost through leaking taps, fault machines and unattended irrigation pipes in corporate premises. This increases the total water withdrawal from water sources. To that effect, there are fears that businesses will face water risk as the environmental regeneration rate is being exceeded by human consumption. There is a need for serious water management in South Africa (Sánchez-Hernández et al., 2017; McKinsey & Company, 2019). A holistic approach should be adopted by the government to attain water sustainability. This can include subsidies as well as punitive legislation to enforce water management and efficiency in the country. Sánchez-Hernández et al. (2017) support this assertion and add that all citizens should participate in the call to use water astutely lest future generations will be at risk. More importantly, awareness should be raised among all citizens on the importance of saving water if this crisis is to be mitigated.

2.4.2.1.2 Water recycling and reuse

Water withdrawn from water bodies should not be discarded permanently. Rather, recycling and reuse should be encouraged and integrated into the firm's activities. This enables firms to treat waste water and reuse it for other purposes which could have needed fresh water. To that effect, water recycling and reuse can go a long way in enabling firms to attain water efficiency. Water recycling and reuse have been successfully implemented in other countries such as America and Singapore, among other countries, and have produced tangible benefits. In this case, firms can recycle water used in other parts of the production process and reuse it to clean toilets and watering some plants. This reduces water withdrawal rate and overall water consumption. Water recycling is made possible by cutting edge technology and innovation. Technology makes it possible to save water in the entire production system by calculating the standard quantity of water required to produce something. Additionally, technology also makes it possible to recycle water where systems to automatically trap water from the production process are used. Thus, automation makes recycling and reuse possible by eliminating inefficient manual processes in the firm's operations. Furthermore, the recycle and reuse strategy requires the firm to effectively communicate with its organisational members. Most organisations fail to attain their set goals because organisational members are not informed and therefore, end up resisting the initiatives. Raising awareness about the importance of water efficiency ensures that the strategy is known by all and made a priority (EL-Nwsany, Maarouf & el-Aal, 2019; Tortajada & Nambiar, 2019).

2.4.2.1.3 Harvesting rain water

Rainwater has been identified as a low-cost strategy to save water. It is defined as water collected from rain and used to support other human activities (Milkias, Tadesse & Zeleke, 2018). It is one of the water source diversification strategies considered by water experts as one of the solutions to mitigate water risk. In semi-arid developing countries where water scarcity is a serious problem, rainwater harvesting can save several businesses from closing because of water shortages (Tolossa, Abebe & Girma, 2020). Annually megalitres of water are received which firms can harvest and utilise in their businesses. This can significantly cut the firm's water demand and water bill. Rainwater harvesting brings various benefits to businesses. These include; its cost-effectiveness in terms of minimal investment in constructing roofs that can trap water, safe to drink and can be used for a wide range of things within organisations (Akter & Ahmed, 2015; Amos, Rahman, Karim & Gathenya, 2018). More importantly, harvesting rain water can afford a firm a positive rating from its green stakeholders such as customers, suppliers, government and investors who are interested in environmentally conscious firms (Shrestha, Jha & Dahal, 2019).

2.4.3 Waste Management

Defining waste has been a challenge among academics and practitioners. It is difficult to define waste as different countries may vary in what they regard as waste. Moreover, the lack of standard measurements and different reporting frameworks globally eliminate the possibility of arriving at a uniform definition of waste. Nevertheless, it remains crucial to define waste in order to provide a definition for waste management as well as guiding policy making (UNEP, 2015). Waste is defined as anything or residue resulting from a process that is deemed of no economic value (Taiwo, Otieno & Venter, 2008). Other researchers define waste as something discarded from human activities (Dube, 2017). It is crucial to understand what constitute waste to inform policy making. Waste can be generated from either households or from commercial activities. There is agreement in existing literature that waste can be liquid waste, solid waste, medical waste, which can further be divided into two broad categories which are hazardous and non-hazardous waste. Waste management is defined as processes put in place by firms and households to sort, collect, reuse, reduce and recycle waste produced from different activities.

The issue of waste is among one of the top threats to human life and environmental sustainability. Waste can be divided into solid waste, liquid waste and e-waste. These three different types of wastes all have negative effects on the environment if not well managed. The issue of waste deserves urgent attention in several developing countries (Olley, Jgose, Rudin & Alabaster, 2014). Alas, a study by Aleluia and Ferrao (2016) note that the issue of waste management is not prioritised in most developing countries as exhibited by low budgets set aside to tackle this challenge. Consequently, in some instances, waste is left uncollected causing a lot of unbearable pollution. Recently, there was a serious waste management hazard in Mozambique where 17 people died near Helene landfill. This event raised eyebrows for a moment and was soon forgotten. This shows that waste management issues are not considered important, yet they pose a serious threat to human life. South Africa is not immune to the looming challenge of waste management in developing countries (Dube, 2017). The country still lags behind in terms of waste management as compared to most developed countries (Godfrey & Oelofse, 2017). The country still relies more on the traditional way of handling waste as opposed to the new and innovative ways adopted by other developed countries. The issue of waste in South Africa is perpetrated by the rapidly growing population and rapid urbanisation (Dube, 2017). The issue of solid waste such as plastics has become a serious challenge worldwide and affects aquatic life. Recently, there has been protests circulating on social media to force firms to replace plastics with biodegradable material in a bid to protect the environment and aqua-life. Plastics not only pollute the environment but are dangerous, especially to animals and most water species. Solid waste from dumping sites contains some toxic chemicals, which disturbs the natural ecosystem, plant life and aquatic life.

Greyling (2017) reveals shocking findings by reporting that South Africa generates an estimate of 108 million tons of waste yearly and only 0.1 of this is recycled while 0.9 of it finds its way to the dumping sites. Worryingly, South Africa is running short of space for more dumping sites, which is a cause for concern. On another type of waste, Kings (2017) reports that huge quantities of untreated sewage are discharged into rivers in South Africa on a daily basis, and approximately 70% of waste generated by industries is dumped every day (Askham & Van der Poll, 2017). This causes environmental damage as most of this waste is untreated. Reports also indicate that South Africa is faced with serious challenges of e-waste (Mhlanga, 2018). A lot of electronic products are produced daily but with little or no consideration for reuse or recycling. Consequently, e-waste finds itself in the dumping sites where it poses a serious environmental risk. An estimated 6.2kg of e-waste is produced by each individual in South Africa, making it one of the top e-waste producers in Africa (Mhlanga, 2018). In South Africa organisations such as the e-Waste Association of South Africa (eWASA) have emerged to take advantage of opportunities that can be derived from recycling e-waste.

There should be a shift from the traditional approach to waste management where organisations and individuals concentrated only on collecting and dumping the waste to more innovative ways that emphasise waste reduction, reuse and recycling (Jerie & Tevera, 2014). Jerie and Tevera (2014) further highlight the need for stricter and efficient waste management from the production process to end users of products. Putting controls in each stage helps to eliminate waste (Mihai & Ingrao, 2018). Greyling (2017) supports this assertion and states that there is a need for a holistic approach to waste management, where everyone participates in the reduction, reuse and recycling of waste. Waste should be handled in a manner which protects and preserves the environment (Das & Bhattacharyya, 2015). In fact, efficient waste management should be prioritised if challenges associated with it are to be mitigated. There is a need for systems that promote reverse logistics where the waste is re-added back into the production process to produce new products. This is in line with the waste management hierarchy.

2.3.1.1 Waste management tools

2.4.3.1.1 Waste management hierarchy

This tool has been endorsed by various researchers as an effective way to improve waste management (Godfrey & Oelofse, 2017). The waste management hierarchy is shown in Figure 2.4 below.

Figure 2.2: Waste management hierarchy

Source: Dube (2017)

As depicted in figure 2.1, the apex of the pyramid represents the safest way to handle waste while the bottom represents the most undesirable ways to handle waste.

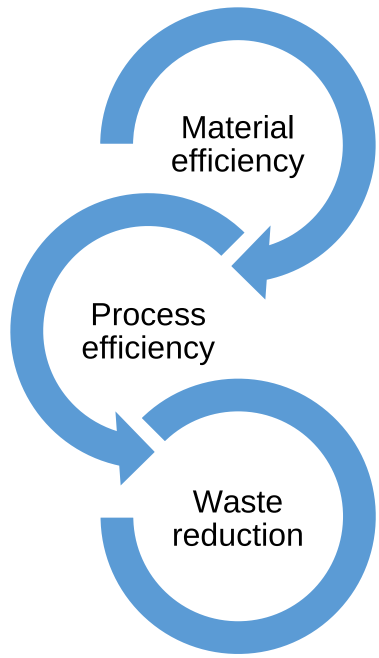
I. Zero waste

Zero waste is regarded as the best alternative where waste is eliminated from resource extraction and production stages. This involves investing in standards and quality techniques such as total quality management, which emphasises zero tolerance to waste. However, this remains difficult to attain as it requires huge investments in technology.

II. Reduce

There has been increased pressure on people, organisations and firms to reduce the amount of waste they generate on a daily basis (Maleka, et al., 2017). Proponents of this campaign submit that waste reduction is achievable through cutting down unnecessary consumption and reducing excessive packaging (Rodrigo, 2015). Another strand of existing literature suggests the integration of systems such as the Enterprise Resource Planning (ERP) and Material Flow Cost Accounting (MFCA) to effectively reduce waste (Fakoya, 2015). The MFCA can be used to generate both financial and non-financial waste information, which firms can use proactively to reduce waste (Fakoya, 2015). In agreement, Tajelawi and Garbharran (2015) remark that MFCA leads to resource efficiency, which automatically leads to a significant reduction in waste. Most firms still generate a lot of waste because they lack proper systems such as the MFCA to assist them in calculating the costs associated with each unit of waste generated (Sun, Sun & Li, 2014). MFCA generates information that can assist a firm to reduce waste from the production process to the end user of the product (Debnath 2014) as it eliminates material flow and process inefficiency (Fakoya, 2015). As noted by Sun et al. (2014), if well implemented, this system stands as a sustainable way a firm can utilise to reduce negative environmental damage and attain overall business environmental efficiency. The benefits associated with MFCA are fully realised when it is integrated with the Enterprise Resource Planning (ERP) (Sun et al., 2014).

Figure 2.3: Role of MFCA in waste reduction



Source: Author (2018)

Figure 2.1 shows the role of MFCA in waste reduction. Waste usually emanates from material flow and process inefficiency. Hence, MFCA generates waste-cost accounting information that enhances material and process efficiency, leading to a reduction in the waste generated. Fakoya (2015) underscores that for the gains of MFCA to be fully realised, everyone in the supply chain should adopt the system as waste starts from suppliers (European Commission, 2018), passed to the firm and eventually to the end user in form of excessive packaging.

III. **Re-use**

Another workable solution to the waste crisis is the re-use strategy where different packaging materials are re-used for some other purposes after the contents are finished instead of throwing them away (Rodrigo, 2015). His study argues that a firm can be able to cut costs through waste minimisation if they efficiently adopt the refilling packaging system. Reusable material can enable a firm to eliminate waste significantly downstream at the consumption side. This means that customers can be educated on how to reuse the product's packages for other domestic purposes. Such a strategy greatly reduces the amount of waste disposed at dumping sites (Global Reporting Initiative, 2019).

IV. **Recycle**

This strategy is effective in eliminating waste, hence, minimising the need for a landfill (Godfrey & Oelofse, 2017). Recyclable waste includes paper/card, glass, plastic and metals produced in different industries. Instead of throwing away waste, firms are encouraged to utilise reverse production/logistics, where they absorb their waste back into the production process to produce new products. Reverse logistics is becoming crucial in the era where waste is becoming one of the worst challenges experienced globally (Lo, 2014; Hsu, Tan & Zailani, 2016). Alternatively, they can sell their waste to other businesses that can use them as raw materials for their products (Yu, Cadeaux & Song, 2012; Aitken & Harrison, 2013). It is mostly the informal sector which is actively involved in the recycling of waste more than other established organisations and businesses (Department of Environmental Affairs, 2016). Godfrey and Oelofse (2017) note that recycling has long been implemented in South Africa but has only managed to divert 0.1 of the total waste, and 0.9 still find its way to the dumping sites. Hence, their study argues that recycling is still under developed and not implemented seriously in South Africa.

V. **Throw away**

This strategy is the most undesirable of all. It is associated with taking the waste directly to the landfills. It has caused severe environmental problems globally and many organisations and nations are trying in the best possible way to move to other alternatives such as recycling, re-use and zero waste. It is still shocking that 90% of waste in South Africa still find its way into landfills (Godfrey & Oelofse, 2017). Pienaar and Howard (2014) report that most landfills are not licensed in South Africa. Consequently, these landfills are in most cases unmonitored, exposing human life and other leaving organisms to severe risk (United Nations Environment Programme, 2015). Currently, South Africa is running out of land for more landfills, hence implying that people should limit the amount of waste they throw away. Existing literature indicates that little progress has been made in the country in terms of migrating from the landfill era to safer ways of waste management such as recycle, re-use, reduce and zero waste. The slow implementation has been blamed on unfavourable legislation that discourages firms to go up the pyramid because of legal costs such as obtaining a license (Western Cape Government, 2014).

2.4.4 Carbon Emission Reduction

Greenhouse gas emissions remain one of the top challenges faced globally. Since greenhouse gases are linked to climate change, nations have been given targets to reduce their emissions. According to Holmgren, Kabanshi, Langeborg, Barthel, Colding, Eriksson and Sörqvist (2019), carbon emission reduction is defined as the minimisation or elimination of carbon emissions from corporate activities. This is aimed at mitigating the issue of climate change which has since been felt globally. Scope 1, scope 2 and scope 3 emissions are categories used to understand the different sources of carbon emissions (GRI, 2019). Scope 1 emissions are defined as carbon emissions directly linked to the firm's activities. On the other hand, scope 2 carbon emissions are defined as indirect emissions associated with electricity consumption by the firm. Scope 3 carbon emissions are defined as indirect emissions not related to the firm's operations. Scope 3 emissions include; emissions emanating from business trips and from vehicles of employees among others. Evidence from assessment of sustainability reports of different firms shows that scope 1 and scope 2 carbon emissions constitute a huge percentage of the firm's carbon emissions, and as such, it is a requirement for firms to report on these emissions. However, to succeed in reducing overall carbon emissions, there should be an overall reduction in scope 1, scope 2 and scope 3 emissions, respectively (Ganda & Milondzo, 2018; GRI, 2019).

Carbon emission reduction has gained attention globally (Conway, 2015; Asongu, et al., 2018). On that note, the issue of climate change requires agent attention globally (Cucchiella, Gastaldi & Miliacca, 2017). Asongu et al. (2018) explicate that carbon emission reduction determines the attainment of the rest of other sustainable development goals (SDGs). Greenhouse gas emissions (GHG) cause climate change, which has since been felt globally for the past three years. Climate change manifests in the form of severe floods, high temperatures, rising sea levels and rampant drought occurrences (Rokhmawati, 2015). In Southern Africa incidences like cyclone Dineo were experienced where it claimed lives in countries like South Africa, Zimbabwe and Mozambique (Mugambiwa & Dzomonda, 2018). In addition, incidences of heat waves were experienced in the past two years in most countries in Southern Africa.

Huxster, Uribe-Zarain and Kempton (2015) associate the heat waves with the use of fossil fuels that emit excessive amounts of CO2 and deplete the ozone layer. Similarly, Rokhmawati and Gunardi (2017) remark that climate change emanates from human activities. As such, temperatures have increased sharply in the last decade making it the hottest ever (IPCC, 2014). Dating back from the Kyoto Protocol 1997, there is increasing pressure on nations and businesses to cut on their carbon emissions. Talks about carbon emission reduction have intensified in a bid to reduce environmental damage (Jones, Wynn, Hillier & Comfort, 2017). It is imperative to devise a consortium of strategies to cut down carbon emissions. Di Pillo, Gastaldi, Levialdi and Miliacca (2017) warn that it will be difficult to keep emissions under the 2.0°C increase threshold as expounded by the Paris Agreement if issues of carbon emission are not regulated. The study further notes that carbon dioxide (CO_2) is the most dangerous gas and responsible for global warming. Approximately 75% of the total emissions come from (CO_2) (Asongu, 2016). The issue of climate change is a reality than a myth. There are trepidations that if temperatures can rise again by a 2°C, the issue of climate change will be uncontrollable (Di Pillo et al., 2017).

Cantore et al. (2017) indicate that it is possible for developing countries to reduce carbon emissions significantly if they can leverage on green methods of production and clean sources of energy. This is because high carbon emissions are associated with the use of fossil fuels. Nevertheless, several corporate managers still question the viability of investing in green initiatives as they tend to focus on the short-term profitability made possible by the use of fossil fuels (Liu, Zhou, Yang & Hoepner, 2016). According to Lucas and Noordewier (2016), such thinking retards progress towards reducing carbon emissions. In essence, going green should not be treated as optional. Instead, firms should participate in carbon initiatives voluntarily investigating the circumstances under which it pays to be green. This positive attitude can then allow firms to find innovative and better ways to reduce emissions while at the same time enhancing their financial performance indicators.

2.4.4.1 Carbon emission situation in South Africa

Regardless of vowing to cut down emissions to 42% by 2025 following the Paris Agreement on Climate Change in 2016 (Garcin & Rodel, 2019), South Africa remains one of the worst emitters in the world, where the average CO_2 emission per person doubles the world CO_2 emission average (Energy and Development Group, 2015). There are fears that if the issue of climate change is not mitigated, South Africa is likely to be twice warmer than the global average (Garcin & Rodel, 2019). The problem of high CO_2 emissions in South Africa is linked to overreliance on coal as the major resource to generate electrical energy. Consequently, with the commissioning of the Kusile and Medupi power stations powered by coal, fears are that the level of CO_2 emissions will worsen in the country (Singh, 2016).

Table 2.1 Top 20 carbon emitters in South Africa

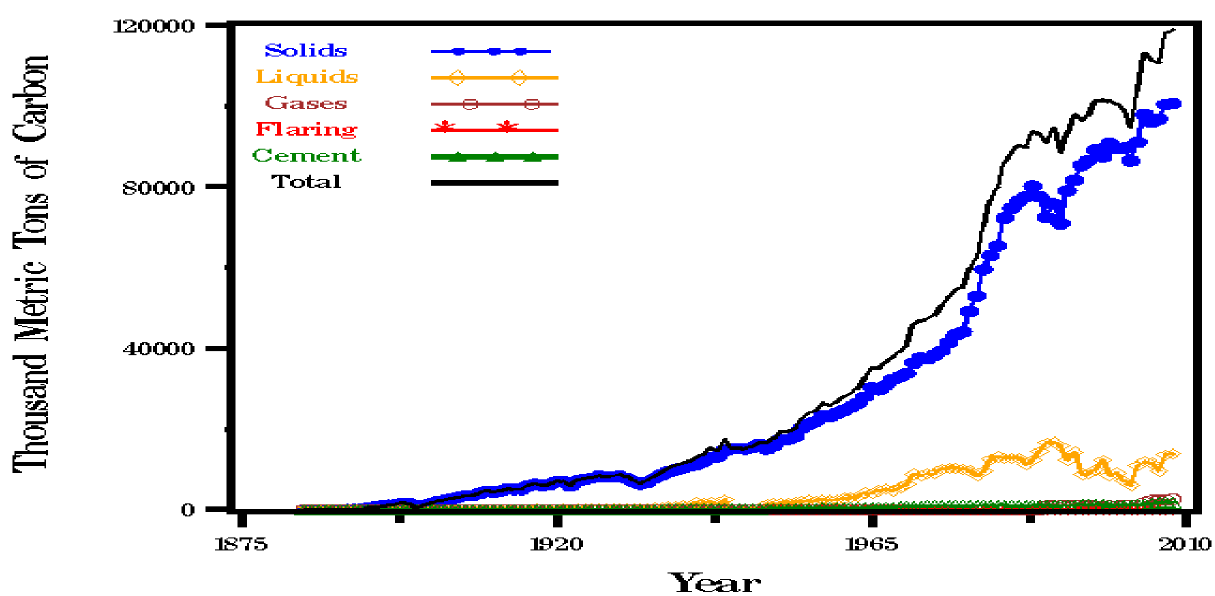
Company	Emissions in million tones/year
Eskom	224.70
Sasol	61.77
BHP Billiton	21.36
ArcelorMittal SA	10.73
Anglo American	8.85
African Oxygen	5.40
PPC	5.13
Sappi	4.78
Mondi	4.42
SAB Miller	1.45
Gold Fields	1.31
AngloGold	1.18
Group Five	0.80
Tongaat Hulett	0.79
Imperial Holdings	0.76
Impala Platinum	0.69
ARM	0.65
Exxaro	0.54
Murray & Roberts	0.51

Tiger Brands	0.47
Anglo Platinum	0.43
Grindrod	0.32
Remgro	0.30
hulamin	0.30
AECI	0.30
MTN Group	0.28
Kumba Iron Ore	0.25
Oceana	0.16
Pick n Pay	0.16
Harmony Gold	0.15

Source: Carbon Disclosure Project (2014)

Table 2.4 shows a list of top 20 carbon emitters in South Africa based on the Carbon Disclosure Project report (2010). As indicated, Eskom and Sasol are the top emitters in South Africa. These millions of carbon dioxide are mainly because these companies use fossil fuels to power their operations. For South Africa to make it out of the top 20 carbon emitters in the world, there is a need for serious and punitive measures to force individual companies to reduce their carbon emissions.

Figure 2.4: Carbon emissions in South Africa



The figure above presents carbon emissions in South Africa since 1875. The different sources of emissions are identified as cement, flaring, gases, liquids and solids. The major emissions are from gases and solids. From the figure, the blue line shows that a huge amount of carbon emissions is from solids such as coal. Overall, the figure shows that carbon emissions in South Africa started increasing at an increasing rate from 1920 to present, which is worrying.

2.4.5 Material Efficiency

Material efficiency is attained when the firm uses minimal inputs to produce more units of a product (Fischer, 2013). Milios (2016) defines material efficiency as the optimum and efficient use of resources in combinations, which allows a firm to produce more output with less resources. Material efficiency can be a sustainable strategy for decoupling economic growth from environmental degradation without compromising people's wellbeing. Material efficiency aims at promoting sustainability in energy use, water and mitigating climate change. Such milestones are achievable in the long term but requires approval and participation by both suppliers and customers (Allwood, Ashby, Gutowski & Worrell, 2013; Fischer, 2013; International Resource Panel, 2018). Material efficiency is linked to resource decoupling (Indo-German Expert Group, 2014). Resource decoupling is defined as reducing the ratio between natural resources inputs and output (Indo-German Expert Group, 2014). On the other hand, decoupling is defined as lifting up the negative effect imposed on the environment by reducing resource uptake in the economic activities of a firm (United Nations Environmental Programme, 2011). To achieve material efficiency, it is crucial to assess the relative impact of material extraction for economic purposes on the environment. Essentially, material efficiency can be attained by decoupling economic activities from scarce natural resources and the environment (Indo-German Expert Group, 2014; Milios, 2016).

One of the major purposes of material efficiency is to create a circular material flows where economic activities are conducted while at the same time accounting for the environment This is aimed at addressing the short falls of the linear economy where there is no consideration for sustainability. Moreover, the circular flow focuses on environmental protection, optimisation of resource use by emphasising the need for material reuse and elimination of processes, which creates negative externalities to the environment. Furthermore, the circular flow economy uses a variety of methods to attain material efficiency. Ideally, the circular flow economy is based on the idea to eliminate waste before production begins and the attachment of value to waste in the event that it was generated (Indo-German Expert Group, 2014; European Commission, 2015; UNEP, 2015; Milios, 2016; Mendoza, Sharmina, Gallego-Schmid, Heyes & Azapagic, 2017). This is because firms just focus on producing and selling without scope for reusing the product after it reaches its useful lifespan. On the other hand, the circular material flow economy is embedded in the sustainability agenda, where materials are sustainably sourced, processed efficiently and packaged in a manner that enables reuse (Indo-German Expert Group, 2014; Milios, 2016). To achieve the circular flow, firms need to change their old ways of production and consumption. This entails adopting green business models and systems to eliminate material wastage. Sustainable business models enable firms to eliminate material wastage by incorporating innovation in systems and materials handling. It is these sustainable business models that can make it easy for firms to adapt to new environmental demands. Sustainable business models also promote the circular flow by changing the way firms source out materials, produce and distribute products (Bocken, Short, Rana & Evans, 2014; Bocken, De Pauw, Bakker & van der Grinten, 2016; Geissdoerfer, Bocken & Hultink, 2016).

Existing literature points to the importance of investing in cutting edge technology and innovation to propel material efficiency (Cramer, 2013; Fischer, 2013; Gutowski, Sahni, Allwood, Ashby & Worrell, 2013). On that note, Fischer and O'Brien (2012) submit that information communication and technology can assist firms in attaining material efficiency. Innovation is key because it makes it possible to maintain or increase the production output without increasing carbon emissions. The argument for products innovation is to have products that are in support of the green economy agenda premised to mitigate environmental damage. New products innovation can add significantly towards environmental sustainability. This is because innovation makes it possible for the business to fully participate in environmental sustainability initiatives. Moreover, it enables a firm to achieve its overall sustainable development goals (Ar, 2012; Gutowski et al., 2013; Hsu, Tan & Mohamad, 2016; Milios, 2016).

Material efficiency can assist nations to be sustainable in other areas such as energy and water (International Resource Panel, 2019). It brings momentous benefits such as enhanced innovation, reduction in carbon emissions, and eliminates resource extinction risk. Hence, it is estimated that material efficiency can reduce natural resource extraction by 28%, reduce carbon emission by 15-20% and reduce the overall cost of climate change initiatives by 2050. More importantly, attaining material efficiency can allow nations to be resource self-sufficient and cut down the volume of imports. Based on this, material efficiency should form the cornerstone of all climate change policies if this phenomenon is to be successfully abated (Allwood et al., 2013; IRP, 2017). Material efficiency can be attained by attaining efficiency from the raw material source (IRP, 2017). This includes reducing the extraction of raw materials and environmental damage at source (Fischer & O’Brien, 2012; IRP, 2017).

2.4.5.1 Material efficiency strategies

Material efficiency is a strategic issue. Existing literature reveals that firms need to leverage on strategy to attain material efficiency. The new strategy entails process transformation and standardisation of systems (Fischer & O’Brien, 2012). This propels the new goal for leaner resource strategy, which is passed on to customers through light weight products without compromising the functionality and quality thereof. Moreover, the entire value chain has to be synchronised with the new material efficiency strategy if the firm is to be successful (Fischer, 2013). Material efficiency can be attained through the following technical strategies;

I. Light-weight design

Some of the huge volumes of waste are caused by too much material on the design of a product. Hence, lightweight product designs can go a long way in assisting firms to attain material efficiency (IRP, 2017). Approximately one third of materials can be saved by implementing lightweight designs (Carruth, Allwood & Moynihan, 2011). New designs have to take into consideration material efficiency. However, robust market research should be conducted first to gauge customers’ reaction towards such developments to avoid producing the product that will be rejected by the market. It follows that customers usually expect to see product modifications overtime as a sign of quality improvements. Hence, producing leveraging on lightweight designs can enhance a firm's competitiveness in the market. Mendoza et al. (2017) found that lightweight material products have less environmental damage.

II. Re-using components

Re-using components is one of the most effective strategies to attain material efficiency. This is in line with the reverse logistics strategy, which has gained momentum recently. This strategy is both economically and environmentally viable (Cooper & Allwood, 2012). For instance, Cooper and Allwood (2012) argue that firms can contribute to the environment positively by reusing components such as steel to construct new structures since approximately 30% of waste can be fed back into the production process. This can reduce the amount of raw materials demanded in the production process (Allwood et al., 2013). However, this strategy can be weakened by the shortage of materials to be re-used (Cramer, 2013), which may disrupt the production process (Pauliuk, Wang & Müller, 2011). All in all, re-using components remains one of the lowly hanging fruit strategies that firms can use to eliminate excessive demands for new raw materials. This is because this strategy is less costly and easy to implement.

III. Longer-life products

Designing products with a longer life cycle can help in attaining material efficiency (Allwood et al., 2013; IRP, 2019). This can reduce the number of products produced in a certain period, hence, cutting the rate of waste disposed on the environment. However, this strategy may conflict with the growth strategies of firms. Producing products with longer life spans entails low demand and sales on the firms' side. This means customers takes long to replace their products with a new one. More gains and less conflicts will be attained if the strategy can focus on specific products.

IV. Material substitution

There is a move towards using environmentally friendly materials in the production process (Allwood et al., 2013; European Commission, 2018). This means adopting materials with less environmental damage. This is being advocated in the entire supply chain. This means that the material efficiency strategy is initiated from source until it reaches the end pipe (Ashby, 2009). On that note, there is a trend towards moving away from plastics as they take long to decompose, causing serious environmental damage. Materials such as plastic cause serious damage to aqua life, wildlife and pollutes the environment extensively (European Commission, 2018; United Nations Environmental Programme, 2018). Departing from such material towards biodegradable ones can solve the current problem permanently.

Before considering material substitution, there is a need to conduct robust environmental impact assessment on different alternative materials. This is because they might also have an indirect negative impact on the environment, which might equate or surpass that of plastics. One of the clear negative impacts might be high energy consumption and excessive carbon emissions, which consequently reduces the firm's environmental performance (Franklin Associates, 2014). Nevertheless, a knowledge gap exists in South Africa as no study has attempted to assess the effect of material efficiency on financial performance (Milios, 2016). Material efficiency has received less attention from existing studies especially in Africa and other least developed countries. This has reduced the effectiveness of plans to mitigate climate change (Allwood et al., 2013). Moreover, this derails theory and practice as there are limited empirical studies on the phenomenon. More studies are required to unpack this phenomenon from a developing country perspective, especially in Africa where fossil fuel use is still at its pick.

2.4.6 Green Products and Services Innovation

This concept is defined as the production of products that are environmentally friendly. In other words, it is the production of biodegradables which can add value to the environment rather than destroying it. Green products are designed to eliminate inefficiencies from the source and eliminate reliance on end of pipe strategies to environmental protection (Bailey, Mishra & Tiamiyu, 2016; Eneizan & Wahab, 2016). This is triggered by the emergence of green customers globally. This is a completely unique set of customers with new needs never served in the market before. Most customers in both developed and developing countries are becoming aware of their health needs and the need for environmental stewardship (Flammer, 2013; Laari, Töyli, Solakivi & Ojala, 2016; Xue et al., 2019). Hence, new markets and customers are emerging for such products globally, creating additional revenue streams for firms that choose to pursue such avenues (Dangelico & Pontrandolfo, 2015; Miroshnychenko et al., 2017). The green products and services innovation strategy can be an effective tool to appeal to environmentally sensitive consumers and overall a crucial tool to mitigate environmental damage (Frenken & Faber, 2009; Chiou, Chan, Lettice & Chung, 2011; Fadly, 2018; Xue et al., 2019).

Essentially, green products and services innovation positively influence other areas such as energy efficiency, water efficiency, waste and carbon emission reduction (Ar, 2012; Eneizan & Wahab, 2016). With high levels of environmental damage caused by excessive pollution and carbon emissions, leveraging on the green products and services innovation strategy enables businesses to minimise environmental damage. More importantly, green products and services innovation may increase the green sales of the firm by attracting environmentally acclimatised customers. Green products and services innovation include eco design, products innovation, use of green packaging, enhanced product quality and eco-labelling, among others.

2.4.6.1 Eco design

Eco design describes the processes put in place by a firm to design products that are environmentally friendly. It can also be defined as a strategy to cut resource overuse at the preliminary stages of the product design (Mendoza et al., 2017). It is characterised by life cycle thinking from the primary stages of product conceptualisation, and it helps in resource efficiency. This is because eco design is an operational strategy (De Pauw, Karana, Kandachar & Poppelaars, 2014). As such, eco design is regarded as the cornerstone of the circular economy (European Environmental Bureau, 2015; European Commission, 2015). Due to rising pressure for environmental protection, pundits of sustainability argue that measures to eliminate possible toxins on the environment should start at the designing phase of the product (Mendoza et al., 2017; Vanalle, Ganga, Godinho & Lucato, 2017). This entails designing products that are biodegradable, hence, minimising environmental damage. On that note, De Pauw, Kandachar and Karana

(2015) are of the view that eco designers can learn much from mimicking natural systems and biological processes. The proponents of this view name it biomimicry. It helps eco product designers to give a product unique features that do not only excel in environmental sustainability, but that can also give the firm an unmatched competitive advantage. Nature inspired design is premised on the idea that waste should be converted into something of economic value through sustainable strategies. Essentially, nature inspired designs are successful when designers infuse their designs with materials which easily decompose and become part of the environmental regeneration nutrients (Tempelman, van der Grinten, Mul & de Pauw 2015). Biomimicry tends to bear fruits when a holistic approach is followed and everyone in the firm participates (De Pauw et al., 2014; De Pauw et al., 2015). Mendoza et al. (2017) underscore that the design stage can help eliminate 80% of environmental damage if well executed as is required in eco designing.

2.4.6.1.1 Eco design steps

According to Mendoza, Sanyé-Mengual, Angrill, García-Lozano, Feijoo, Josa and Rieradevall (2015), eco design follows a series of steps. The process of eco design starts when the firm crafts goals towards the design of an environmentally friendly product. This is informed by robust research both from the suppliers of components and the market. In the goal formulation, it is crucial to set the vision and goals clear to avoid confusion among the design teams and the rest of the organisation. The overarching vision will assist in giving the eco design team and the rest of the organisation long-term direction. The vision should be in line with the eco strategic orientation, which emphasises environmental protection (Hong, Kwon & Roh, 2009; Hsu et al., 2016).

Step 2 entails the identification of the basket of products that need to be modified. The product is evaluated based on specific features that should be modified (Sanyé-Mengual, Lozano, Farreny, Oliver-Solà, Gasol & Rieradevall, 2014). In step 3, different eco design strategies are initiated and compared. This step also involves the assessment of the product on its technicalities and environmental impact. This assists in selecting features to be considered for modification in step 4. In step 5, the product is developed, and when considered compatible to the vision and desired characteristics, it is processed to the next step.

The final step involves the crafting of production and marketing plans. This means the product can be produced in bulk and serve the markets the firm focuses on. Having such a systematic process to design eco-friendly products is crucial to guide the green efforts of firms, even though practically, phenomena do not usually follow a linear approach as the business environment is dynamic. The eco design steps presented above are crucial in guiding managers, especially in developing countries, who still find it difficult to initiate environmental sustainability programmes (Mendoza et al., 2015; Hsu et al., 2016).

2.4.6.3 Green packaging

The issue of packaging has generated much debate recently. There is evidence that plastics generate approximately 70% of environmental pollution (Yildiz & Sezen, 2019). As such firms need to rethink their packaging to suit the green requirements (Franklin Associates, 2014). Hsu, Tan and Zailani (2016) define green packaging as applying environmental sensitivity in the packaging of a product. In this definition, other scholars deduce that green packaging also involves using packages that are compliant to the quality standards as set out by environmental regulators (Franklin Associates, 2014). There is an agreement among researchers that green packaging consists of using biodegradable material, cutting out excess material on the package and using alternative packages. Nevertheless, green packaging should not compromise the perceived quality of the product, ease of use and its compatibility for distribution purposes. This entails that firms should take all these factors into consideration before adopting the packaging (Lin, Kuei & Chai, 2013; Hsu et al., 2016). Green packaging can cut cost in the reverse logistic systems.

2.4.6.4 Eco labelling

In this study, eco labelling is defined as initiatives put together by a firm to communicate its environmental responsibility. This is done by putting information related to green practices on the firm’s products. Such information is intended to educate customers on the benefits of green behaviour as well as organic ingredients contained in the product. As such, eco-labelling has become one of the crucial tools of green marketing (Hornibrook, May & Fearne, 2015; Testa, Iraldo, Vaccari & Ferrari, 2015). Eco-labels are meant to guide customers on their purchase decision making. It follows that customers perceive firms that effectively label their products transparent as compared to those that do not. On that note, customers usually trust green products with international green certification. This assures them that the information provided on eco labels is authentic. Eco labelling backed by international environmental certification assures customers that the firm is not into greenwashing, a concept that has led most green customers not to be easily convinced by eco labels. Fears are that marketers preach what they do not practise in reality. As such, firms should ensure that the information provided on eco labels is legitimate to avoid possible lawsuits (Blengini & Shields, 2010; Testa et al., 2015; Hameed, Siddiqui & Husain, 2016; Prieto-Sandoval, Alfaro, Mejía-Villa & Ormazabal, 2016; Delmas & Lessem, 2017; Hameed & Waris, 2018; Lee, Bhatt & Suri, 2018).

For the above green product and services innovation strategy to work, the entire internal processes should be transformed to support the new strategy. Trying to implement the green product and services innovation strategy without aligning it to internal processes can lead to outright failure of the initiative. To that effect, green processes should be in place to help eliminate any inefficiency from inputs to the outputs. Moreover, the firm's buildings, warehouses and its logistics should signal to customers that the firm is seriously involved in green revolution not green washing. When all the above are in order, it becomes a well-coordinated system that guarantees the firm success from its green investments (Eneizan & Wahab, 2016).

2.4.7 Environmental compliance

The concern over the depletion of natural resources coupled with the goal to reduce emissions have seen more environmental policies, standards and regulations being implemented globally (Naila, 2013; Dechezleprêtre & Sato, 2017; Neeveditah et al., 2017). In some industries such as construction and retail, firms are under pressure from customers to possess environmental standard certificates (Fadly, 2018). Environmental non-compliance poses a serious threat to the firm. These manifest in the form of lawsuits, penalties and suspension of trading licenses. For instance, lack of compliance negatively affected Enterprise Foods in South Africa when the company's food items were linked to the outbreak of Listeriosis. This led to a serious outcry and protests by civilians, leading to serious consequences for the firm. Recently, institutions globally have been calling for stringent penalties on firms that fail to account for their environmental impact. Due to the rapid adoption of new technologies and leveraging on innovation, the conventional thinking that environmental compliance increases cost has since lost support (Riaz et al., 2019; Dechezleprêtre & Sato, 2017). Environmental compliance at firm level is exhibited through the presence of internal environmental policies, possession of environmental excellence certificates, adoption of environmental certifications such as the International Standards Organisation 4001 and the absence of environmental fines and penalties (Boakye, 2018).

2.4.7.1 The International Organization for Standardization (ISO) 14001:2004

ISO 14001 is an international environmental management system standard established in 1996 in Geneva, Switzerland (Neeveditah et al., 2017). ISO 14001 is defined as "that part of the overall management system that includes organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing, coordinating and maintaining an environmental policy" (Farok & Searcy, 2015:483). As such, the idea is to have a universal standard that is acceptable and adopted globally. This system was formed to design standards to protect the environment. More importantly, the system is open to any organisation or company that wishes to improve legitimacy to its stakeholders. However, adoption thereof, depends on several firm and industry specific factors (ISO 14001:2004). The ISO 14001:2015 environmental management system uses the Plan-Do-Check-Act (PDCA) as a model to initiate and implement the system in an organisation. The model is broken down into a number of stages as shown below.

Planning

The first stage is for the organisation to craft objectives linked to their environmental policy. In this instance, all the departments and all the stakeholders of the initiative should be considered when crafting the objectives. The objectives have to be inclusive, otherwise the entire strategy will face rejection at the operational level. More importantly, the objectives should be measurable. This makes it easy to attach key performance indicators to each objective.

Doing

The doing stage of the model involves implementing the environmental plan. At this stage different operational committees should be established and resources disbursed to units created to handle the environmental policy. Top management is crucial to avoid bottlenecks in implementing the plan. More importantly, clearly defining roles, lines of communication and chain of command is vital to improve the success of the system.

Checking

The checking stage is when management takes control measures to check progress in terms of set goals. This step helps management to see if they are on track or lagging in terms of achieving set targets.

Acting

This stage occurs when management has to conduct some reviews based on what they found when controlling the project. When discrepancies are found, management has to track the causes and take remedial actions to enhance environmental performance in future. At this stage, management is encouraged to be objective when making judgements and pointing areas of improvement. More importantly, care should be taken not to demoralise the employees and those responsible for the implementation of the environmental policy in the firm.

Continuous improvement

Another important aspect of the Plan-Do-Check-Act (PDCA) model is continuous improvement. Establishing a successful environmental policy is a daunting task and takes a series of steps to finally get it right. It takes into consideration a lot of activities such as bench marking best practices from competitors, acknowledging and correcting previous mistakes and adopting new technology to attain the desired standard. Hence, continuous improvement becomes a crucial piece if the organisation plans to score high on environmental performance.

ISO 14001:2004 is credited for its positive contribution towards environmental protection by firms and other organisations (Farok & Searcy, 2015). ISO 14001:2004 continues to improve its standards regularly (Farok & Searcy, 2015). Recently, there is a newer version, ISO 14001:2015 which successively improved upon the previous version. The adoption of ISO 14001 has increased rapidly over the past decade. However, the effectiveness of ISO 14001 is still to be validated since there are mixed findings. Most firms tend to adopt ISO 14001 for legitimacy purposes only without much effort to use it as an environmental quality assurance tool. This has negative connotations to the firm in the context of consumers who can view it as green washing by the firm resulting in the boycotting of its products (Delmas & Montes-Sancho, 2010; Bowen & Aragon-Correa, 2014; Neeveditah et al., 2017; Riaz et al., 2019). To avoid bad reputation and earn green trust from stakeholders, firms should adopt ISO 14001 as a tool to assist them in improving their processes and systems to attain excellent environmental performance (Boiral & Henri, 2012).

2.4.7.3 Absence of fines and penalties

Absence of fines and penalties can be a clear sign that the firm is proactively involved in environmental protection. Recently, environmental sustainability issues have crucially formed one of the serious issues that governments have to deal with. Firms with negative environmental behaviour risk paying environmental fines and penalties. For example, BP was fined heavily on the oil spill incident on the Gulf in 2010. Emanating from that incidence, BP has lost legitimacy from its green customers, investors and affected societies at large. Even though BP may try to embark on lobbying and other crisis management strategies, green trust is relatively difficult to regain since it takes long to build. Hence, firms can unlock momentous benefits by investing seriously in environmental sustainability initiatives (GRI, 2019).

With a move towards green supply chain, it follows that other environmentally sensitive members of the supply chain avoid partnering with firms with a negative environmental rating. For example, environmental fines and penalties show that the firm’s environmental behaviour is undesirable. Hence, with an increase in environmental whistle blowers and the emergence of responsible investing, environmentally well performing firms may avoid collaborating with environmental laggards to protect their green image. To that effect, environmental fines and penalties are some of the areas other supply chain partners assess before entering into a contractual agreement with a firm.

2.4.7.4 Internal environmental policies

To comply with institutional environmental legislation, firms should design their own internal environmental policies. Having well-crafted internal environmental sustainability policies can help firms to excel in environmental protection and to comply with institutional environmental legislation in general. The absence of internal environmental policies does not only expose the firm to punitive measures from the government but may also make the firm to lose focus in regulating its carbon footprint, water and energy use. Internal environmental policies are more effective when they are proactive as compared to reactive policies. Additionally, policies should be designed in a way to unlock the innovative capacity of the firm rather than as a tick box approach for compliance only. This gives a firm an opportunity to innovate and influence organisational members to share the same vision. This is because a firm’s competitiveness is no longer judged on its assets only, but also on intangible assets such as green trust and green image gained from the green stakeholders of the business. To that effect, internal environmental sustainability policies shape the behaviour of the firm towards environmentally desirable behaviour. Essentially, having internal environmental sustainability policies can improve the firm’s environmental responsibility ratings. Globally, it is becoming a requirement to have internal policies to protect the environment (Neeveditah et al., 2017; Worae & Ngwakwe, 2017; Bawua & Owusu, 2018).

Practically, in countries such as Ghana, firms are evaluated and given colours that correspond to their environmental performance. For instance, a gold colour is given to a firm with excellent environmental behaviour, entailing that it has internal policies aimed at protecting the environment and possess environmental certification. On the other hand, laggards in terms of adoption of environmental protection policies are given a red colour showing that their attitude and behaviour towards the environment behaviour poses a threat to the environment. Such an environmental rating forces firms to comply (Sekyi, 2011; Bawua & Owusu, 2018).

From the synthesis of existing literature, there is still a lot to be done for firms to comply with environmental legislation. It seems that firms are not taking heed to the environmental sustainability call to design their own internal environmental policies. This emanates from the weak implementation of environmental policies. To that end, the effectiveness of environmental policies is questionable. Other studies argue that environmental policies are an effective tool to enforce green behaviour, while others remain sceptical (Dechezleprêtre & Sato, 2017). Since internal environmental policies are informed by national policies, the weak policy framework and lack of implementation makes environmental policies ineffective. This a common problem in most developing countries such as South Africa (United Nations Environmental Programme, 2014). This view is also supported by other studies, which submit that environmental policies may be insignificant in instances where they are not seriously enforced. This can discourage environmentally responsible firms since the laggards continue to trade without any penalties or fines for environmentally irresponsible behaviour (Riaz et al., 2019). The results of this study will aid in making recommendations towards a transformative and effective policy framework in South Africa.

2.4.8 Stakeholder Engagement

Other studies define stakeholder engagement as proactive actions taken by firms to collaborate with their key stakeholders on different environmental sustainability initiatives (Yildiz & Sezen, 2019). Such initiatives allow a firm to attain its long-term vision while at the same time satisfying its key stakeholders (Vanalle, Ganga, Godinho Filho & Lucato, 2017). In this study, Stakeholder engagement broadly describes initiatives such as green supply chain management (GSCM), stakeholder communication, internal stakeholder collaboration and collaborations with the community on environmental initiatives. These are separately discussed below.

In the context of environmental sustainability, stakeholder engagement has started to gain momentum recently, and it is regarded as an effective driver of sustainable development initiatives (Caniëls, Cleophas & Semeijn, 2016). Attaining sustainable development will remain an elusive agenda if there is no effective stakeholder engagement (Fadly, 2018). All stakeholders need to come on board to share and collaborate on environmental sustainability initiatives. Both internal and external stakeholders of a firm are crucial in supporting the environmental sustainability strategy. For instance, a firm requires green oriented suppliers, employees and customers if the environmental sustainability agenda is to be successful. It follows that some stakeholders such as suppliers are coming up with innovative environmental solutions which they are willing to share across their supply chain, which can be advantageous to the firm (O'Riordan & Fairbrass, 2014).

Be that as it may, the role of the community in approving or disapproving environmental sustainability projects cannot be underestimated (Nugraha, Rarasati & Adiwijaya, 2019). In their implementation of the water system project in Indonesia, Nugraha et al. (2019) noted that failure to fully engage and collaborate with stakeholders in environmental sustainability initiatives results in outright failure of such projects. It is advisable for firms to actively engage its stakeholders to convert possible challenges into drivers for the environmental sustainability agenda. It is effective stakeholder engagement which increases the probability of stakeholder buy-in for a firm's environmental sustainability initiatives (Caniëls et al., 2016; Wang & Wood, 2016).

Some of the resources and support structures required by firms to pursue environmental sustainability initiatives are locked in stakeholder networks (Kwamega, Li & Abrokwah, 2018; Nugraha et al., 2019). The Resource Based View (RBV) theory submits that having access to key resources gives a firm a competitive advantage over others (Barney, 2012). Unlocking resources tied in different stakeholders enhances the competitiveness of the firm in the face of its competitors. The competitive advantage is sustained by creating factors conditions which are inimitable by competitors in that industry. These include eco-reputation (Hsu et al., 2016) and stakeholder buy-in which are gained by the firm from active collaborations with supply chain partners (Choi & Hwang, 2015). For instance, a firm requires new technology from suppliers while at the same time its employees who will ensure that the new technology is accepted. Hence, when stakeholders are continuously engaged and integrated into environmental related issues and projects which the firm plans to execute, they are likely to support the firm. Stakeholder engagement does not only differentiate a firm from its competitors, but also makes the firm to be efficient and effective in attaining its environmental sustainability goals

(Kwamega et al., 2018). This unlocks value and sustainable synergies which translates into superior financial performance.

2.4.8.1 Collaborating with green supply chain partners

Stakeholder engagement can be exhibited in a firm's collaborations with its supply chain partners such as green suppliers and green customers. Most studies have used green supply chain management (GSCM) to describe stakeholder engagement (Wang & Wood, 2016). GSCM is increasingly becoming prominent as pressure towards environmental protection is burgeoning. GSCM is a concept used to infuse green thinking among different stakeholders of the firm in its supply chain (Yildiz & Sezen, 2019). GSCM practices involve actions taken by the firm to influence suppliers and customers as end users of products to participate in environmental sustainability initiatives. GSCM initiatives include agreements on green product designs, type of materials to be used and collaborations between the business and other supply chain members. Such collaborations enable the firm to enjoy first mover advantages which result in superior financial performance. Additionally, a firm can enhance its overall environmental performance by collaborating with its supply chain partners. Green supply chain partners such as customers and suppliers have unique characteristics of importance to the firm which it can harness to enhance its environmental sustainability initiatives. More importantly, stakeholder engagement can assist a firm in coordinating reverse logistics where they actively collaborate with and encourage customers to recycle the firm's products. Collaborating with suppliers in environmental sustainability initiatives enables a firm to eliminate possible waste at source (upstream), while collaborations with customers assist a firm in ensuring that waste is minimised and unrecyclable materials are properly disposed downstream (Golicic & Smith, 2013; Dangelico & Pontrandolfo, 2015; Hsu et al., 2016; Laari et al., 2016; Miroshnychenko et al., 2017).

2.4.8.3 Internal stakeholder collaborations

Internal stakeholders such as employees are valuable in the success of environmental sustainability initiatives adopted by a firm. Firms planning to yield positive financial performance from environmental sustainability initiatives should collaborate with their employees from the onset. Through training and development, employees can be green ambassadors of the firm, which enhances brand value and loyalty from the perspective of its customers. This consequently drives sales up as employees are capable of clearly communicating the benefits of green initiatives to the customers. Other researchers further submit that employees possess certain skills which enable the smooth running of the internal and external environmental sustainability initiatives of the firm. However, employees have been neglected in most environmental sustainability issues resulting in resistance to change. Failure to collaborate with internal stakeholders such as employees may create barriers towards the attainment of environmental sustainability (Alfalla-Luque, Marin-Garcia & Medina-Lopez, 2015; Muposhi & Dhurup, 2016; Kwamega et al., 2018).

2.4.8.4 Stakeholder communication

Effective communication is key in stakeholder engagement. Excellence in stakeholder communication assists a firm in clarifying its specific goals which facilitates buy-in from other supply chain members and can also positively impact on firm financial performance (Boakye, 2018). All stakeholders do not prefer to be left in the dark regarding the operations of the firm (Lannelongue, Gonzalez-Benito & Gonzalez-Benito, 2015). Firms which continuously engage their stakeholders through newsletters, memos and through their websites are likely to gain trust and loyalty from stakeholders (Boakye, 2018). This can attract investors in the company and suppliers which gives the firm an unmatched competitive advantage. Constant stakeholder engagement makes investors to perceive the firm as transparent (Cheng, Ioannou & Serafeim, 2014). In the case of listed firms, transparency is one of the crucial factors which assists investors in deciding whether or not to invest in that company. Based on that, Cheng et al. (2014) reported that stakeholder engagement has a positive effect on financial performance. Additionally, Lannelongue et al. (2015) remark that when a firm invests in stakeholder communication, this enhances their environmental sustainability initiatives through stakeholder feedback, support and buy-in. This translates into superior financial performance and sustainable competitive advantage (Lannelongue et al., 2015). This line of thought augurs well with the Signaling theory which explains that the management should share relevant information with its stakeholders to eliminate information asymmetry. When such is achieved, the firm is likely to enjoy momentous benefits in terms of financial performancewhich spans into the long run (Haninun et al., 2018).

According to Legitimacy theory, excelling in stakeholder engagement improves the legitimacy of the firm in the perspective of the society (Dowling & Pfefeer, 1975). When synchronisation between the values of the firm and that of the society is attained, the firm gets approval from the society on its environmental sustainability initiatives. Given how strong the society is becoming in South Africa, firms which continuously engage this group of stakeholders attain financial goals by avoiding lawsuits and product boycotts. Recently, there have been massive strikes within mining communities in South Africa where local communities complained that their rights were undermined by mining companies. This practically shows that if a firm fails to engage the society, then chances of business closure are imminent.

2.5 INTERNATIONAL ENVIRONMENTAL AGREEMENTS/PROTOCOL

A series of summits have been put in place to force organisations and firms to respond to sustainable development. These include; the Bruntland Report (1987), the Kyoto protocol 1992, the World summit on Sustainable Development, the Earth summit 2012 and the recent Paris Agreement 2015 on climate change among others.

The Bruntland Report (1987) came as a call to encourage nations to join hands in the fight against the environmental sustainability threat by balancing human needs and the environment regeneration rate. The commission successfully published a report termed "Our common future" which was widely adopted and shaped the definition of sustainable development. The Brutland Report (1987) successfully managed to develop the tenets of sustainable development. To that effect, the triple bottom line of economic, social and environmental sustainability was successfully developed and continue to form the crux of all studies in sustainable development. Ideally, the present study benefits largely from the foundations of the Bruntland Report (1987) by focusing on environmental sustainability.

The Kyoto protocol 1997 was conveyed in Brazil in 1992 and later adopted in Japan in 1997. The major goal of the summit was to reduce carbon emissions by member states after realising that global warming was becoming a serious human life threat. Member states were tasked to reduce their carbon emissions but with developed countries leading the call since the current trends of global warming were attached to their state of development. The emission reductions were pegged at 5.2% from 1990 levels to be achieved by 2012.

The World summit on Sustainable Development was a followup to the Re de Jenairo summit in 1992. The most crucial outcome of the summit was the establishment of the Johannesburg Declaration on Sustainable Development. This was more general and covered sustainable development broadly and led to the conceptualisation of 300 partnership initiatives linked to the attainment of the millennium development goals.

Earth summit 2012 in Riode Janeiro was organised by the United Nations Department of Economic and Social Affairs. The summit was a follow-up to the Kyoto protocol 1992 and the World summit on Sustainable Development in Johannesburg in 2002. It was attended by all UN membership holders and the main objective was to craft a robust environmental policy. The major themes of the summit were centred on the move to adopt the green economy and to establish an institutional framework aimed at enhancing international coordination on sustainable development issues. The major important outcome of this summit was the birth of “The Future We Want” document which saw 192 nations present committing to support the sustainable development agenda.

The Paris Agreement is a recent summit held in Paris, France in 2015. The Paris summit saw 195-member states coming together to agree on nation by nation carbon emission quotas starting from 2020. Resolutions were taken over reducing carbon emissions hence, strategies to mitigate, adapt and finance such initiatives were agreed upon (Sutter & Berlinger, 2015). Though this summit was successful in putting measures to address climate change, it can be noted that its lack of mechanisms to enforce what was agreed upon is a serious loophole which can reduce its effectiveness. There were also some problems with participation by other member states such as the US. The US’s refusal to affiliate and participate in the Paris Agreement through its president Donald Trump was a major blow to the initiative since the US is a significant member.

Besides some of the noted weaknesses in some of the International Environmental Agreements, the above environmental summits contributed immensely towards establishing best practices towards environmental protection. These different summits remain cornerstones to the issue of sustainable development. More importantly, these summits successfully encouraged the development of sustainable development guidelines by different voluntary organisations. Some of the guidelines are designed to guide firms in reporting their environmental footprints. This will be discussed in detail in the next section.

2.6 INTERNATIONAL ENVIRONMENTAL PROTECTION FRAMEWORKS

The international community continues to play a crucial role towards promoting sustainable development. The international community consists of non-profit organisations which voluntarily design frameworks which assist firms in the preparation of their sustainability reports. To that effect, several international frameworks have been established with a mandate to provide guidelines towards environmental protection. These include, the Global Reporting Index (GRI), the Carbon Disclosure Project and the ISO among others. Each of these frameworks will be discussed in the next section.

2.6.1 Global Reporting Index (GRI)

According to Weber, Koellner, Habegger, Steffensen and Ohnemus (2008), GRI is an international organisation responsible for providing guidelines on sustainability reporting. This organisation was formed in 1997 and got to act as an independent board in 2002. At present, the GRI has worked closely with the United Nations Environment Programme (UNEP). Having its sustainability reporting framework adopted widely, the GRI framework has become a standard for reporting sustainability issues (Weber et al., 2008). The GRI data base of companies and organisations utilising its framework to report sustainability issues has grown rapidly since its inception. For example, in 2003, there were only 1892 reports in the GRI data base (Weber et al., 2008). This has increased rapidly to 31 689 in 2019 (GRI, 2019). GRI pursues this mandate to encourage firms, globally, to participate in environmental protection initiatives. The GRI sustainability reporting framework also covers issues of governance among firms to improve their transparency and legitimacy.

However, the participation is voluntary. The GRI sustainability reporting framework consists of four sections which are; vision and strategy, profile, governance structure and management systems and lastly, performance indicators (GRI, 2019).

Table 2.2: Sections of the GRI sustainability reporting framework

Section	**Contents**
1. Vision and strategy	-Consists of statement from the CEO -Sustainability strategy
2. Profile	-Consists of the firm's structure, operations and scope of material covered in the entire report.
3. Governance structure and management systems	-This section is broken down into organisational structure, policies and management systems as well as stakeholder engagement initiatives.
4. Performance indicators	-This section covers the impact of the firm on sustainability areas such as economic, social and environmental aspects.

Source: GRI standards 2019

Table 2.2 shows the sections of the GRI sustainability reporting framework. As indicated in the table, each section provides a clear guideline on sustainability reporting. This study is based on the analysis of how firms report their environmental sustainability initiatives. Reporting is preceded by environmental sustainability participation. Hence, GRI is playing a crucial role towards sustainability commitment by firms globally. The GRI framework for sustainability reporting has several performance indicators intended to measure the firm's impact on each sustainability measure. This study is limited to the environmental indicators (EN outcomes) of the GRI sustainability reporting as executed by firms under consideration. The following section provides an outline of GRI indicators and their codes.

Table 2.3: GRI Environmental Performance Indicators and their Codes

Code	**Performance indicator**
Materials	
EN1	Materials used by weight or volume.
EN2	Percentage of materials used that are recycled input materials.
Energy	
EN3	Energy consumption within the organisation.
EN4	Energy consumption outside the organisation.
EN5	Energy intensity.
EN6	Reduction of energy consumption as a direct result of conservation and efficiency initiatives.
EN7	Reductions in energy requirements of products sold and services achieved.
Water	
EN8	Total water withdrawal by source.
EN9	Water sources significantly affected by withdrawal of water.
EN10	Percentage and total volume of water recycled and reused.
Biodiversity	
EN11	Location and size of land owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas.
EN12	Description of significant impacts of activities, products and services on biodiversity in protected areas and areas of high biodiversity value outside protected areas.
EN13	Habitats protected or restored.
EN14	Number of IUCN Red List species and national conservation list species with habitats in areas affected by operations by level of extinction risk.
Emissions, effluence and waste	
EN15	Direct Greenhouse Gas (GHG) emissions (Scope 1).

EN16	Energy indirect Greenhouse Gas (GHG) emissions (Scope 2).
EN17	Other indirect Greenhouse Gas (GHG) emissions (Scope 3).
EN18	Greenhouse Gas emissions intensity.
EN19	Reduction of Greenhouse Gas (GHG) emissions.
EN20	Emissions of ozone-depleting substances by weight.
EN21	NOx, SOx, and other significant air emissions by type and weight.
EN22	Total water discharge by quality and destination.
EN23	Total weight of waste by type and disposal method.
EN24	Total number and volume of significant spills
EN25	Weight of transported, imported, exported or treated waste deemed hazardous under the terms of the Basel Convention Annex I, II, III, and VIII, and percentage of transported waste shipped internationally.
EN26	Identity, size, protected status and biodiversity value of water bodies and related habitats significantly affected by discharges of water and runoff.
Products and services	
EN27	Initiatives to mitigate environmental impacts of products and services and extent of impact mitigation.
EN28	Percentage of products sold and their packaging materials that are reclaimed by category.
Compliance	
EN29	Monetary value of significant fines and total number of non-monetary sanctions for noncompliance with environmental laws and regulations.
EN30	Significant environmental impacts of transporting products and other goods and materials used for operations and transporting members of the workforce.

EN31	Total environmental protection expenditures and investments by type.

Source: GRI (2019)

As indicated above, the GRI breaks down each environmental sustainability variable and details how each can be reported in a firm's integrated sustainability reports. However, GRI has been criticised by the business fraternity and academics for superimposing specific indicators for reporting. Additionally, other studies such as Roca and Searcy (2012) criticise GRI and submit that the organisation's purpose is blurred and its failure to make it a requirement to verify the sustainability reports renders it ineffective. Nevertheless, GRI framework for sustainability reporting has been widely adopted and implemented globally as an international standard for sustainability reporting (Munoz, Zhao & Yang, 2017). As such, this framework will inform the basis on which the environmental sustainability information is going to be extracted and evaluated from the firms under study.

2.6.2 Carbon Disclosure Project

The CDP is based in the UK. It is responsible for encouraging companies, cities, states and regions to voluntarily disclose their carbon footprint. The CDP was established in 2002 in support of the Global Reporting Initiative to raise awareness about the importance of taking responsibility in cutting on emissions. The CDP gathers information from companies, cities, states and regions on their carbon emission volumes and initiatives taken to reduce it. The data is processed into meaningful information which is reserved in CDP data bases and disbursed to users to enable them to make different decisions. The users include; investors, policy makers and businesses. Since its inception in 2002, the data base for CDP has grown to 6 000 corporations which voluntarily disclose their carbon foot prints.

According to Janzwood (2017), CDP influences investors to invest in companies which disclose their emissions volumes and impact. This motivates the laggards to participate in order to attract investors who are environmentally conscious. To attain its mission, CDP has broken down its initiatives into programmes such as climate change, water, supply chain, forests and cities. On that note, companies, cities, states and regions must disclose their carbon emission intensity and the measures they have devised to mitigate it. As such, CDP requests companies to voluntarily disclose data reported under each of the stated programmes. CDP guidelines are relevant for the purpose of this study and are already in use in South Africa. These have been used to rate firms in terms of their carbon disclosure. Hence, the CDP is evaluated together with other environmental legislations and guidelines on how they have influenced listed firms to take heed of the environmental sustainability call by formulating internal environmental policies and effectively reporting on their environmental footprints.

2.6.4 Sustainable Development Goals

These are a set of global goals crafted by the United Nations General Assembly in 2015 to deal with sustainable development problems. Sustainable development goals consist of 17 goals, each addressing a different aspect identified as crucial in solving sustainable development challenges. The idea is for different states globally to adopt them and implement to reach the targets as set out in the 2030 Agenda. These 17 sustainable development goals are presented in Table 2.3 below.

Table 2.4: Sustainable Development Goals

Goal number	Description
1	No poverty
2	Zero hunger
3	Good health and well-being for people
4	Quality education
5	Gender equality
6	Clean water and sanitation
7	Affordable and clean energy
8	Decent work and economic growth
9	Industry, Innovation, and Infrastructure
10	Reducing inequalities
11	Sustainable cities and communities

12	Responsible consumption and production
13	Climate action
14	Life below water
15	Life on land
16	Peace, justice and strong institutions
17	Partnerships for the goals

Source: United Nations (2015)

Table 2.4 shows Sustainable Development Goals. As indicated, there are 17 sustainable development goals. Since this study focuses on environmental sustainability commitment, emphasis is made on selected sustainable development goals that address the area. These are goals, 6, 7, 12 and 13 and are highlighted in green. Each is discussed in the following section.

2.6.4.1 Clean water and sanitation (Goal 6)

Water is life as it is it supports all living organisms. As such, there is a need to safeguard water sources to ensure that human beings do not face water scarcity problems. Access to clean water is a necessity as it combats the chances of contacting water borne diseases such as bilharzia, diarrhoea, cholera and typhoid among others. Water scarcity is also another problem addressed by goal number 6. Water scarcity is a serious concern since above 40% of the world's population is directly or indirectly affected by water scarcity. Sanitation in this case covers issues such as water treatment from sewer systems to make it safer for human consumption (United Nations International Children's Emergency Fund (UNICEF), 2017). In terms of ensuring proper sanitation, targets have been set to stop open defecation and to ensure that each household or organisation has access to hand-washing facility especially after using the toilet (World Health Organization (WHO), 2017). Goal number 6 (Clean water and sanitation) is broken down into eight targets and eleven indicators for easy monitoring of progress. There is still a lot to be done in terms of attaining goal number 6 worldwide. It has emerged that a significant number of countries worldwide (67%) have no data for sanitation estimates and indicators and countries such as Brazil, China, Ethiopia, India, Indonesia, Nigeria and Pakistan among others, still practise open defecation (UNICEF, 2017). South Africa, like other developing countries, is struggling to attain the clean water and sanitation goal. Efforts are needed to ensure that all citizens have access to lean water and proper sanitation.

2.6.4.2 Affordable and clean energy (Goal 7)

Energy is a fundamental resource for industrialisation and for domestic use. Ensuring that everyone has access to energy is the major purpose of goal number 7 of the SDGs. However, emphasis is placed on sustainable energy use practices to avoid energy scarcity in future. Another consideration is an end to the use of fossil fuels and adopt cleaner sources of energy such as hydroelectricity, wind, biogas and solar energy among others. Such transformations are on the agenda world-wide due to the call to cut down carbon emissions. Another important milestone to be covered under this goal is ensuring that there is a well-developed renewable energy infrastructure in developing countries. Most developing countries are still lagging in terms of attaining this goal. For example, countries such as Nigeria and South Africa generate a huge part of their electricity from fossil fuels. This calls for serious measures to adopt renewable energy systems as advocated for by the SDGs.

2.6.4.3 Responsible consumption and production (Goal 12)

SDG number 12 acknowledges that humans consume resources every day to meet their needs. As such, the major purpose for this goal is to encourage human beings to practise sustainable consumption and production. It is mainly through production and consumption that huge volumes of waste are generated. Therefore, nations are encouraged to adopt eco-friendly production systems that minimise waste. Additionally, nations are mandated to increase their recycling capacity and also indicate their environmental impact in integrated sustainability reports. It is upon each nation to break down the national targets into small targets and timelines to be achieved by departments and companies to ensure this goal is attained by 2030.

2.6.4.4 Climate action (Goal 13)

Climate change has become a common challenge globally. World over, nations have discovered that this conundrum can only be solved in a joint manner where everyone commit to cut down carbon emissions. Analysts argue that the climate action mandate can only be attained if other SDGs are also realised. For instance, countries can be able to cut down carbon emissions if they can attain energy efficiency and adopt eco-friendly methods of production. The Paris Agreement on Climate Change (2015) has been adopted as an aggressive stance to force nations to commit to the climate change mitigation initiative seriously (Ansuategi, Greño & Houlden, 2015).

2.7 OVERVIEW OF ENVIRONMENTAL LEGISLATION IN SOUTH AFRICA

Pressure is burgeoning for nations globally to initiate, implement and control the activities of different entities in order to attain environmental sustainability. In the absence of strong environmental policies, a country risk incurring unrecoverable environmental damage (UNEP, 2014). Most firms are driven by the profit motive which makes them to extend no or little care towards the environment. A sound environmental policy, therefore, stands as an effective tool to regulate human behaviour and attitude towards the environment. More pressing issues on environmental protection pertains to meeting targets as set out by the international community to achieve sustainable development goals. As such, South Africa, like other nations globally, is compelled to adopt and implement robust environmental policies which enable it to protect its an environment while at the same time contributing immensely towards climate change mitigation. South Africa has a lot to learn from developed countries in terms of environmental policy (Godfrey & Oelofse, 2017).

South Africa is committed to the sustainable development goals. To honour its pledge towards environmental protection and climate mitigation, South Africa has adopted a series of initiatives and legislations. The different environmental legislations include; the Environmental Conservation Act 73 of 1989, The South African Constitution (Act 108 of 1996) and the National Environmental Management Act (South Africa, 1998). An overview of environmental legislation in South Africa is motivated by the aim to investigate the extent to which legislation shapes environmental sustainability behaviour among firms and organisations in South. Additionally, since this study intended to test the effect of environmental sustainability on financial performance of firms listed on the JSE, it is crucial to unpack environmental regulation in South Africa. This can assist in explaining findings regarding environmental compliance among JSE listed firms which indirectly have a bearing on other environmental sustainability variables such as energy efficiency, water efficiency, waste management, material efficiency and stakeholder engagement among others. To that effect, the next section discusses different regulations in South Africa.

2.7.1 The Environmental Conservation Act 73 of 1989

This legislature was founded on the principles of environmental protection. The government realised that the environment is finite and hence, needs to be protected from overuse and irresponsible behaviour by humans. As such, an environmental council was established to act as advisors to the minister on issues pertaining to the environment. According to the Environmental Conservation Act 73 of (1989), human activities should be carried out in a manner that does not damage wetlands, ecosystems, ecological species and other special wild animal species. The Environmental Conservation Act 73 of 1989 also emphasised against environmental pollution. On that note, it sets waste management as a key strategy to be adopted to ensure that there is no littering on the environment and on water bodies. More importantly, the legislature puts clearly the consequences of breaching the regulations set to protect the environment. For instance, the Environmental Conservation Act 73 of 1989 set out that a person found guilty of littering in undesignated areas can be fined a total of R1000 or serve a jail term of not more than three months.

2.7.2 The South African Constitution (Act 108 of 1996)

The constitution of South Africa sets some clause which advocate for a clean environment for the citizens. This is enshrined in the constitution of South Africa 1996 under section 24, which stipulates that the environment should be protected by ensuring that there is appropriate legislation. This is to ensure that South Africa enjoys its present economic growth in the constraints of sustainable development. To that effect, the constitution acts as a reference point from which other environmental policies are crafted. Since environmental alertness is imbedded in the South African constitution, environmental issues should be taken seriously like any other issues related to the wellbeing of South Africans. Having environmental considerations in the constitution shows that South Africa acknowledges the importance of the environment and respect the sustainable development goals set out by the international community. Even though South Africa still ranks among the highest polluters in the world, it can be argued that the constitution of South Africa has greatly influenced environmental policy development in South Africa. These different environmental policies will be discussed in the next section.

2.7.4 Energy Legislation

In a bid to attain sustainable energy, South Africa has put in place various initiatives through the Department of Environmental Affairs. The energy sector is guided by South Africa’s White Paper on the energy policy published in 1998. The Paper has five objectives that try to address energy access at affordable rates by all, governance, growth, energy environmental impacts and energy diversity. More importantly, the White Paper emphasises the need for the government to use energy in a sustainable manner. In 2003, the White Paper on Renewable Energy Policy was established. This policy chiefly aimed at migrating the country towards renewable energy in all sectors by creating an enabling environment for the implementation thereof. The policy projected to produce 10 000 GWh of energy from renewable energy sources by 2013. This was followed by the establishment of the Electricity Regulation Act 4 of 2006 and the National Energy Act 2008. The Electricity Regulation Act 4 of 2006 emphasises the need for energy efficiency. As such, based on section 15(1) (u) of the Electricity Regulation Act 4 of 2006 The National Energy Regulator of South Africa (NERSA) was placed in charge to administer licensing in the energy sector. NERSA can also put conditions on the licenses in order to force energy users to comply. The National Energy Act 2008 was also enacted largely to encourage energy users to move towards energy efficiency. The specific objectives of the Act are around ensuring uninterrupted energy supply, energy efficiency, energy access and sustainability among others. To achieve the afore-mentioned objectives, the Act empowers the Minister of energy to continuously provide data to inform policy making towards sustainable energy use and regulate energy use based on section 19(f)-(n). Furthermore, the Act gives the Minister powers to prohibit the production and importation of energy sources deemed less efficient. Lastly, the Minister is also expected to intervene in times of energy shortage by introducing energy rationing. All these actions and interventions by the Minister are intended to ensure that South Africa continues to generate sufficient energy for its people in a sustainable manner.

The different Acts discussed above have shaped energy legislation in South Africa. Based on that some other initiatives continue to form part of the ongoing debate about moving away from fossil fuels towards renewable energy for efficiency. To that effect, South Africa is implementing a nuclear energy strategy as a way to respond to the call for the use of sustainable sources of energy. Some studies argue that governments should shift policy from fossil fuels to renewable sources of energy. The adoption of renewable energy policies and frameworks has grown rapidly in developed countries than in developing countries over the past decade. There are numerous benefits to be had if African countries can align their policies towards energy efficiency as there are many companies wishing to invest in renewable energy supply (Du Plessis, 2015; Cantore et al., 2017).

From the above outline and discussion of different acts of regulating energy use in South Africa, it can be seen that South Africa has the framework and legislation in place. Nevertheless, the problem remains implementation. It has emerged that these different energy legislations remain political statements. Lack of implementation has caused severe calamities in the country such as high levels of environmental pollution as the culprits go unpunished. Additionally, lack of implementation of the energy legislation has exposed the country to a myriad of problems such as energy scarcity which saw Eskom implementing unlimited load shedding which was seen as a desperate measure to regulate electricity use. Hence, a robust and implementable energy legislation is needed to attain energy efficiency in South Africa.

2.7.5 Water Management Legislation

Water management in South Africa is governed by the National Water Act 36 of 1998, which was enacted to protect water resources in South Africa. The major purpose of the Act was to ensure access to clean and safer water for all, to protect aquatic life and to eliminate inequalities present in the previous Act. To protect water resources in South Africa, the Act has sections to eliminate water pollution and to attain environmental sustainability. The Act is one of the best ever legislations enacted in South Africa and has been used by other countries such as Zambia and China, among others, to shape water legislations in their countries. With such a brilliant legislation, one could have expected some improvements in water sustainability in South Africa. Nevertheless, it is argued that the Act has not added much value to South Africa. The outstanding factor is lack of implementation, which is pinned to factors such as lack of a clear implementation plan, poor leadership and trying to achieve many initiatives at once. To that effect, South Africa continues to face severe water challenges. Sadly, the country is on the verge of a water sustainability threat as other provinces such as Western Cape have already been hit by water scarcity (Schreiner, 2013).

2.7.6 Waste Management Legislation

Waste management remains one of the critical areas on the agendas of all municipalities in South Africa. This emanates from concerns over environmental pollution caused by dumping of waste in undesignated places such as parks, streets and water bodies. To rectify this, a plethora of legislations have been established to force firms, municipalities and households to handle their waste in a manner that does not damage the environment. Without a strong environmental legislation framework, it is difficult to control the behaviour of firms towards the environment. This is because most firms aim to maximise profits that environmental sustainability is usually treated as a secondary issue. Waste legislation in South Africa was greatly shaped by the White Paper on Integrated Pollution and Waste Management. Other different legislations on waste management continues to draw principles from the White Paper. South Africa has devised a plethora of initiatives in order to encourage waste management among different industry players. These include promoting voluntary participation, use of economic instruments, command and control instruments as well as information instruments. These instruments are used to reinforce different waste management legislations in South Africa (Godfrey & Nahman, 2007). The different policies and legislations are discussed in the next section.

2.7.6.1 National Environmental Management Act (NEMA): Waste Management Act 59 of 2008 (Waste Act)

This became the first legislation in South Africa after the White Paper on Integrated Pollution and Waste Management. The major goal of the Waste Act was to ensure that South Africans live in a pollution-free environment achievable by efficient waste management. The Waste Act was also prompted by the need to contribute towards sustainable development goals. The Act sets a detailed waste management legislation which outlines the need to set norms and standards on waste handling in South Africa. The Waste Act also emphasised the reuse, reduction and recycling of waste in all sectors. To achieve this, the Waste Act emphasised licencing those who wish to participate in waste management. Compliance was also put in as a tool to ensure the set goals and expected behaviour are attained. To comply with the Waste Act, one of the requirements is for industries to develop their waste management plans which are regularly reviewed to see if they comply with the requirements of the Waste Act. The Act can be credited for making waste management mandatory rather than voluntary. Furthermore, the emphasis on compliance and licensing partly contributed to waste management awareness. This has encouraged responsible behaviour towards the environment by some firms and organisations despite the need for more to join in.

However, the National Environmental Management Act (NEMA): Waste Management Act 59 of 2008 (Waste Act) has also suffered criticism from different environmental experts. The argument is that the Waste Act is too strict and has become a red tape which retards business growth (Godfrey & Oelofse, 2017). Nevertheless, one of the major products of the National Environmental Management Act (NEMA): Waste Management Act 59 of 2008 (Waste Act) was the establishment of the National Waste Management Strategy which will be discussed below.

2.7.6.2 The Polokwane Declaration on Waste Management

The Polokwane Declaration on Waste Management was released from The National Waste Management Summit in 2001. The Declaration was launched to pursue a zero-waste agenda attained by promoting recycling of waste in all sectors. Specifically, the Declaration aimed to halve waste disposal by 2012 and to attain zero waste by 2012. To that effect, a 16-point plan was adopted as a guideline to attain this agenda. The Declaration is credited for the evolution of waste recycling in South Africa (Godfrey & Oelofse, 2017). Post 2001, some notable milestones towards promoting waste recycling were recorded. One of the key milestones was the banning and introduction of tax on single use plastics. Nevertheless, recycling remains relatively low in South especially among large firms (Dube, 2017; Godfrey & Oelofse, 2017). Notable steps have only been among small scale waste recyclers in the informal sector. This is insufficient to offset the huge volumes of waste generated daily in South Africa. The low recycling by large firms shows that the waste legislation in South Africa is weak. Moreover, the goal to have zero waste on dumping sites by 2022 remains but an elusive agenda since waste remains one of the irking challenges in South Africa. In agreement, Taiwo et al. (2008) argue that the Polokwane Declaration on Waste Management is just but a political mantra which is purely unrealistic. The waste recycling culture is still lacking in South Africa. Until a point when people start to see the value in waste, the waste will remain unresolved (Taiwo et al., 2008).

2.7.6.4 National Environmental Management: Waste Amendment Act 26 of 2014

This Act was introduced to make amendments to the NEMA: Waste Management Act 59 of 2008 (Waste Act) in a bid to improve environmental performance. Some definitions in the NEMA: Waste Management Act 59 of 2008 (Waste Act) were amended in Section 1 of NEMA: Waste Amendment Act 26 of 2014 to suit the context and circumstances under which the Act will be applied. Some of the most important amendments was the insertion Chapter 3A in NEMA: Waste Management Act 59 of 2008 (Waste Act) which sets a methodology on waste management. The Act also gives the MEC and the Minister powers to approve or reject waste management plans from different industries based on a prescribed criterion. NEMA: Waste Amendment Act 26 of 2014 emphasises waste management strategies such as recycling, reuse and waste reduction. On that note, the Act sets clause for the establishment of the Waste Management Bureau which will work in consultation with the Minister to design policy. The Act also critically puts emphasis on waste management by categorising it into hazardous and general waste. Furthermore, the Act further breaks down waste from each category by source. This helps in managing issues related to waste and also determine appropriate waste charges on each waste category and source from which it is generated. The NEMA: Waste Amendment Act 26 of 2014 has been enacted and the four years until 2018 gives ample time to evaluate its effectiveness together with other environmental legislations highlighted in this study.

2.7.7 Carbon Tax Act 2019

The carbon tax was signed into law on 1 June 2019. It was enacted to impose specific tax on carbon emissions. This decision was made after robust discussions and consultations motivated by the fact that climate change has become a reality than a myth, hence, the need to act urgently to mitigate its effects (Department of National Treasury, 2019; Strydom & Bradfield, 2019). Since climate change is largely caused by carbon emissions, the carbon tax was enacted to force firms and organisations to reduce carbon emissions. According to the Carbon Tax Act (2019), an entity deemed to release carbon emissions from its business activities shall pay a tax fee corresponding to its activity category. This information is clearly outlined in schedule 2 of the Carbon Tax Act 2019. Different activities have specific codes and carbon emission thresholds. It follows that if a firm’s or an organisation’s activities exceeds its pegged threshold, then it has to pay a certain amount of tax. The Department of Environmental Affairs has a crucial role to play in the implementation and success of the Carbon Tax Act (Government Gazette, 2019). The carbon tax rate is pegged at R120 per ton equivalent of carbon emissions for the tax period. The tax should be paid annually as set out by the Customs and Excise Act, 1964 (Act No. 91 of 1964). According to Garcin and Rodel (2019), the carbon tax is an important tool to assist the nation in mitigating the effects of climate change and meet its sustainable development goals. Nevertheless, the Carbon Tax Act (2019) is widely criticised by environmental pundits for being too weak to resolve the already burdened environment in South Africa (Garcin & Rodel, 2019). The Act has too many allowances which leaves heavy carbon emitters with less to pay. This means that South Africa might not be able to meet its carbon emissions reduction of 42% by 2025 as part of the goals set out in the Paris Agreement in 2016. Environmental experts believe that the Carbon Tax Act 2019 favours economic growth at the expense of the environment.

Regardless of a plethora of environmental polices mentioned above, implementation remains the worst challenge common among most developing countries. The effectiveness of these different policies remains questionable as the issue of environmental sustainability continues to worsen. It is argued that the issue of environmental policy is still underdeveloped and ineffective in most developing countries. African states are laggards when it comes to the adoption and implementation of environmental policies. To that effect, there is a huge gap between developing countries and developed countries in terms of environmental sustainability. The gap between commitment and enforcement continues to widen as environmentally irresponsible behaviour goes unpunished. In developing countries such as South Africa, there is a lack clear implementation plan, lack of serious commitment by political leaders, weak legal environment, lack of clarity on the role of government towards environmental protection and lack of secondary markets for waste and corruption (UNEP, 2014; Cantore et al., 2017). There is an urgent need for developing countries to execute their environmental policies to avoid further environmental damage. This might include the immediate prosecution of firms that fail to comply with environmental policies. Moreover, developing countries can benefit largely by benchmarking best practices from developed countries. This is because developed countries have long since implemented some of the policies and can share insights on the implementation hurdles as well as possible loopholes to avoid. Inspections and continuous environmental monitoring should become a common practice among departments and environmental agencies tasked to enforce environmental compliance.

2.8 SUMMARY

This chapter discussed theories and literature review based on the key variables of the study. The Shareholder theory was included to trace the origin of the Stakeholder. The Stakeholder and Legitimacy theories provided profound theoretical underpinnings on the key variables of the study. The Stakeholder theory pointed to the need for firms to manage stakeholders' interests effectively lest they risk business failure. The key stakeholders identified are; the government, suppliers, investors, environmental pressure groups, the natural environment, customers and employees. On the other hand, the Legitimacy theory emphasised that firms should take into consideration the society's values and norms by investing in environmental sustainability initiatives. Sustainable development was also discussed in this chapter. On that account, the triple bottom line concept was discussed. Nevertheless, the focus of this study is on environmental sustainability commitment. Hence, emphasis was put on discussing environmental sustainability. The literature review was discussed by unpacking environmental sustainability. Environmental sustainability was broken down into; energy efficiency, water efficiency, waste management, carbon emission reduction, material efficiency, green products and services innovation, environmental compliance and stakeholder engagement. Additionally, the chapter discussed the international environmental agreements/protocol and different international environmental protection frameworks. These were deemed crucial as they form the basis for environmental sustainability reporting by firms. The next chapter will discuss environmental sustainability commitment among firms.

CHAPTER 3

LISTED FIRMS AND ENVIRONMENTAL SUSTAINABILITY COMMITMENT

3.1 INTRODUCTION

The preceding chapter outlined different theories that support this study. In addition, the chapter unpacked environmental sustainability and different policies governing the field. Firms are at the heart of an environmental sustainability commitment strategy. This is because firms are resourceful and flexible enough to respond to the environmental sustainability call as compared to the government. As such, this chapter aims to discuss environmental sustainability commitment within firms. This is intended to uncover issues surrounding the low commitment among firms on environmental protection. To that effect, the chapter will describe the current environmental sustainability commitment outlook among listed firms in South Africa. Henceforth, the chapter will discuss the environmental sustainability strategy and environmental sustainability culture as desired responses for firms to heed the environmental sustainability call. The chapter will also discuss drivers of environmental sustainability commitment by firms. Understanding drivers of firms' sustainability behaviour is pertinent to redirect them from the unsustainable status quo motive to a more sustainable state where firms participate in environmental sustainability issues with a quest to protect the environment. The next section provides the environmental sustainability commitment outlook among listed firms in South Africa.

3.2 LISTED FIRMS AND ENVIRONMENTAL SUSTAINABILITY COMMITMENT

Due to rising concerns over environmental degradation, firms are continuously being scrutinised to see if they are incorporating environmental sustainability practices in their operations. This is because listed firms contribute intensively towards environmental degradation yet, they lack seriousness towards investing in environmental protection initiatives (Appiah, Du & Boamah, 2017; Jansson et al., 2017; Whetman, 2017). It is documented that listed firms take advantage of weak environmental policies to evade environmental compliance. Oftenly, listed firms are involved in fraudulent activities such as environmental tax avoidance, non-disclosure of environmental impact from their operations and green washing in order to escape environmental commitment. To attain a better future for all, listed firms should take environmental sustainability commitment seriously to cover up for their actions. This may include investing beyond their profit motive and also put the society and the environment into consideration (Eccles & Krzus, 2015; Vasanth et al., 2015; Kim & Im, 2017; Putz, 2017; Whetman, 2017; Alshehhi, Nobanee & Khare, 2018).

A good firm strategy is no longer characterised by its ability to boost profits only, but also on how it caters for the environment. Being environmentally responsible positions the firm as the best and increase the likelihood of a positive rating and publicity by stakeholders. This is because stakeholders are looking for firms which are environmentally responsible. Alas, listed firms are responding slowly to the call for environmental sustainability compliance and reporting. A significant number of firms still occupy a spectator position on the issue of environmental sustainability commitment and reporting as they perceive it as costly and worst of shareholders' returns (Higgs, 2015; Laermann, 2016). Consequently, there are few firms excelling in environmental sustainability initiatives. These include firms such as Wooworths and Wal-Mart Stores Inc among others which decided to put environmental sustainability commitment at the core of their business models and supply chain. Kiron et al. (2017) support this assertion by arguing that environmental sustainability leaders remain scant compared to non-players. In fact, the issue of environmental sustainability is on the crossroads. Although some milestones have been recorded, some key players and leaders of influential countries such as America are distancing themselves from actively participating in environmental issues. This was witnessed when President Donald Trump withdrew from the Paris Agreement on climate change in 2015 (Menarndt & Menard, 2018). This can influence firms in such countries not to take environmental sustainability seriously. This is because leaders set precedence to acceptable norms and acceptable behaviour which citizens and organisations should adopt. Hence, in the case of the US president withdrawing from the Paris Agreement on climate change in 2015, the implication is that the environmental sustainability commitment call is jeopardised since America is a super power in terms of resources which can be contributed towards this call (Kiron et al., 2017).

Nguyen (2016) argues that firms should commit to environmental sustainability where they aim to attain efficiency in energy consumption, water consumption, waste management and carbon emission reduction among other environmental variables. This is because firms consume a huge magnitude of energy as compared to households. For instance, manufacturing firms alone account for 50% of global energy consumption (Solnørdal & Foss, 2018). Regardless of this, firms are still reluctant to invest in energy efficient technology resulting in an energy efficiency gap and pollution (Lin & Tan, 2016). High levels emanating from inefficient production and other human activities are linked to global warming and climate change. Consequently, temperatures are likely to increase by 5-6 C if businesses do not act responsibly to reduce carbon emissions (Rokhmawati, 2015). To prevent or mitigate global warming, firms should strive to produce environmentally friendly products using clean technology. Additionally, firms can leverage on product stewardship, clean technology and pollution prevention. These then act as proactive measures towards environmental sustainability commitment, which reduces the costs associated with pollution and waste from the production process. Other crucial measures include aligning the product development phase and the manufacturing process to the green business model. This calls for adoption of total quality management strategies such as lean methods of production which cut resource demand and wastes. This can enable firms to eliminate inefficiencies in the entire production system and protect the environment (Amini & Bienstock, 2014; Schaltegger & Burritt, 2014; Canepari, 2017; Goi, 2017).

Environmental sustainability reporting is another pertinent issue listed firms should embrace and take seriously (GRI Report, 2015). It is worrying that a significant number of firms still find it difficult to report on their environmental impacts and plans set aside to mitigate such. The GRI report (2015) emphasises the importance of sustainability reporting by firms. The report further stresses that firms should detail reports on how they are dealing with environmental sustainability issues. In support, Kiron et al. (2017) note that a variety of organisations have been established to guide firms on how to report environmental sustainability issues. Higgs (2015) concurs and asserts that firms should formulate environmental sustainability blueprints which make sustainability reporting easier. In South Africa, the issue of environmental sustainability commitment though still new and at its developmental stages, it is now one of the key requirements for firms listed on the JSE (South African Institute of Chartered Accountants SAICA, 2011). The SAICA board has set up a team aimed at crafting the reporting framework where all listed firms are encouraged to publish an integrated annual report which incorporates sustainability.

3.3 ENVIRONMENTAL SUSTAINABILITY STRATEGY

The environmental sustainability strategy implies that the firm undertakes to generate value from its business activities by being environmentally sensitive and being actively involved in the issues thereof (Akinyemi et al., 2015). According to Cici and D'Isanto (2017), there is no clear definition on what integrating environmental sustainability strategy in the business means. Nevertheless, *“integrating sustainability in business means redesigning and redefining strategy and operative processes to face the changes and meet the needs and expectations of the market and society alike, with the ultimate goal of increasing competitiveness and supporting durable profitability” (Cici & D'Isanto, 2017:54).* The implication of the above definition is that an environmental sustainability strategy should be integrated into the main business strategy rather than being treated as a separate strategy. Essentially, this entails that the environmental sustainability strategy should form the basis for setting objectives and company policies not the other way around (Cici & D'Isanto, 2017).

Environmental sustainability is a strategic issue which requires a firm to come up with a profound environmental sustainability strategy. Lack of a clear strategy can weaken the business’ competitiveness in the face of other competitors who might be doing well in terms of strategic issues (Scott, 2014; Rajala et al., 2016; Kiron et al., 2017). This same line of thought argues that some firms view environmental sustainability commitment as a threat to firm profitability due to lack of a clear and innovative sustainability strategy. Given the possible litigation issues and disrepute that come with irresponsible environmental behaviour, it is crucial for firms to adopt proactive as opposed to reactive environmental sustainability strategies. Firms should not view the sustainability call as a threat to business viability, but as a scope to unlock new opportunities (Kiron et al., 2017). The issue of the British Petroleum oil spill in 2010 is a good case to show the negative implications on a firm’s corporate image for irresponsible environmental behaviour. After the oil spill, it costed the BP a lot of money and its corporate image was put into disrepute (Heflin & Wallace, 2017). The major disadvantage of irresponsible behaviour is that the negative corporate image can persist into the long run. Hence, an environmental sustainability strategy should not be considered as an option but a key tool to drive the long-term strategy of all firms. According to Fraj et al. (2015), the best environmental sustainability strategy should leverage on clear green policies and green practices shared by all organisational members. This ensures that the strategy is understood by everyone which makes it easier to implement and achieve the expected results. Integrating the environmental sustainability strategy in a firm's operations can make it resilient in a dynamic business environment. This can enhance the firm's longevity as the business model is responsive to the needs of different stakeholders of the business (Haanaes, 2016; EY Global, 2018).

Accordingly, environmental sustainability commitment among firms requires a strategic shift and alignment (Rajala et al., 2016). This means moving away from the view that a firm's profitability is based on a good brand to a new way of thinking where the environmental sustainability strategy is emphasised and becomes the core of all business' strategies. The implication of this is that firms should consider reconstructing their business models to incorporate environmental sustainability. This can only generate expected results if the new strategy is aligned to the entire organisational processes and shared across on all organisational business units (Rajala et al., 2016). Several models and frameworks have been designed to assist firms to integrate environmental sustainability strategies in their businesses. These include; The Gond model, The Lozano approach, The Roadmap for Integrated Sustainability by United Nations Global, The guide and Sustainability Incorporated among others (EY Global, 2018). It is at the discretion of the firm to choose which model or framework best suits their organisation. The choice is guided by several factors such as the firm's organisational structure, vision and policies driving the organisation. Regardless of which framework is adopted, the important factor is that it should enable the firm to transition smoothly and become a proactive player regarding environmental protection. The next section outlines crucial steps which firms can follow when implementing strategic shift and alignment.

3.3.1 Strategic Shift and Alignment for Environmental Sustainability Commitment

Kiron et al. (2017) note that firms which are doing well in environmental sustainability tend to have a solid sustainability strategy embedded in their business models. This forces firms to focus on the green agenda while at the same time creating value for shareholders. The same study advances the notion of strategic shift and alignment by using eight steps to explain the process as shown in figure 3.1 below. The argument is that sometimes firms end up losing direction due to lack of a clear plan. Hence, the following steps are intended to guide listed firms wishing to transform their businesses into sustainable organisations.

Figure 3.1: Strategic shift and alignment for environmental sustainability commitment

Source: Kiron et al. (2017)

3.3.1.1 Step 1: Set your sustainability vision and goals

Kiron et al. (2017) state that the first thing to do for a firm is to set up a sustainability vision which is made feasible by clearly stated goals. A vision should be shared by all organisational members for buy in and support. Since environmental sustainability is a long-term investment, a vision should clearly paint a clear picture to enable organisational members to comprehend it (Kantabutra, 2020). Henceforth, firms should create a sustainability strategy with clear action plans and how they will be evaluated. In some cases, for example, in the case of firms driven by fossil fuels, a strategic shift may entail considering other cleaner sources of energy and mitigate environmental pollution. When the sustainability vision is well understood by everyone, it can be transformational and help organisations to smoothly incorporate environmental sustainability strategies in their businesses (Adnan & Valliappan, 2019).

3.3.1.2 Step 2: Focus on material issues

Firms should invest in critical sustainability issues unlike just other activities done for compliance if they are to make an impact and add value to their businesses. There should be a strong connection between the firm's sustainability strategy and the sustainability issues they tackle (Kiron et al., 2017). For instance, a manufacturing firm can obtain more value by implementing a sustainability strategy which leverages on recycling their waste into something more valuable which they can resell. Ideally, firms which focus on issues which are material to their businesses tend to benefit immensely from sustainability initiatives (Kiron et al., 2017).

3.3.1.3 Step 3: Sustainability organisation setup

An effective sustainability strategy requires a sustainability-oriented organisation. This entails a holistic approach where everyone in the organisation understands the sustainability stance adopted by the firm. An organisational setup for sustainability implementation also requires that each business unit should have its own set of goals and targets as well as monitoring and evaluation programmes set aside to make sure that the strategy is successful. Furthermore, this requires clear lines of communication, distribution of roles and responsibilities for accountability purposes. When there is no structure, it becomes difficult to implement the whole strategy as people are not sure of what they are supposed to do (Zawawi & Wahab, 2019; Kantabutra, 2020).

3.3.1.4 Step 4: Explore business model innovation opportunities

The green business model is centred on innovation, which unlocks value for the firm and allow it to enjoy benefits associated with adopting an environmental sustainability strategy. Incorporating an environmental sustainability strategy in a business requires a change in the business model. Several firms are failing to harvest the gains from environmental sustainability commitment due to the inability to reshape and align their existing business models to the new sustainability strategy. Business model innovation enhances the competitiveness of the business and make it resilient even in volatile business environments (Geissdoerfer, Vladimirova & Evans, 2018). Kiron et al. (2017) explicate that firms should also consider an organisational culture change in order to accommodate a new and innovative sustainability orientated business model. Rigid organisational cultures tend to quench off the innovative ability in firms leading to stagnation and more costs. In addition, a new sustainability business model requires a firm to reassess and examine its value chain so that there will be congruence of the business models among all value chain members. Kiron et al. (2017) further remark that a firm can unlock value by creating an efficient supply chain where all members in the supply chain adopt the new business model. Other than just eliminating bottlenecks in the supply chain, this innovative model creates new markets for the firm's products in the long run.

3.3.1.5 Step 5: Develop a clear business case for sustainability

A sustainability strategy that is not built from a sound business case is a waste of resources. Firms should endeavour to come up with clear cut business cases that are based on well researched cases. For instance, there should be a strong reason behind every environmental sustainability project or programme that is initiated. These include, investing in energy, water, waste and carbon reduction technologies with a strong business case based on the financial performance of the business as well as being a responsible corporate. This is opposed to when the environmental sustainability strategy is adopted as a way to appease the ego of management. A well thought business case should be highly regarded in terms of both quantitative and qualitative criteria for choosing the best project or initiative (Schaltegger & Lüdeke-Freund, 2013; Dooley, 2015). Kiron, Kruschwitz, Haanaes, Reeves and Goh (2013) remark that most firms which derive value from environmental sustainability commitment, started with a profound business case. However, another strand of researchers argues that investing too much on coming up with a business case can be a daunting task and can delay the business from tapping into the opportunity. This line of thought further argues that it is possible to launch a successful initiative without a business case but it can come at a later stage when the business is well pronounced. Nevertheless, a business needs a strong business case lest the investments will go in vain (Kiron et al., 2017; Winston, 2018).

3.3.1.6 Step 6: Get the board of directors on board

According to Salvioni, Gennari and Bosetti (2016), a board of directors plays a critical role in making an environmental sustainability strategy a success. As such, the firm should carefully appoint board members who have strong understanding of environmental sustainability to avoid issues of a poorly developed and implemented sustainability strategy. Essentially, a progressive board of directors is capable of setting up corporate governance structures which makes it easier to design, implement and assess the effectiveness of an environmental sustainability strategy. Without a clear structure, all the organisational members will end up confused which can create conflicts. Another requirement for the body of directors is that they should be familiar with the firm's environmental sustainability vision as well as green investor priorities. This is because the board's commitment goes a long way in making the environmental sustainability strategy a success (Ioppolo, Cucurachi, Salomone, Saija & Shi, 2016; Salvioni et al., 2016; Kiron et al., 2017).

3.3.1.7 Step 7: Collaborate with a variety of stakeholders to drive strategic change

The sustainability call requires full participation by every member in the supply chain to be effective. This creates synergies and cost cutting advantages which erase the inertia by many firms to invest in environmental sustainability (Haanaes, 2016). In a study conducted by Kiron et al. (2017), 90% of the respondents interviewed submitted that collaboration is key in the quest to attain environmental sustainability. In agreement, Wahga et al. (2018) endorse collaboration as a crucial tool to attain high environmental sustainability performance among firms. In South Africa, Woolworths can be used as the best case on the effectiveness of leveraging on collaboration to attain environmental sustainability. For instance, as pointed out by Dos Santos, Svensson and Padin (2013), it is through collaboration which made Woolworth's "Good Business Journey Programme" a success after it encouraged its supply chain partners such as suppliers of its vegetable products and its customers to be environmentally sensitive.

3.4 ENVIRONMENTAL SUSTAINABILITY CULTURE

Organisational culture is defined as how organisations behave and conduct themselves. This manifests in the way organisational members, interact, share information, the way they dress and their corporate colours. This is usually embedded in the beliefs, norms and traditions shared by everyone in the business (Puri & Bharti, 2015; Nafchi & Mohelská, 2020). Other studies on organisational culture such as Cho, Kim, Park and Cho (2013) concur with Shein's definition. Furthermore, organisational culture can be described as the personality of the organisation which differentiate each organisation from another (Okatan & Alankuş, 2017). This study defines organisational culture as values, norms and beliefs shared by the entire organisation regarding environmental sustainability.

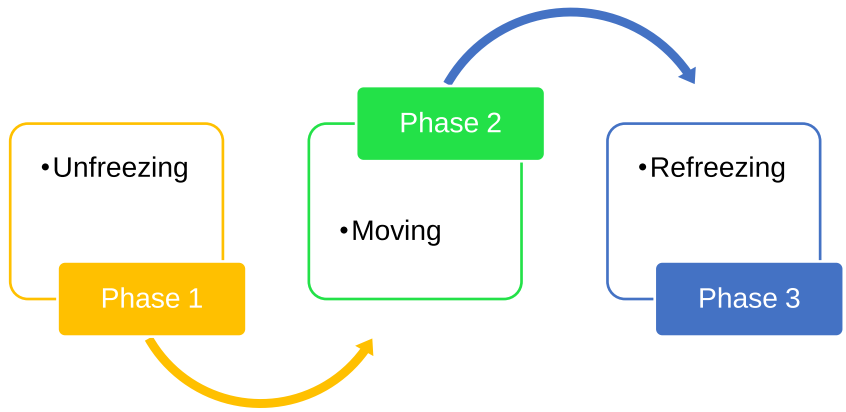
Culture sets dictates on how things should be run in a firm (Mann, 2014). As such, organisational culture has a bearing on strategy implementation and success thereof (Zailani, Subaramaniam, Iranmanesh & Shaharudin, 2015; Kurniawan, Zailani, Iranmanesh & Rajagopal, 2017). Hence, there is a need for cultural readiness in an organisation before introducing new changes such as the environmental sustainability strategy. Since culture is learned over time, the top management have a duty to reorient their staff to accept the new culture. Omitting the new culture reorientation leads to resistance to change by organisational members and consequently results in environmental sustainability failure (Rajala et al., 2016). If well executed, culture can be a strong tool to foster environmental sustainability commitment among firms since it determines the personality of the firm (Iranmanesh et al., 2019). In most instances, the demise of any strategy can be linked to failure to acknowledge the power that culture can exert in the acceptance and implementation of the strategy (Iranmanesh et al., 2019). Iranmanesh, Zailani et al. (2019) further indicate that a culture which enforces and promotes continuous improvement is conducive for the environmental sustainability strategy since it is driven by technology and innovation. Rajala et al. (2016) explicate that managers who take environmental sustainability commitment to be among their top priorities and core values achieve big in dealing with this issue. Be that as it may, they will not perceive environmental sustainability commitment as a block against attaining profitability but perceive it as a tool to improve their legitimacy.

A narrative by Scott (2014) advocates for a change in the organisational culture where environmental sustainability commitment becomes embedded in the identity, beliefs, value systems and norms of the firm. When something is embedded in organisational culture, it becomes easy to implement since it is expected of every organisational member to observe it lest some punitive measures can be inflicted for non-compliance. Change here is required in the case of firms that previously focused on profitability only without taking the environment into consideration (Iranmanesh et al., 2019). Nevertheless, culture change should be conducted systematically and considered a long run phenomenon other than a short run phenomenon. As such, needs assessment should be conducted to understand the existing culture and to note areas where change is required. Cummings and Worley (2004) set guidelines for initiating cultural change. These include, formulating a clear strategic vision, top-management commitment, modeling culture change at the highest level, modifying the organisation to support organisational change, selecting and socialising newcomers and terminating deviants as well as developing ethical and legal sensitivity.

3.4.1 Organisational Culture Change Process

The process of cultural change to incorporate the environmental sustainability strategy happens in three phases (Rajala et al., 2016). These include unfreezing, moving and refreezing. These phases consist of different activities employed by a firm to attain the desired vision. An organisation should ensure that it has experienced experts to drive this change lest the change can be resisted by organisational members. Ideally, most organisations invite independent experienced consultants who can come and facilitate the change process. This usually produce results as the consultants can offer an independent opinion without taking sides as they do not have a stake in the business.

Figure 3.2 Organisational culture change process



Source: Rajala et al. (2016)

3.4.1.1 Unfreezing phase

The unfreezing stage is when an organisation is still contemplating on adopting the environmental sustainability strategy (Rajala et al., 2016). This is done by evaluating the potential gains of adopting the environmental sustainability strategy. This phase requires a firm's management to conduct internal review to determine the firm's present state in terms of energy use, water, waste and footprint. It also involves the management challenging the status quo in order to move away from the long-held beliefs and models which used to make the firm profitable. Unfreezing a certain shared organisational culture can be challenging task if management does not approach it strategically. On that note, there is a need for dialogue across all departments such that the strategy is treated as a holistic approach rather than being view as a management tool to overload employees (Hussain, Lei, Akram, Haider, Hussain & Ali, 2018). There is also a need for top management commitment and a pledge to disburse resources to support the new environmental sustainability strategy. Usually, issues such as resistance to change due to fear of the unknown can be a common challenge that an organisation can face in unfreezing its long-held beliefs, values and norms (McEachern, Middleton & Cassidy, 2020). However, as indicated by Rajala et al. (2016), when a firm challenges its status quo and be in an unfreezing state, reconsidering adopting a green business model becomes feasible.

3.4.1.2 Moving phase

The moving phase involves the firm moving towards the desired state, which is a point where the environmental sustainability strategy is adopted and integrated into the main strategy. This phase consists of two steps which are; crafting an environmental sustainability vision and aligning the business model with the new vision (Rajala et al., 2016). This phase requires a management's mind-set change to refocus on the new ideas and strategy. Management is challenged to abandon old ways of doing things. In this case, there is a need for change in operations, production systems, products packaging and changing the procurement system. The cost associated with each move should be broken down from functional units to departmental level (Rajala et al., 2016; Hussain et al., 2018; McEachern et al., 2020).

3.4.1.3 Refreezing stage

According to McEachern et al. (2020), the refreezing stage is the last step where the business has chosen a specific environmental strategy and now has to consider making it part of its culture. In this phase, the firm is involved in decisions aimed at cementing the new culture and let it known by its key stakeholders. This entails contacting other stakeholders to make the environmental sustainability strategy a success. Both top management and operational managers should always engage and continuously improve on a newly adopted environmental sustainability strategy (Rajala et al., 2016). When the management is satisfied that the environmental sustainability strategy is implementable and accepted by organisational members, the crucial step will be to reinforce a culture that is shared by everyone. This can be attained through top management speeches, dress code, colour of office buildings and meetings (Bakari, Hunjra & Niazi, 2017). Additionally, top management can reward organisational members who practise environmental sustainability practices such as switching off machines which are not in use, switching off lights during the day and using fuel efficient cars among others.

3.6 DRIVERS FOR ENVIRONMENTAL SUSTAINABILITY COMMITMENT AMONG FIRMS

Existing literature indicates that it is rational to focus on the factors that can motivate firms to participate in environmental sustainability initiatives than to dwell on challenges. This is because firms do not see any motivation to invest in environmental sustainability. Hence, outlining and discussing factors which are driving other firms can serve as enough motivation for them to participate. It is pertinent to understand the motive and driving force behind firms' environmental sustainability behaviour to inform policy (Costa-Campi, García-Quevedo & Segarra, 2015; Trianni, Cagno, Marchesani & Spallina, 2017). Understanding drivers for firms' sustainability behaviour is pertinent to redirect them from the unsustainable status quo motive to a more sustainable state where they participate in environmental sustainability issues with a quest to protect the environment (Lozano, 2015). It remains indistinct until now as to what drives firms to participate in environmental issues. This is partly attributed to scarcity of studies which have tried to investigate this issue among listed firms (Solnørdal & Foss, 2018). Existing literature has pointed to the following as some of the motives why firms invest in environmental sustainability: institutional pressure, stakeholder pressure, values and ethical behaviour of managers and anticipated financial gains. These are discussed in detail as follows;

3.6.1 Institutional Pressure

There is burgeoning pressure on firms over their attitude and behaviour towards environmental issues from various stakeholders. This is because firms benefit largely from the environment through the extraction of raw materials to power different revenue generating activities yet fail to account for their damage to the environment (Jansson et al., 2017). The institutional framework for a country consists of elements such as the government, legal, regulatory and professional structures all aimed at monitoring how firms behave in tandem to their environmental responsibilities (Thorne, Mahoney & Manetti, 2014). With pressure mounting every day from the global arena for nations to reduce their environmental impact, the institutional elements in each country are becoming strict on firms to earnestly consider the environment. Institutions such as the government have noted that majority of firms will not voluntarily commit to environmental sustainability issues such as efficient energy use, water efficiency, waste management and carbon emission reduction without strong legislation.

There are trepidations over which stance to adopt between punitive legislation or the incentive strategy (Jansson et al., 2017). This is because each of these approaches yield different results depending on the context. Ortolano, Sanchez-Triana, Afzal, Ali and Rebellón (2014) note that some governments have designed a consortium of incentives aimed at encouraging firms to increase their environmental performance. However, scholars such as Wahga, Blundel and Schaefer (2018) argue that the institutional framework in most African countries has been reported to be weak, hence, failing to make firms to fully participate in environmental sustainability issues. Several firms have been just investing in environmental sustainability initiatives for compliance purposes only. Initiatives aimed at attaining environmental sustainability were fruitless because firms have been investing only to an extent to meet legal requirements. To make more impact in environmental issues, firms should invest beyond compliance as this can allow them to identify innovative combinations in terms of resource allocation and save costs.

3.6.2 Stakeholder Pressure

Stakeholders are defined as parties with vested interests on how a firm operates and conducts itself. These include governments, customers, employees, investors and suppliers, among others, each with a unique set of interests and hence, pressure to the firm. Pressure is burgeoning from both internal and external stakeholders for firms to consider environmental sustainability seriously. In light of the above, pressure from stakeholders force firms to participate in environmental sustainability initiatives. This is because stakeholders have power to boycott the products or services of a business or challenge in the court of law (Thorne et al., 2014; Haleem, Farooq, Boer & Gimenez, 2015; Meixell, Luoma & Saenz, 2015).

According to Meixell et al. (2015), stakeholders may raise environmental sustainability awareness, adoption and implementation decisions among firms. The assumption made is that sometimes some firms do not actively participate in environmental issues because they lack awareness in terms of the benefits as well as costs associated with non-participation. Hence, stakeholder pressure is crucial in this regard. Nevertheless, stakeholder pressure on awareness, adoption and implementation differs based on the stakeholder type. For instance, the media might have more influence on awareness than other stakeholders. But this may differ on adoption and implementation where probably the government, customers and suppliers have a major influence. Different stakeholders force firms to invest in initiatives aimed at protecting the environment because they know that firms benefit greatly from its resources (Meixell et al., 2015). Park and Kim (2014) further allude that pressure from stakeholders coerce firms to adopt proactive measures to protect the environment as opposed to the wait-and-see attitude they take in the absence of such pressure. Another study by Jang (2016) argues that managers should not view stakeholders as a nuisance but as strategic partners in the endeavour to unlock value from environmental sustainability investments.

3.6.3 Values and Ethical Behaviour of Managers

Managers are entrusted to run organisations by shareholders. Since they are actively involved in the day to day operations of the business, their values and ethical behaviour may have a bearing on environmental sustainability commitment decisions. Managers are responsible for strategic decisions of a firm which in a way influences the decision to incorporate sustainability in their business since it is a strategic issue. On that note, managers will incorporate sustainability practices in their businesses if it is embedded in their firm's mission and vision. Essentially, it is the manager's values which have a bearing on the decision to adopt environmentally friendly policies or not. Values may help to guide an individual on what is perceived as morally right or wrong (Meixell et al., 2015; Jang, 2016; Jansson et al., 2017). Since environmental sustainability requires a collective effort, the values held by top management should be shared across the entire firm so as to allow every employee from base floor to senior level to participate in the endeavour to reduce environmental damage. Epstein and Buhovac (2014) are of the view that top managers' values and beliefs determine the extent to which a firm invests in environmental sustainability initiatives. Jang (2016) concurs and expresses that managers with strong environmental values tend to proactively invest in environmental sustainability initiatives than those less environmentally inclined. The same scholar further explicates that some managers perceive environmental issues as their moral obligation, hence, something they have to voluntarily participate in. This is supported by the value-belief-norm (VBN), which explicates that managers with strong values tend to be aware of the negative implications of irresponsible environmental behaviour, hence, they strive to proactively adopt environmentally friendly practices. Using the Signalling and Legitimacy Theory, Thorne et al. (2014) reason that firms engage in environmental issues voluntarily because of certain values they have which respect the environment.

According to Jang (2016), a significant number of sustainability initiatives fail due to lack of top managers' commitment, therefore, having managers who hold strong values in favour of the environment is a positive step towards attaining environmental sustainability. However, Okuboyejo (2013) notes the existence of a value-action gap in reality where managers are reluctant to action their values into profound sustainability initiatives. Hence, much is still needed to transform values and ethical standards into action where managers are encouraged to adopt and implement environmental sustainability initiatives (Jansson et al., 2017).

3.6.4 Anticipated Financial Gains and Competitiveness

Epstein and Buhovac (2014) submit that environmental sustainability is no longer an option but a requirement if a firm is to survive in a business environment where responsible investing is becoming a key issue for investors to select where they can invest. Another strand of literature explicates that a few firms incorporate environmental sustainability in their businesses to enhance their competitiveness (Rajala et al., 2018). Similarly, Jansson et al. (2017) posit that in some instances, other firms may proactively invest in environmental initiatives voluntarily to outcompete their rivals by responding to the needs of green oriented customers. Rajala et al. (2016) support this and submit that some firms invest in an environmental sustainability strategy as a differentiation strategy.

More commonly, firms are likely to invest and commit to environmental sustainability issues if they perceive to make financial gains (Jang, 2016). Recently, some firms are beginning to see the cost savings associated with investing in environmental protection (Whelan & Fink, 2016). For example, Dow, an American firm was able to realise an estimated figure of US$9.8 billion from an initial investment of US$2 billion in resource efficiency. However, there are other studies pointing out that investing in environmental sustainability has more costs than benefits (Vijfvinkel et al., 2011). Hence, enlightening firms on the potential financial benefits to be gained by investing in sustainability initiatives can go a long way in moving firms from the present status quo associated with non-compliant behaviour sustainable and committed position.

3.6.5 Resource security

Globally natural resources are getting depleted and this have prompted calls for everyone to minimize resource extraction. Other firms have already started experiencing resource constraints due to the fact that the environment's regeneration rate has been exceeded by extraction rate. Human activities such as mining and farming among others strain the environment annually and this may also expose industries to risks associated with resource scarcity. This means firms should look for sustainable ways to harness natural resources if they are to survive into the foreseeable future (Bell, 2017). South Africa is not an exception to this problem as resource scarcity problems have already been experienced. As the country is in the midst of an environmental sustainability crisis, some firms have begun to realise the importance of environmental sustainability commitment as a strategy to secure resources such as water and energy (Singh, 2016). South Africa is currently faced with an energy supply crisis, hence, this drives firms to consider other alternatives of energy such as solar power, wind energy and investing in technology which saves water and energy resources. Another significant factor driving firms towards environmental sustainability commitment is a sharp increase in energy prices which negatively impact on production.

3.8 SUMMARY

This chapter discussed the role and status of firms in environmental sustainability issues. It was discovered that the issue of sustainability commitment is at cross roads since there is a lack of commitment by key world leaders and firms at large. Existing literature pointed out that developing countries such as South Africa still lack serious commitment to environmental sustainability as compared to developed countries. This is due to their weak environmental sustainability legal framework as well as heavy reliance on fossil fuels to power their industries. The last section of the chapter discussed different factors which influence firms whether or not to invest in environmental sustainability. Factors such as institutional pressure, stakeholder pressure, values and ethical behaviour of managers and anticipated financial and competitiveness were found to be critical drivers of environmental sustainability commitment among firms. It emerged that, it is imperative for policy makers to scrutinise these drivers critically to see how they can shape policy to encourage more firms to participate in the environmental sustainability revolution. The next chapter will provide a robust discussion of the financial performance of firms.

CHAPTER 4

FIRM PERFORMANCE

4.1 INTRODUCTION

This chapter discusses firm performance. The concept of performance is an important construct in the field of strategy. Paradoxically, there is a paucity of studies which have used this strategic metric as a multi-dimensional construct especially when measuring financial performance. Hence, this chapter focuses on discussing the different measures of firm performance. The chapter starts by outlining firm performance in general, after which financial performance is discussed. An in-depth discussion of accounting and market-based ratios will be done to construct a robust financial performance model adopted in this study. Different financial ratios from each measure will be discussed in detail. It is crucial to understand the performance outlook of JSE listed firms. Hence, the last section of this chapter will provide a focused discussion of the JSE and the importance of this board as a regulatory board for listed firms.

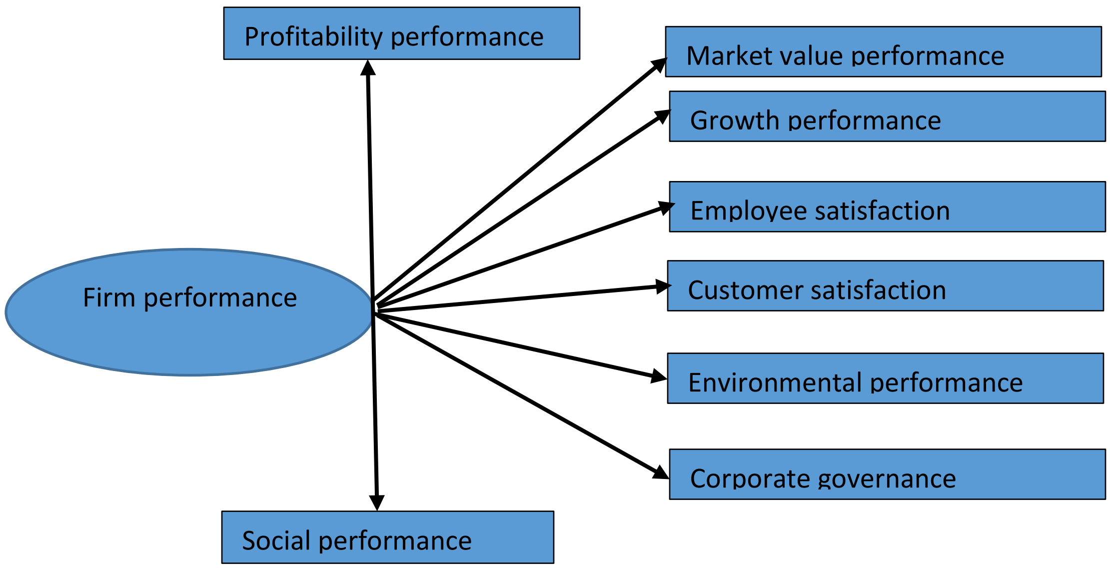
4.2 FIRM PERFORMANCE

Performance is a crucial construct in management. However, a universally accepted definition of performance is scarce in existing management literature. The reasons for much variation among the definitions is because of the multidimensionality of performance and that performance is interpreted differently by different scholars. It is defined as the attainment of organisational goals. Another strand of scholars define performance as a process of transforming organisational targets into reality with minimal resources. Other studies define performance as the extent to which an organisation enacts its strategy to realise the overall vision. Based on that performance is categorised as underperformance, desired performance and over performance. Underperformance is experienced when the organisation fails to attain set objectives while over performance is attained when a firm surpasses its targets (Krause, 2005; Samsonowa, 2012). A decomposition of the above definitions singles out the attainment of goals as a common definition. Essentially, this study deals with performance at firm level. This is because firm performance is rooted in strategic management and is the key factor which sets apart strategic literature from the rest. This makes firm performance a long-term phenomenon, which is evaluated periodically to check the progress of the firm towards goal attainment. The concept of performance provides information on how the firm has utilised its assets over a certain period. This is crucial for a firm's strategy renewal and future growth plans (Al-Matari, Al-Swidi & Fadzil, 2014.; Kobuthi, K'Obonyo & Ogutu, 2018). The next section provides a robust discussion of the definition of firm performance.

There are definitional divergences among researchers in terms of what constitute firm performance. The lack of convergence in the definition of firm performance emanates from the failure to fully explain it based on its multi-dimensionality. Other studies have used a unidimensional approach while others used a multi-dimensional approach to define firm performance. Several scholars have used a single factor of performance based on convenience. The variations in firm performance definitions creates confusion among scholars. This creates a need for a more acceptable and clear definition to help advance theory and practice. Firm performance is defined as the effectiveness and efficiency of a firm in attaining its set of goals. Firm performance has also been defined as a measure of productivity over a period of time. Nevertheless, this is refuted by other studies which argue that performance and productivity are interrelated but different concepts. Hence, other scholars have defined firm performance as a measure of organisational success achievable by responsibly harnessing the resources provided by the natural environment to meet organisational needs (Al-Matari et al., 2014; Selvam et al., 2016; Herciu & Șerban, 2018; Taouab & Issor, 2019).

Selvam et al. (2016) advance a multi-dimensional measure definition of performance. As such, Selvam et al. (2016) define firm performance as the ability of a firm to excel in different dimensions such as "growth, profitability, market value, customer satisfaction, employee satisfaction, environmental excellence, corporate governance and social performance." This is depicted in the figure below.

Figure 4.1: Multi-dimensional definition of performance



Source: Selvam et al. (2016)

Figure 4.1 shows the multi-dimensional definition of performance advanced by Selvam et al. (2016). According to Selvam et al. (2016), profitability is a measure of the extent to which a firm was able to attain its financial goals in a given period. Profitability performance is considered the cornerstone of firm performance. Market value describes the value of the firm as perceived by the market. On the other hand, growth performance describes the capacity of a firm to expand its scope of business which increases its size. According to Selvam et al. (2016), profitability, growth and market value performance are interrelated and may influence each other in some way.

Employee satisfaction is a measure of how the firm aspires and has put mechanisms in the workplace to enhance the wellbeing and morale of employees. These include providing coaching, skills development and boosting employee self-esteem. These are crucial for a firm to survive in the dynamic business environment where the issue of globalisation and digitalisation have intensified competition among firms. Customer satisfaction describes the degree to which the business meets or exceeds its customers' expectations. This is one of the most crucial firm performance dimensions. Due to intense rivalry among firms for the same purchasing power of customers, banking on a good name only does not pay anymore. As such, firms are forced to excel in building customer experience which translates into 100% customer satisfaction performance. Nevertheless, investing more on building customer experience can be costly to the firm.

Environmental performance is also among key dimensions of performance proposed by Selvam et al. (2016). It measures the extent to which a firm achieves its economic objectives without disturbing the natural regeneration rate of the environment. This dimension of performance has recently gained importance because of the sustainable development agenda. As such, a firm ought to excel in environmental performance to increase its legitimacy and gain green trust from its key stakeholders. Environmental performance is linked to good corporate governance which is one of the performance measures also identified as a key dimension of firm performance (Selvam et al., 2016). Accordingly, a firm has to ensure that its conduct is in line with the guiding principles which regulate the behaviour of firms. To that effect, a firm has to excel in both internal and external governance issues if it wishes to remain a going concern.

The Balanced Score Card which was originally developed by Kaplan and Norton (1992) to improve performance within organisations, has also been used to capture firm performance in existing literature.The Balanced Score Card measures firm performance based on four quadrants such as financials, customer focus, processes and learning and growth. This is presented below.

Figure 4.2: Balanced scorecard measures of firm performance

Source: Kaplan and Norton (1992)

The learning and growth dimension measures performance in line with the business' capability to develop its internal processes to adapt to the business environment. It follows that organiations which are not learning oriented perform poorly. The characteristics of a learning organisation are flexible leadership style, team work, sharing of knowledge, skills development and talent development. It is such characteristics which can enable a firm to perform above average and beat competitors at a punch. The business environment is dynamic. It is continuous learning of the environment which can enable to a firm to survive in the market.

The customer focus dimension emphasises strategies to enhance customer satisfaction. Satisfied customers are crucial for the sustenance of a business. Hence, this dimension focuses on identifying customer needs and insights and finding better ways to satisfy them. Customer satisfaction and overall business performance are possible when there are business processes to support such a strategy. Hence, the business should have core and supporting processes to create value for the business and its customers for enhanced performance. These include maintenance of customer data bases, process to handle big data and others to eliminate inefficiencies in the business. The financial dimension is based on the fact that a firm needs to be profitable for it to remain a going concern. This suffice to say that positive financial performance is crucial for a firm. Hence, a firm is recommended to establish how it plans to increase profits for that financial year, maximise shareholder value and gather financial data it can use to project its future prospects. The Balanced Scored Card has the advantage that it forces firms to attain their strategic objectives. This is because the tool is simple to use and forces firms to narrow their focus on only four crucial performance dimensions which add value to the firm. Nevertheless, the Balanced Score Card has been criticised for being too simplistic and omitting other crucial stakeholders of the firm.

Other studies broadly use the objective and subjective criteria to define firm performance. Objective measures of firm performance use financial data while subjective measures rely on management assessments of the firm. Another dichotomy between objective and subjective measures of performance is that objective measures are numerical in nature while subjective measures are based on normative statements. Moreover, subjective measures of performance tend to be future oriented and strategic whilst objective measures tend to be operational. Subjective measures include elements such as growth, firm reputation and social performance. These are crucial as they capture the strategic success of a business which might be difficult to capture using objective measures. Moreover, subjective measures of performance are easy to understand and interpret as compared to objective measures. However, since subjective measures of firm performance rely more on perceptions of managers, they might result in the generation of biased information which can mislead investors. This is because managers can report information which favours their ambitions and ego but difficult to verify its authenticity. They also tend to understate their failures but emphasise their success. This is one of the major drawbacks of the subjective criteria of firm performance.

On the other hand, the objective criteria include financial indicators found in financial statements. The objective criteria have several advantages which have been pointed out in existing literature. Several studies highly regard financial performance indicators since the information is easy to replicate than subjective measures. studies show that financial performance has been the widely measure of firm performance and is mostly relevant for comparison purposes by financial analysts and potential investors. This is because objective measures of performance, are easy to verify since the formulas used to compute the data are provided. However, the objective criteria is criticised for being less flexible and does not explain the reasoning behind the numbers. This makes it difficult for users of financial data to make decisions based on the financial information presented in the form of ratios (Kaplan & Norton, 1992; Masa'deh, Tayeh, Al-Jarrah & Tarhini, 2015; Singh, Darwish & Potočnik, 2016; Vij & Bedi, 2016; Kobuthi et al., 2018).

Nevertheless, financial information is the most widely adopted measure of firm performance in studies which have linked environmental sustainability and performance (Muhammad et al., 2015; Tasneem, Hamza & Basit, 2016; Lewandowski, 2017; Boakye, 2018; Iranmanesh et al., 2019). Given the variations in how firm performance is defined in existing literature, a researcher is forced to select the best category of firm performance and explain its usefulness for that particular study, context and its sufficiency as performance measure in the strategic management field (Santos & Brito, 2012; Singh et al., 2016). This study soley focused on financial performance. This is because it is reliable and easy to access financial data. Financial performance is standardised which makes it easy to forecast the future performance of a firm objectively. Moreover, it makes it easier to compare the performance of firms across industries unlike other measures of financial performance which lack standardisation. As such, financial performance will be discussed in the subsequent section.

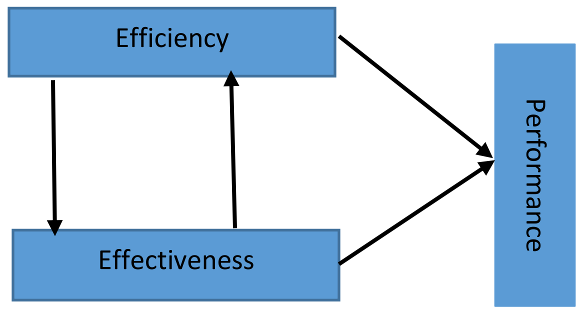
4.3 FINANCIAL PERFORMANCE

4.3.1 Definition of Financial Performance

It is crucial to define financial performance as the bottom line to understand how it is measured. However, there is no common definition of financial performance in existing literature as different definitions and measures have been advanced by different researchers. Since financial performance is widely used to inform investment and growth decisions, coming up with a common definition can eliminate confusion among scholars and enhance the usefulness of the financial performance concept (Strouhal, Gurvits, Nikitina-Kalamäe & Startseva, 2015; Khudhair, Norwani, Ahmed & Aljajawy, 2019). FP measures a business' financial health. The financial health of a firm also warns managers of the probability of experiencing financial risk in advance so that measures to mitigate such can be adopted. Furthermore, the financial health of a firm can enable managers to identify areas of strength where they can leverage on to create a sustainable competitive advantage (Deutsch & Pintér, 2016). Khudhair et al. (2019:29) define FP as "*a subjective assessment on how well a firm can utilize the asset based on its primary business to generate the revenues*". Other authors have defined FP in different ways. FP is defined as an assessment of economic goal attainment. The definition has also been decomposed to include effectiveness and efficiency. Moreover, FP is defined as a financial condition of a firm measured using different ratios over a given period. Another strand of scholars has defined financial performance as being able to meet shareholder expectations (Gentry & Shen, 2010; Harrison & Wicks, 2013; Ganda, 2016; Kurniaty et al., 2018; Haninun et al., 2018).

Regardless of the differences on how financial performance can be defined, there is a convergence of definitions towards a firm's efficiency and effectiveness in achieving its financial targets. These two concepts have been used in several definitions of financial performance either directly or indirectly.

Figure 4.3: Components of the financial performance definition



Source: Ozcan (2008)

Figure 4.3 above shows the components of the performance definition. The figure depicts that efficiency and effectiveness sufficiently define financial performance. Essentially, as indicated above, effectiveness and efficiency influence each other in some way. It is this combination which leads to performance. Hence, the performance definition is incomplete without any of these two concepts. In this study, performance is defined as the attainment of predetermined goals of an organisation using minimal resources. Effectiveness explains the firm's ability to attain its goals. On the other hand, efficiency defines the firm's ability to attain the set goals with lean resources. Resource constraints in most firms make managers to work under pressure towards ensuring that the firm's resources are used parsimoniously. Even though these concepts are different, it is their varying combination which can give a firm excellent financial performance. To sum it up, a firm needs to be both effective and efficient to avoid wasteful practices and systems in the race to attain set targets. Therefore, the level of a firm's profitability exhibits management's effectiveness and efficiency in combining the different resources to attain set targets (Ganda, 2016; Teece, 2017; Bloom, Brynjolfsson, Foster, Jarmin, Patnaik, Eksten & Van Reenen, 2018; Kurniaty et al., 2018; Osazefua, 2019).

4.4 IMPORTANCE OF FINANCIAL PERFORMANCE

FP is very important for a firm's existence. In most circumstances, firms which exhibit a weak FP, usually find it difficult to satisfy all its business needs. To that effect, FP is linked to the profit maximisation goal of the firm theory. This school of thought argues that a firm exists to make profit and to maximise value for its shareholders before any other obligation. Furthermore, the profit maximisation goal argues that managers should develop some skills which can allow them to attain profitability goals set out by shareholders no matter the situation. Economically, this line of thought makes much sense. A business requires finances to meet its needs such as paying suppliers, employees, taking advantage of discounts and sufficient funds to invest in other projects which are in line with the firm's vision. Besides debt finance, it is returned profits which a firm can use to finance its growth aspirations. Hence, the profit maximisation goal can be too hard to ignore as it is the basis from which other initiatives can be funded. The profit maximisation goal is therefore supported by a plethora of existing studies (Gentry & Shen, 2010; Chashmi & Fadaee, 2016; Kokemuller, 2016; Samiloglu, Oztop & Kahraman, 2017; Kurniaty et al., 2018; Cho, Chung & Young, 2019; Wijayanto, Suhadak & Nuzula, 2019).

The profit maximisation goal remains crucial for the survival of a firm. Positive financial performance enables a firm to be a going concern. The basis of the argument is supported by the fact that a firm must meet its financial obligations such as paying creditors, securing raw materials, paying its employees and for expansion purposes. As such, managers need to continuously measure and report on financial performance. Continuously measuring financial performance can allow managers to quickly identify possible red flags and eliminate them to enhance long term financial performance. Good finances are the lifeblood of a firm. Poor financial performance can weaken the firm's competitiveness exposing it to rivals in the industry. To that effect, once a market share is lost, it is difficult to regain it. More importantly, it is only through positive financial performance that equity providers are rewarded. It follows that shareholders are encouraged to invest more in the business if the financial performance is positive. This assures shareholders of higher returns in terms of dividends (Ramakrishnan, 2008; Epstein & Buhovac, 2014; Umobong, 2015; Sethibe & Steyn, 2016; Kurniaty et al., 2018; Osazefua, 2019).

FP has become an important construct in strategic direction of listed firms. For instance, it is a requirement for all listed firms to publish their financial statements, hence, making it an important metric to use for reporting. This financial information should inform the stakeholders of the firm to make informed decisions. The growth and sustainability of any firm is determined by its FP. Hence, it is crucial to continuously monitor financial performance as it has a bearing on the long-term growth of the business. Financial performance information is also used for resource allocation within an organisation and is usually used internally by management for budgeting purposes. This can allow managers to make informed decisions on how much debt they require to bridge the gap between their profits and planned projects for that year. Recently, firms are using a health financial position as a key resource to generate a competitive advantage for the business. Therefore, this has seen much effort being channeled towards analysing a firm's financial performance regularly than before (Gentry & Shen, 2010; Epstein & Buhovac, 2014; Masa'deh et al., 2015; Pandian & Narendran, 2015; Chashmi & Fadaee, 2016; Dao, 2016; Selvam et al., 2016; Osazefua, 2019).

Financial performance data is used as one of the inputs in strategy formulation. In most cases, financial performance information helps the management to identify their strengths and weaknesses financially. This provides a good starting point to formulate new strategies to improve the longevity of the business. A firm should leverage on its strengths and continuously improve on its weaknesses to remain profitable. Without financial performance information, it is not feasible to implement corporate strategy. Financial performance indicators also make it easy to evaluate progress in terms of attainment of objectives as set out in the strategic planning session (Vakilifard, 2011; Pandian & Narendran, 2015; Chashmi & Fadaee, 2016; Kurniaty et al., 2018; Akers, 2019).

Information related to financial performance is crucial to key stakeholders such as investors who favour firms with superior FP. Due to globalisation and easy of access to information, a plethora of potential investors evaluate financial information of listed firms daily. Investors use financial information such as ratios to determine future growth in dividends or possible appreciation of the firm's share price. The major goal of investors is to generate more returns from their investments. Hence, when it becomes clear to investors that the firm is performing well, institutional barriers towards access to finance are automatically bypassed as investors are willing to invest. It follows that a business with a positive financial performance is efficient in using its resources. Hence, investors use this to predict future behaviours of the managers in firms in which they wish to inject their long term investments (Al-Matari et al., 2014; Selvam et al., 2016; Zhang, 2016; Haninun et al., 2018; Kurniaty, 2018).

Financial performance information is used as a basis to design key performance indicators within an organisation. “A key performance indicator (KPI) is a measure used to reflect organisational success or progress in relation to a specified goal” (CGMA, 2013). Financial KPIs are based on information derived from financial statements. This includes return on sales and return on equity among others. When the financial KPIs are in place through information derived from financial statements, it becomes easy to evaluate a firm’s financial position and progress made towards attaining the desired financial targets in that period. With the growth of sustainability reporting, standardised financial performance data is one of the metrics used to evaluate how a firm has performed over a certain period when linking it to how it has accounted for the environment. Moreover, accounting metrics are used by international bodies such as the Sustainability Accounting Standards Board (SASB) to evaluate the financial health of the firm. The SASB has 77 indicators designed to cater for firms across all industries but with a specific focus on listed firms. Financial performance information is one of the key metrics in the SASB indicators (Chartered Global Management Accountant, (CGMA), 2013; Chashmi & Fadaee, 2016; SASB, 2018; Haber & Schryver, 2019).

Financial performance is also a crucial determinant of the economic sustainability of the business. Based on that, economic sustainability is one of the pillars of sustainable development. For a business to meet other goals such as social and environmental, it has to be making profits. Even though the business has to balance its economic activities with social and environmental needs, its financial performance determines the success or demise of such initiatives. Hence, financial performance is a key metric which cannot be ignored if the sustainability issue is to be addressed. This view is supported by the slack resources hypothesis and the resource-based view. The slack resources hypothesis argues that firms with a strong financial performance can have slack resources which can be used by the firm to respond swiftly towards the forever dynamic business environment. The resource-based view explicates that a business can leverage on its financial resources to create a sustainable competitive advantage. This enables a firm to dominate the industry and have the power to determine prices and quantity of units to be produced in a given period (Jansen, Simsek & Cao, 2012; Przychodzen & Przychodzen, 2015; de Boer, 2016; Qiu et al., 2016). The next section will provide a discussion on financial statements.

4.5 FINANCIAL ANNUAL REPORTS

A financial annual report is defined as a summary of a firm's activities at the end of its financial year. It contains elements such as balance sheet, income statement, statement of stockholders' equity, cash flows statement and notes to financial statements (Crane, 2010). Financial annual reports are prepared based on strict guidelines and principles peculiar to each country. In South Africa, financial annual reports preparation is guided by Generally Accepted Accounting Practice (GAAP). Financial performance information is obtainable from financial statements such as balance sheets and income statements. Based on the Financial Reporting Standards (FRS's), information provided in financial statements should be accurate and free from bias to allow stakeholders to make informed decisions. Information contained in financial statements should be reliable. When such is achieved, the information contained therein becomes a crucial tool which both managers and other key stakeholders can rely on for decision making. For consistency in financial statements, listed firms are encouraged to use Financial Reporting Standards (FRS's) guidelines (Aliabadi, Dorestani & Balsara, 2013; Masa'deh et al., 2015; Kurniaty et al., 2018).

The quality of financial statements is another crucial factor which should be considered by firms before publishing their financial statements. Chen et al. (2019) "define balance sheet-based accounting quality as the degree to which accounting asset measurements reduce investors' uncertainty about firms' economic capital, relative to overall uncertainty." For instance, financial statements such as a balance sheet reflects the economic capital of a business based on the assets reported for that financial year. Consequently, it is such information that investors can use to make investment decisions. Hence, publishing quality financial statements eliminates risk in the perspective of investors which encourages them to invest in the firm (Chen et al., 2019).

4.6 FINANCIAL RATIO ANALYSIS

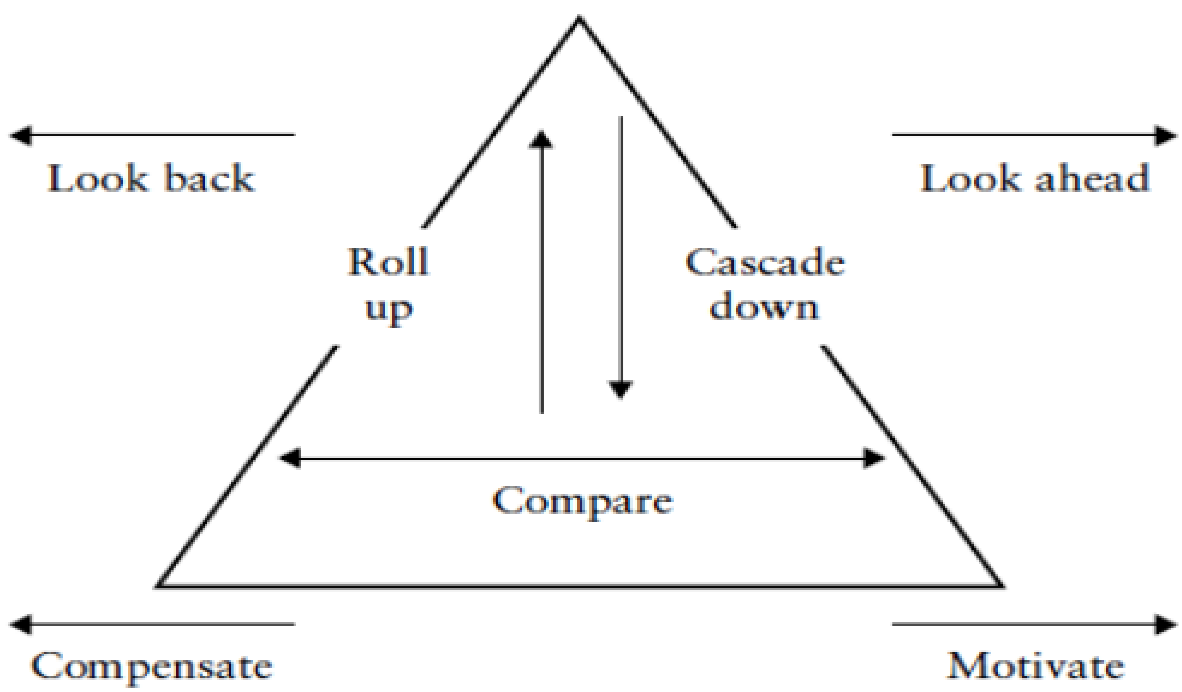
Ratio analysis forms the basis for understanding the financial performance of a firm. To that effect, financial ratios can allow the management to compare the financial performance of a firm from different financial years or with other competitors in the same industry. Furthermore, financial ratios can allow management to identify their weaknesses and strengths based on the financial data. Since managers cannot influence or control the external environment, having up to date financial data can assist them in decision making. Financial ratio analysis enables firms to survive the tides of volatile stock markets (Epstein & Buhovac, 2014; Masa'deh et al., 2015; Dao, 2016).

Financial ratio analysis helps a firm to continuously improve its operations to remain competitive. This is because it provides a firm with historical and current data which the firm and its stakeholders can use to forecast future performance. As such, a replete of studies suggest that financial ratio analysis should be an ongoing practice, if the firm wishes to survive in the dynamic business environment. A firm can employ different techniques when conducting financial ratio analysis. These include time-series and cross-sectional approaches. Cross-sectional approaches are used when the management wants to compare the firm's current performance with other industry players. Coversely, a time-series is used when the management wants to obtain a historical reflection of how the firm has performed. Analysts suggest that 5-10 years is a sufficient period to run a time-series. During ratio analysis, analysts and managers use different financial performance measures to evaluate the financial health of a business (Masa'deh et al., 2015). The next section discusses different measures of financial performance.

4.7 MEASURES OF FINANCIAL PERFORMANCE

The concept of performance was initiated to act as a control mechanism to evaluate the extent to which a firm has converted its set of strategies into the expected outcomes (Maditinos et al., 2006). As such, it is crucial to continuously measure performance to improve organisational success. It is difficult for a firm to control activities and projects if the performance measures are not defined and set properly (Gawankar, Kamble & Raut, 2015). Performance measures serve different reasons in different organisations. The degree to which an organisation treats a certain category of performance might vary substantially from another organisation based on their strategic posture, organisational culture and goals for that financial year. Some of the different purposes of performance measures are shown below.

Figure 4.4 Seven Purposes of Performance Measures



Source: Marshall (2002)

Figure 4.4 above shows some of the purposes of performance measures. The figure shows that performance measures serve seven purposes in a firm. As shown above, performance measures are the basis for compensation and motivating employees after they attain specific financial targets. The look back and look ahead measures of performance serve the purpose to update the firm of its previous financial performance which then set precedents to predict future performance. This can allow a firm to be cognizant of the dynamic business environment. The look back and look ahead purposes of performance measures are crucial and form the backbone of this study. The compare purpose is used to assess the firm's performance in relation to other industry players while the roll up, cascade down and compare purposes are core elements which define the culture of the business especially large firms which strive to signal a positive image to potential investors (Marshall, 2002; Maditinos et al., 2006; Gawankar et al., 2015).

Existing literature is divided when it comes to understanding measures of financial performance. A plethora of studies linking environmental sustainability to financial performance have adopted different financial measures based on their objectives. This has caused much confusion in existing literature and partly contributed to the inconclusiveness of findings. Unfortunately, misunderstanding of financial performance measures can mislead investors and prompt managers to make poor decisions which exposes the firm to failure. In some instances, managers shun away investors because of their inability to select the best measures of performance which later signal bad governance (Maditinos et al., 2006; Hagberg, Johansson & Karlsson, 2015). Nevertheless, a huge part of existing literature points to the use of accounting and market financial performance measures. This is outlined in a plethora of existing studies (Gentry & Shen, 2010; Al-Matari, Al-Swidi & Fadzil, 2014; Vanpoucke, Vereecke & Wetzels, 2014; Deutsch & Pintér, 2016; Sethibe & Steyn, 2016; Zhang, 2016; Jansson et al., 2017; Uwuigbe et al., 2018; Wijayanto et al., 2019). The following section will discuss each of these financial measures in detail by critically outlining the characteristics, perceived advantages and disadvantages of each.

4.7.1 Accounting Based Measures of Financial Performance

Several studies linking environmental sustainability to firm financial performance have used accounting-based measures because they reflect what has really happened in the firm. These measures have been in use for decades and form the standard for financial reporting (Agarwal, 2013; Selvam et al., 2016; Zhang, 2016; Lassala, Apetrei & Sapena, 2017; Samiloglu et al., 2017). There is strong evidence that these measures bring a plethora of benefits to the firm and its key stakeholders.

Accounting based measures of financial performance bring numerous benefits to different stakeholders. Chief among them is that the information is easy to interpret and use. Accounting based measures of financial performance such as ROA, ROE and EPS are easily available and accessible in a firm's financial statements. Furthermore, the information provided is reliable and valid since it could have been audited by independent auditors before they are published. This makes accounting-based measures of financial performance an important tool for managers (Aliabadi, et al., 2013; Issah & Antwi, 2017).

Profitability ratios are used as yardsticks on how the firm has performed overtime (Nuryaman, 2013; Mans-Kemp, 2014; Batchimeg, 2017). These ratios are used to make industry comparisons to rate the firm's performance in relation to other key players (Brigham & Houston, 2012; Younger; 2013). Furthermore, they are used to evaluate the opportunity cost of funds to be invested in the firm compared to when it is invested in other projects (Batchimeg, 2017). In this study, ratios such as ROE, ROA and EPS were used under profitability ratios. These ratios are widely used in existing literature (Gherghina & Simionescu, 2015; Masa'deh et al., 2015; Deutsch & Pintér, 2016; Samiloglu et al., 2017; Cherian et al., 2019). These ratios have been used following similar studies linking environmental sustainability and firm financial performance (Boakye, 2018). The next section will discuss these ratios separately.

4.7.1.1 Earnings Per share (EPS)

EPS shows the amount of earnings allocated to shareholders. In other words, it reflects the value of a firm's shares. Firms listed on the JSE are required to publish their EPS. More importantly, EPS is used for strategic decisions such as stock valuations and possibilities of considering another firm for possible joint ventures or mergers. EPS is also relatively easy to calculate. Most firms use EPS because investors easily understand it. EPS has an influence on the share price of the firm (de Wet, 2014; Mans-Kemp, 2014; Madugba & Okafor, 2016; Samiloglu et al., 2017).

EPS is calculated as follows;

$$\text{EPS} = \frac{\text{Profit or loss attributable to ordinary shareholders of the parent firm}}{\text{Weighted average number of ordinary shares issued}}$$

EPS is widely criticised in existing literature. The contenders argue that EPS is influenced by the growth rate and accounting principles applicable to a certain firm. This makes it difficult to make financial performance across industry based on EPS. EPS is also subject to manipulation by managers who in most cases end up using deceitful accounting practices to have a positive EPS (de Wet, 2014; Boakye, 2018). Besides the above few shortcomings, EPS remains a key ratio useful in financial reporting.

4.7.1.2 ROE

Return on equity is well understood as profits divided by shareholders' equity. ROE is a measure of a firm's overall efficiency. This ratio makes it possible to compare the firm with other industry players. Investors use this ratio to assess the viability of investing in the firm's shares. In principle, investors inject their money in firms where they speculate to have high returns for their investments. A high ROE attracts investors as it gives them a clear picture of the firm's performance before they can commit their capital in the business. More importantly, ROE improves the value of the firm. Investors are very sensitive on the management's behaviour and governance issues as these can influence expected growth in dividends. Hence, other studies are of the view that ROE can give a clear picture of how efficient the firm's managers were in generating returns with shareholders' investments. When investors perceive irresponsible conduct among the firm's management, they are likely to withdraw their investments and invest somewhere. This is the major reason why stock markets react based on speeches by top management from listed firms or appointment of a new CEO (Ong et al., 2014; Zhang, 2016; Kennon, 2017; Kurniaty et al., 2018).

ROE is calculated as follows;

$$\text{ROE} = \frac{\text{Net profit}}{\text{Owners' equity}}$$

4.7.1.3 ROA

The return on total assets (ROA) measures the overall effectiveness of management in generating profits with their available assets. It follows that a high value for ROA shows the effectiveness of a firm's assets in generating value for its shareholders and is widely used as a measure of financial performance. ROA is considered an effective ratio to measure financial performance because it captures performance from both the income and balance sheet. Additionally, ROA withstands short run manipulation that usually transpires when the income statement only is used. Managers should invest in assets which have a high potential to generate positive net present values. This makes it possible for assets to generate more returns for owners of capital (Hagel, Brown, Samoylova, Lui, Damani & Grames, 2013; Ong et al., 2014; Al-Matari et al., 2014; Sethibe & Steyn, 2016; Issah & Antwi, 2017; Lassala et al., 2017; Boakye, 2018).

ROA is calculated as follows;

$$\text{ROA} = \frac{\text{Net profit before interest and tax}}{\text{Total assets}} * 100$$

ROA is criticised in existing literature since it ignores the sources of finance used to purchase assets and associated cost (Masa'deh et al., 2015; Manrique & Martí-Ballester, 2017). Nevertheless, ROA remains one of the highly adopted measures of financial performance in studies related to environmental sustainability and financial performance.

On that note, ROA was adopted as one of the measures of financial performance in this study.

4.7.1.4 Criticism of accounting-based measures of financial performance

The accounting-based measures of financial performance have been criticised for being inadequate and backward looking leaving little or no considerations for the future value of the firm. Other studies also argue that accounting measures of financial performance can easily be manipulated by managers to suit their own goals. The same line of thought advances the view that the use of accounting-based measures of financial performance can be a drawback to a firm as it might be difficult to benchmark the firm with others in the same industry due to diversity in policies in each firm. Furthermore, these measures of financial performance are critiqued for their insufficiency to inform robust decision making by managers (Venanzi, 2010; Aliabadi et al., 2013; Al-Matari et al., 2014; Kobuti et al., 2018). Nevertheless, accounting measures of financial performance remain relevant and widely used to measure financial performance. They are used as a basis for reporting in South Africa and globally. Furthermore, these measures are easy to understand and interpret, hence, they are preferred by many investors. The information provided in accounting-based measures of financial performance is reliable and valid since it is prepared based on generally acceptable principles (Zhang, 2016; Issah & Antwi, 2017; Samiloglu et al., 2017).

4.7.2 Market Based Measures of Financial Performance

Market based measures of financial performance emerged in a bid to improve the shortcomings of traditional accounting-based measures of financial performance. Consequently, there has been an increase in the number of studies adopting market-based measures of financial performance in studies related to sustainability. These market-based measures provide insights into the future value of the firm. This becomes important in the era where investors are also concerned about the future value of the business rather than basing their investment decisions on the historical performance of the firm. Instead, a replete of investors prefer to use the historical performance of the business as a baseline which is then used together with perceptions about the firm's performance. In South Africa such a trend is growing due to the growth of institutional investors (Maditinos et al., 2006; Zhang, 2016; Galant & Cadez, 2017; Alshehhi et al., 2018).

Market-based measures of financial performance are based on the assumption of stock market efficiency advanced by Fama (1970), who assumed efficient flow of information in a stock market in coining the stock market efficiency hypothesis. The assumption is that investors are always updated with current information which can affect share price (Fama, 1970; He, Chakrabarty & Eden, 2016). The stock market efficiency hypothesis can be categorised as weak, semi-strong and strong. The hypothesis is weak when the stock price reflects all the historical price patterns. "In the strong efficiency form, all available value-relevant information is already reflected in stock prices, eliminating any possibilities of making excess return. The semi-strong form suggests that the current stock price accurately reflects a wide amount of public information about the company, including any new value-relevant information that has just been published" (Ahlén & Ahlén, 2012:7). This study assumes that stock market efficiency is semi strong given that the JSE is highly regulated and issues of transparency, effective communication and governance are highly enforced.

Another strand of literature submits the view that market-based measures of financial performance provide an external valuation of a firm based on expected future performance. To that effect, the market value of a firm should be a cause for concern for managers as it has a direct impact on future investments in the business. Market based measures of financial performance such as Price-to-Earnings (P/E) Ratio: Market-to-Book (MB) Ratio, Tobin's Q and share price are ideal in studies conducted in well-developed stock market exchanges. Hence, since the JSE is one of the oldest and largest stock market in Africa it was ideal to consider market-based measures of financial performance in this study as the data was easily available (Li, 2013; Mans-Kemp, 2014; Masa'deh et al., 2015; Selvam et al., 2016; Zhang, 2016; Tafirenyika, 2019). The next section will discuss market-based ratios adopted in this study.

4.7.2.1 Tobin's Q

"The Q ratio is defined as the market value of a firm divided by the replacement cost of the firm's assets" (Fu et al., 2016:1). A Tobin's Q measures a firm's value. It is also used to measure a firm's long run financial performance. As such, the Tobin's Q is highly regarded as a key ratio that informs future investment decisions in existing literature. Tobin's Q also provides an accurate status of the shares of the firm (Garcia-Castro, Ariño & Canela, 2010; Rodgers, Choy & Guiral, 2013; Al-Matari et al., 2014; Fu et al., 2016). The value of 1 for Tobin's Q indicates a favourable state of the firm. A higher Tobin's Q signals investors that the firm value will appreciate in future, hence, guaranteeing them of future gains (Sethibe & Steyn, 2016; Manrique & Martí-Ballester, 2017). According to the Signaling theory, a firm with a positive Tobin's Q is able to send a positive signal to the market. Such signals have a positive influence on the firm's growth prospects. The signal should be clear enough for the investors to notice. Due to vastness of information, it is becoming relatively easy for investors to pick out a genuine signal from just a marketing gimmick. There is an argument that some firms' sustainability initiatives fail to pay because they fail to send strong signals to investors that their environmental responsibility have improved. Hence, when the Tobin's Q is favourable, this can send a strong signal to investors and convince them to build long term investment relationships with the firm (Kurniaty et al., 2018; Wijayanto et al., 2019).

Based on this, managers are encouraged to adopt a series of strategies to ensure they attain a positive Tobin's Q ratio. The Tobin's Q is a crucial ratio in the investment field (Fu et al., 2016). Regardless of its importance in measuring a firm's future value and hence, influence investors to entrust the business with their capital, there is a paucity of studies which have used Tobin's Q in studies linking environmental sustainability performance and financial performance of listed firms in South Africa. Therefore, the Tobin's Q was adopted in this study to close this gap and enrich the financial performance model. Furthermore, Sethibe and Steyn (2016) assert that Tobin's Q is the most preferred market-based ratio to measure the long run effects of certain investments.

4.7.2.2 Share price

A share price is the price at which a single share of a firm is worth. In other words, a share price is the price at which investors are willing to pay for the firm's single share based on the perceived value of that business. It is a crucial firm performance metric assessed by investors before they can invest in a business. A higher share price implies that the concerned firm is highly valued by the market. For institutional investors to consider diversifying their surplus capital into the firm's share, they should signal a trend of upward performance. Hence, a firm's share price should perform well to enhance the market value of the firm. The share price is volatile by nature. As such, it reacts to global and local news that directly or indirectly affects the firm. The concept of share price changed the traditional way of valuing the entire business based on the results from the financial statements to valuing the business based on the price of each share held in the business. Ever since, it has been used as an important metric by investors who wish to purchase the firm's shares. However, in some instances, managers pay less attention to share price performance and concentrate on indicators which are linked to their rewards. This causes tension between the managers and stockholders. Besides, share price has an effect on the growth prospects of a business. With a weaker share price, it means the firm may not be able to attract external funds from equity holders (Coleman, 2006; Mullins, 2014; Lingaraja, Selvam & Vasanth, 2015; Selvam et al., 2016; Kurniaty et al., 2018).

4.7.2.3 Criticism of market-based measures of financial performance

Market-based measures of financial performance can be misleading since management influence investors' perceptions of the future performance of the business based on the information they choose to disclose. Furthermore, some investors are skeptical to make investment decisions on future expectations that the firm will be profitable because the business environment is dynamic and unpredictable (Lassala et al., 2017). Other studies criticise market-based measures of financial performance based on its market efficiency hypothesis (Gentry & Shen, 2010; Sethibe & Steyn, 2016; Heymans & Santana, 2018). The market efficiency hypothesis is questionable because of information asymmetry which sometimes exist in markets (Deutsch & Pintér, 2016; Heymans & Santana, 2018). "The most prominent of these behavioural finance anomalies are: the seasonality in stock returns, the existence of dividend yields and earnings yields in stock returns, the impact of macroeconomic factors on stock returns, the presence of autocorrelation in stock returns and size-related anomalies" (Heymans & Santana, 2018:6). Moreover, Heymans and Santana (2018) argued that stock markets are not static but always dynamic implying that information will always change, hence, some individuals might possess misleading information which eliminates the stock market efficiency hypothesis.

Nevertheless, market-based measures are highly regarded and adopted as measures of financial performance especially when the researcher is interested in understanding the future value of the firm. Market based measures of financial performance were adopted in this study because the study was interested in assessing the future value of a firm as predicted by its environmental sustainability behaviour.

4.8 DEBATE ON THE APPROPRIATE FINANCIAL PERFORMANCE MEASURE

There is ongoing debate among investors, academics, practitioners and managers on the rightful measure of financial performance. Even though there is agreement among several studies that financial performance can be measured using accounting market-based measures, identifying the appropriate financial performance measure remains elusive in literature. For instance, institutional investors press for clarity on the appropriate measures to adopt to avoid investing in risk portfolios because of inappropriate information derived from financial performance measures adopted (Maditinos et al., 2006; Sethibe & Steyn, 2016). Other studies argue that the accounting-based measures of financial performance were extensively used by the Financial Reporting Standards (FRS's), hence, can be appropriate measures of financial performance (Masa'deh et al., 2015). As such, accounting based measures are among the guidelines used for reporting under Financial Reporting Standards (FRS's). Accounting-based measures of financial performance were the most used prior to 1980 and studies using market-based measures of financial performance started proliferating from 1980 onwards (Gentry & Shen, 2010).

A replete of studies suggest that it is preferable to employ both measures when measuring financial performance as the two measures complement each other (Maditinos et al., 2006; Boakye, 2018). Consequently, this improves the accurateness of the financial performance construct. As such, this study adopted both accounting and market-based measures of financial performance. The financial performance model designed in this study is informed by the Stakeholder theory. On that note, each financial ratio adopted in this study is linked to each stakeholder of the firm. It is therefore, inferred that each set of financial ratios reflects the view of the stakeholders towards the firm. As such, firm performance should be defined in the confines of stakeholder satisfaction (Selvam et al., 2016; Haninun et al., 2018). Having done that, it becomes easy for researchers to construct effective financial performance measures that best reflect the stakeholder's perception of the firm.

4.9 JOHANNESBURG STOCK EXCHANGE

The JSE is a market where securities can be traded in South Africa (Johannesburg Stock Exchange, 2019). Its establishment dates back to 1887, making it Africa's oldest stock exchange and one of the top 20 world's largest exchanges (Zhang, 2016). The JSE is currently ranked as the 19th largest stock exchange globally (Tinavapi, 2017). Currently, there are approximately 400 firms listed on the JSE with the sole aim to raise capital and grow their investments. Another salient achievement made by the JSE is being the first stock market to make integrated reporting mandatory (JSE, 2016). The main purpose of the JSE is to efficiently manage both primary and secondary capital markets for the benefit of firms and investors (JSE, 2019). The JSE also exists to regulate the stock market to ensure transparency and fairness among individuals, firms and institutional investors who trade on this platform. This is because stock market is one of the crucial factors both domestic and international investors check on a stock market. To some extent, governance issues have a bearing on stock market efficiency (JSE, 2019). Besides the facilitation of buying and selling of shares, the JSE also facilitates the market for currency derivatives. This is targeted for investors and firms which aim to hedge different currencies against exchange rate volatility. Another crucial role of the JSE is to enforce compliance in terms of listing requirements. To that effect, the JSE has powers to suspend a firm from the listing if it does not meet the listing requirements anymore (JSE, 2019).

All listed companies on the JSE are grouped into either small caps, medium caps or large caps depending on the market capitalisation. The market capitalisation is determined by multiplying the shares held by the current share price (JSE, 2019). Firms can be listed on the JSE main board or on the AltX. These two boards have different listing requirements. For a firm to be listed on the JSE main board, its share capital should be R25 million and above, having a track record of profitability over the past 3 years and should have pre-tax profit of R8 million among other things.

On the other hand, the ALTX is an alternative public equity exchange board created for high growth small to medium enterprises which cannot meet the listing requirements of the JSE main board. The share capital required of AltX companies is only R2 million and there is no need to provide 3 years track record of profits and pre-tax profits. Other listing requirements for AltX firms include proof of the appointment of the Designated Adviser, proof of directors' attendance of the AltX Directors Induction Programme, and proof of the appointment of the executive financial director among others. The market capitalisation of this group of firms is pegged at bellow R1 billion. The ALTX is created to prepare these companies for future listing on the main board. This ranges from exposing them to JSE expected conduct and governance issues to adhering to strict compliance requirements (Brownlee, 2016; JSE, 2019). Alternatively, firms are categorised as follows:

Table 4.1: Firm categorisation based on market capitalisation

Category	**Market capitalisation**
Smalls caps/ALTX	Bellow R1 billion
Medium caps	Between R1-R10 billion
Large caps	Above R10 billion

Source: JSE (2019)

Table 2.1 above shows firm categorisation based on market capitalisation. This study focuses on large caps, that is, firms above R10 billion in the current study year. A stock market allows firms to interact with different stakeholders. Once a firm is listed on a stock market, the next step is to trade and find key strategies of how to deal with competition and increase its value. Essentially, listing on the JSE enables a firm to raise capital to fund its growth from a huge pool of both domestic and internal investors. Moreover, a firm can also enhance its image by being listed on the JSE which is ranked the 19th biggest stock market and the largest in Africa. This can enable a firm to attract top talent in its business which enhance its long-term performance. Also, firms listed on the JSE tend to get more media coverage and publicity which is good for business growth. On the other hand, listing on the JSE can have several drawbacks to the firm. For instance, listed firms are highly scrutinised in terms of compliance with legislation and strict listing requirements. These can strain the firm financially, leading to weak financial performance. Additionally, all publicly listed firms are required to publish their financial statements at the end of each financial year to be accessed by the public. This process can be tedious and costly as the firm has to employ experts and auditors to prepare and assess financial reports before publication (Müller, 2016; Zhang, 2016; Tinavapi, 2017; JSE, 2019).

4.9.1 Financial Performance of Listed Firms in South Africa

The growth of any economy worldwide largely depends on the stock performance of listed firms (Selvam et al., 2016). Efficient stock markets which are strictly regulated attract long term and stable investment. Essentially, efficient stock markets provide a conducive environment for various transactions (Tinavapi, 2017). On that account, there has been growing interest on the financial performance of listed firms in developing countries. In the case of South Africa, this emanates from the desire to achieve the projected economic growth by 2030. Hence, health and well performing listed firms can play a crucial role in mitigating the developmental conundrums such as high unemployment, poverty and the widening income inequality in South Africa. This is supported by existing literature which states that well-functioning stock markets can enhance economic inclusive economic growth (Ndlendle, 2017; Tinavapi, 2017; Osazefua, 2019). Not only is the government of South Africa interested in these firms but also a replete of investors who are attracted on the growth potential of emerging economies in Africa, particularly South Africa with a well-established stock market. That is why it is crucial to ascertain factors which influence the financial performance of firms listed on the JSE because their contribution to the economy is of utmost importance.

However, the performance of listed firms in South Africa has been recorded to be weak in 2018. This was the case especially for the top 40 large caps firms such as Aspen

Pharmacare, NEPI Rockcastle, British American Tobacco, Tiger Brands and MTN among others (Businesstech, 2019). These firms recorded a serious plummet in their share price leading to a weak performance in 2018 as indicated by Table 4.1 below.

Table 4.2 List of JSE listed firms which experienced a decline in share price in 2018

Company	January	December	Change
Aspen Pharmacare	R 273.28	R 133.31	-51.2%
NEPI Rockcastle	R 212.23	R 110.77	-47.8%
British American Tobacco	R 835.15	R 472.71	-43.4%
Tiger Brands	R 456.59	R 268.50	-41.2%
MTN	R 133.73	R 88.06	-34.2%
AB InBev	R 1,386.06	R 964.26	-30.4%
Kumba Iron Ore	R 382.76	R 280.00	-26.8%
Rand Merchant Investment	R 45.76	R 36.24	-20.8%
Naspers	R 3,580.90	R 2,900.00	-19.0%
Glencore	R 65.35	R 53.32	-18.4%
Remgro	R 236.51	R 194.68	-17.7%
Richemont	R 111.08	R 92.96	-16.3%
Exxaro Resources	R 162.50	R 136.46	-16.0%
Woolworths	R 63.93	R 54.50	-14.8%
Growthpoint Properties	R 27.13	R 23.13	-14.7%
Discovery	R 182.50	R 157.49	-13.7%
Shoprite	R 217.00	R 189.60	-12.6%
BidCorp	R 298.50	R 265.00	-11.2%
Investec PLC	R 90.20	R 80.22	-11.1%
Absa	R 177.36	R 159.24	-10.2%
PSG Group	R 269.13	R 242.07	-10.1%
Vodacom	R 143.97	R 131.60	-8.6%
Standard Bank	R 194.28	R 178.24	-8.3%
Mondi PLC	R 324.20	R 298.04	-8.1%
Redefine Properties	R 10.53	R 9.70	-7.9%
Sanlam	R 84.20	R 79.10	-6.1%
Bidvest	R 212.66	R 204.00	-4.1%
FirstRand	R 66.28	R 65.27	-1.5%

Source: Businesstech (2019)

Table 4.2 shows a list of JSE listed firms which experienced a decline in share price in 2018. There has also been outright collapse of big listed companies especially in the construction sector in 2018 and early 2019. These companies include: Basil Read, Group Five, NMC Construction, Esor and the Liviero Group. The closure of these companies means more job losses to a country which is already facing the unemployment conundrum which is one of the highest in the world. Recently, companies such as Edcon, Standard Bank and Steinhoff have also been added to the list of listed firms showing deteriorating financial performance. Standard Bank has issued a statement that it is going to close 91 of its branches which directly results in 1200 employees losing their jobs (Kahla, 2019). For instance, Steinhoff's profitability plummeted in the last quarter of 2018 and worsened in 2019 as shown by a decline in its share price to R1.60 per share (Mchunu, 2019). The weak performance exhibited by the JSE listed firms is a cause for concern since their economic activities directly affect the overall economic performance in South Africa.

With the expected economic growth and an increase in foreign direct investment (FDI) in South Africa, JSE listed firms have a critical role to play. President Cyril Ramaphosa has openly shared his vision and plan to attract foreign direct investment into South Africa. Listed firms are key players to fulfill that vision as investors usually find investing in listed firms relatively flexible and rewarding (Zhang, 2016). An efficient stock exchange market with financially well performing firms can allow emerging countries such as South Africa to attract the capital required for economic growth (Tafirenyika, 2019). As Africa is projected as the continent with the fastest growth potential, investors are ready to invest in local firms than in developed markets (Zhang, 2016). Hence, it is mandatory for listed firms to perform well if they are to attract investors and boost FDI in their countries (Tafirenyika, 2019).

Since the JSE is the biggest stock market in Africa, listed firms in South Africa are expected to turn the fortunes of the country around. The JSE has a strong potential to attract quality and stable investors such as institutional investors. Additionally, South Africa has been ranked the best in attracting FDI in 2015, which is something listed firms should exploit and grow their businesses (Zhang, 2016; JSE, 2019). Large caps are high growth-oriented firms looking forward to raising more capital to expand their businesses by offering shares for money invested. Due to burgeoning pressure on firms to consider environmental issues seriously (JSE, 2019), the author of this study believes that firms can be able to attract more investors if they consider environmental issues earnestly. This view is supported by other studies such as Ganda (2016) as well as Park and Ghauri (2015) which assert that investors are interested in investing in firms which excel in environmental performance and are prepared to pay a premium in obtaining shares form such firms because of anticipated future appreciation of the share price.

Recently, investors are now considering environmental behaviour of a firm before they can commit their capital in the business. This has become a new norm because of the emergence of responsible investing. Responsible investing describes the type of investment which considers sustainability behaviour of the target firms. Other firms in South Africa such as Steinhoff have already started embarking on stakeholder engagement to address the financial crisis within the company. More listed firms are expected to implement environmental initiatives to enhance their financial performance. This is because the green strategy is becoming a prerequisite for most investments (Scholtens, 2014; Khan, Serafeim & Yoon, 2016; Zhang, 2016; Mchunu, 2019).

4.4 SUMMARY

This chapter discussed firm performance. A review of existing literature showed that there is no consensus regarding the definition of firm performance. However, a plethora of studies agree that firm performance should be defined using a multi-dimensional approach. On that account, firm performance was categorised into objective (financial performance) and subjective (non-financial performance). Financial performance was adopted as it presented several benefits to the firm as properly documented in existing literature. Essentially, financial performance indicators are used for decision making by various stakeholders such as managers, investors, creditors and suppliers among others. Moreover, the chapter also discussed the performance of listed firms in South Africa based on latest statistics. The next chapter will discuss hypothesised relationships between environmental sustainability commitment and firm financial performance.

CHAPTER 5

HYPOTHESIS DEVELOPMENT- ENVIRONMENTAL SUSTAINABILITY COMMITMENT AND FINANCIAL PERFORMANCE

5.1 INTRODUCTION

This chapter endeavours to discuss the hypothesised relationships among key variables of the study. The existing debate is whether investing in environmental sustainability initiatives can enhance or worsen financial performance. Existing literature about the relationship between environmental sustainability commitment and financial performance is equivocal. It is within the scope of this chapter to discuss the related empirical literature in the quest to solve this conundrum. The chapter starts by discussing the environmental sustainability commitment and financial performance relationship in general. Henceforth, each environmental sustainability variable such as energy efficiency, water efficiency, waste reduction, carbon emission reduction, materials efficiency, compliance, stakeholder engagement and green products and services innovation will be discussed alongside measures of financial performance. The combination of these environmental variables influences each other in some way which translates into cost savings and enhanced financial performance. The empirical literature is grouped along the key hypotheses of the study. The broad relationship between environmental sustainability commitment and firm performance is discussed in the next section.

5.2 THEORIES LINKED TO ENVIRONMENTAL SUSTAINABILITY COMMITMENT AND FINANCIAL PERFORMANCE

The theoretical perspective on the nexus between environmental sustainability and financial performance is divided into two main opposing theoretical explanations. These include the value creation theories among which is the Porter hypothesis and the Tradeoff hypothesis emanating from Friedman's 1984 ideology.

Porter (1995) argues that strong and stringent environmental policies forces firms to fully commit towards environmental protection. To that effect, a well-structured environmental legislation makes it possible for firms to be profitable while at the same time being environmentally responsible. The Porter hypothesis takes a “revisionist” approach which opposes the widely held views by the traditionalist approach which argues that environmental legislation can weaken the financial performance of a firm. To that effect, Porter (1995) is of the view that environmental legislation can force firms to innovate which translates into environmental sustainability commitment. In that case, a firm can benefit from new product innovations and systems innovation which help the firm to be a market leader, hence, motivates it to invest in environmental sustainability initiatives. New innovations can also help a firm meet and surpass its financial goals by cutting costs. The major argument derived from the Porter hypothesis is that environmental pollution is clear evidence that the firm’s operations and processes are highly inefficient. Additionally, if the firm incurs costs because of committing to environmental sustainability initiatives means the firm is doing it for compliance only for which it can achieve better cost savings benefits by being proactive and innovative. This can enable a firm to gain green trust from its stakeholders which enhances its legitimacy. Firms which are viewed as legitimate can boost profitability by selling their green products at a premium.

Conversely, the Tradeoff line of thought advances the argument that stringent environmental policies can discourage firms from participating in environmental sustainability initiatives. According to Friedman (1984), a firm only exists to make profit and enhance value for its shareholders. Hence, any other obligation such as environmental sustainability commitment comes with extra cost that erodes its profits and reduces returns for shareholders. To that effect, environmental considerations are a burden to the firm. Hence, managers may only consider it after the profitability goals of the firm have been attained and only if the owners of the firm give managers permission to use its resources to participate in environmental protection initiatives. The most compelling argument advanced by the Tradeoff hypothesis is that other obligations such as environment protection uses up the resources of the firm which are supposed to be used for more value creation within the firm.

The two opposing hypotheses discussed above have shaped discussions on the usefulness of environmental sustainability commitment. As such, a huge volume of existing literature is divided along these two lines of thought. Even though there is another strand of literature which opposes both of these two hypotheses, they remain the cornerstones influencing other recent discussions on the failure of studies to achieve similar findings as discussed in the next section.

5.3 ENVIRONMENTAL SUSTAINABILITY COMMITMENT AND FINANCIAL PERFORMANCE

The link between environmental sustainability commitment and financial performance has received global attention. This has prompted deep interest among researchers globally to clearly understand this relationship but up to now, existing literature is inconclusive. Researchers have adopted different approaches including different measures and methodologies to tackle this conundrum, however, with no clear and uniform findings (Jabbour et al., 2012; Lu & Taylor, 2015; Horváthová, 2016; Miroshnychenko et al., 2017).

Various studies have been conducted to test the Porter hypothesis that environmental commitment enhances financial performance. A meta-analysis study conducted by Horváthová (2016) reveals that approximately 50% of studies support the Porter hypothesis that environmental commitment enhances the profitability of a business. The study reports that only 16% of the articles dismiss the validity of the Porter hypothesis. The remainder of the articles report an insignificant relationship.

Endrikat et al. (2014) conducted a meta-analytic study to resolve the inconclusiveness in existing literature. The study reviewed 149 articles which had previously captured the subject under investigation. The major purpose of the study was to find the underlying reasons for this inconclusiveness in existing studies. Endrikat et al. (2014) established that environmental sustainability commitment resulted in positive financial returns in cases where the firm’s environmental sustainability commitment was proactive rather than reactive. The study supported this assertion by indicating that a proactive environmental sustainability commitment strategy improves the image of the firm which translates into positive financial returns. Considering the inconclusiveness of existing literature, Endrikat et al. (2014) noted that this emanates from methodological inconsistencies and presumably the multi-dimensionality of both the environmental sustainability and financial performance constructs.

Albertini (2013) conducted a meta-analysis study to investigate if environmental sustainability enhances financial performance. The study analysed 52 articles published in a period of 35 years. Most of the articles supported the view that environmental sustainability commitment enhances a firm's financial performance. To account for variability and lack of consensus in existing literature, Albertini (2013) suggested that it could be because of the different environmental and financial performance measures used as well as time period in which each study was conducted. The context in which the studies were conducted could also be a valid factor in explaining the inconclusiveness. For instance, over 35 years, different legislations could have been passed which may influence the results.

Siew, Balatbat and Carmichael (2013) investigated the link between sustainability commitment and performance of construction firms. The study sampled 44 listed construction firms from the Australian Stock Exchange. The results indicated that firms actively involved in reporting on environmental performance report healthy financial performance compared to the laggards. This view is supported by the growing importance attached to green behaviour by key stakeholders of a firm. Suppliers are also willing to extend trade credit facilities to supply chain partners which actively invest in environmental initiatives. This enables the firm to grow while at the same time recording an increase in profits.

A study by Muhammad et al. (2015) also investigated the environmental performance and financial performance nexus among Australian listed firms. The study used secondary data where environmental sustainability data was obtained from the National Pollutant Inventory (NPI) while information related to financial ratios was obtained from ASX database. The findings showed that each firm which invested in environmental issues recorded positive financial returns especially in times of growth. The results suggest that a firm's environmental investment never goes to worst especially in a growing economy.

Lu and Taylor (2015) assessed whether commiting in environmental issues influenced financial performance or not. The study followed a meta-analytic approach. The sampled size consisted of 31,514 observations from 198 case studies. The findings showed that environmental sustainability commitment was strongly related to business profitability.

Moreover, Lu and Taylor (2015) noted that the strength of the environmental sustainability financial performance nexus was stronger in long term periods. This suggests that environmental sustainability initiatives take time before they can pay back (Putz, 2017). It follows that duing the short and medium term, the firm is still adjusting to capacity and recovering from losses incurred in installing new machines and technology to implement the green business model. This means that financial performance can only become positive in the long run. However, this view is refuted by another line of thought which argues that environmental sustainability commitment improves financial performance in the short run because the new machines and technology are still efficient and can cut waste and waiting time. According to this line of thought, such profits are offset in the long run when the machines are old and require constant repair. This means the firm incurs serious cash out flows which erode profits.

Manrique and Martí-Ballester (2017) analysed the impact of a firm's commitment to environmental initiatives on the financial returns. A sample of 2982 firms were considered, and data was from 2008 and 2015. The results showed that environmental sustainability commitment positively influences a firm's performance. The study noted that the effect was stronger for developing countries. The study argued that the effect is more pronounced among developing countries that are still investing in low hanging environmental sustainability practices such as recycling which are less costly. This is different when it comes to developed countries that are at an advanced stage with environmental sustainability. This entails that most of the environmental sustainability initiatives they engage in require huge investments which may reduce their profits. Such a scenario serves as a strong motivation for firms in South Africa to take environmental sustainability seriously by starting with practices that require less cash outflows.

A study by Amacha and Dastane (2017) established that environmental sustainability commitment was directly linked to firm performance. The study was conducted using firms in the oil and gas industry in Malaysia. The results further revealed that firms which were actively involved in environmental sustainability initiatives reported more positive financial performance than their counterparts. The study concluded that environmental sustainability is a crucial determinant of financial performance. These results are supported extensively by studies such as Soytas et al. (2016). The study used overall environmental sustainability which was tested against ROA and ROE. The study found that environmental sustainability commitment was positively linked to financial performance.

Conversely, a strand of literature which advocates for a negative relationship is supported by the Trade-off hypothesis. “The trade-off hypothesis is based on Friedman’s statement regarding social responsibility and argues that engaging in environmental activities lower the financial performance of a firm” (Putz, 2017:11). Proponents of the trade-off hypothesis further argue that the costs incurred by a firm towards being environmentally sustainable far outweigh the benefits (Trumpp & Guenther, 2017). Investment in technology and environmental compliance generates additional costs which consequently reduces business profitability (Fujii et al., 2013).

Another strand of literature argues that environmental performance has no effect on financial performance (For instance, Aras, Aybars & Kutlu, 2010; Qiu et al., 2016). Riillo (2017) assessed firms involved in green initiatives to analyse the effect of environmental commitment on the profitability of these firms. The study established a U-shaped. Qiu et al. (2016) studied the relationship between environmental sustainability, social disclosures and financial performance. The study also reported that environmental sustainability commitment had no effect on a firm’s profitability. However, the study found that it was social disclosures which were positively related to financial performance. Though debatable, Qiu et al. (2016) argued that investors are more attracted to firms which excel in social than environmental sustainability.

On that backdrop, more empirical studies are required to give clear conclusions on this relationship. Busch and Hoffmann (2011) argue that it is crucial to measure environmental sustainability variables separately and ascertain how each can influence firm financial performance. As such, the next section will present the relationships among each environmental sustainability measure (energy efficiency, water efficiency, waste reduction, carbon emission reduction, materials efficiency, stakeholder engagement and green products and services innovation) and performance.

5.3.1 Relationship between Energy Efficiency and Financial Performance

Regardless of concerns over environmental damage by firms, there is also concern over their weak financial performance. The unsatisfactory financial performance is partly attributed to excess costs in terms of high energy costs, wasteful energy usage and lawsuits. A significant number of firms still lack proper strategies and measures to attain energy efficiency (Winston, Favaloro & Healy, 2017). As such, a lot of firms spend millions of dollars on energy alone. As alluded to by Winston et al. (2017), given the increasing prices of energy, firms should embrace energy efficiency strategies to eliminate risks associated with spending too much on energy.

Several scholars submit that it is pertinent to understand the effect of environmental sustainability commitment and financial performance by differentiating between energy intensive firms and less energy intensive firms (Gonenc & Scholtens, 2017). This can enhance the effectiveness of possible solutions tailored to the needs of a particular sector than generalizing (Pons, Bikfalvi, Llach & Palcic, 2013). A significant number of energy intensive firms still score low on energy efficiency which consequently reduces their performance indicators on the stock market (Gonenc & Scholtens, 2017). Hence, firms are encouraged to invest in energy saving strategies as it influences their financial performance (Henriques & Catarino, 2016). Pons, M., Bikfalvi, A., Llach, J. & Palcic, I. (2013).

A plethora of studies agree that energy efficiency is a key determinant for improved financial performance of firms (Gonenc & Scholtens, 2017). Attaining energy efficiency enables firms to cut energy demand and energy costs which results in improved firm financial performance. Firms generally aim to minimise costs while maximising profits. To that effect, attaining energy efficiency can assist firms to minimise cost associated with heating, transportation and lighting which translates into a favourable financial performance. Firms can also improve profitability by investing in green buildings, which can allow a firm to cut energy use and drive sales up by appealing to green customers (US Department of Energy, 2015; Lundgren, Marklund & Zhang, 2016; Zhang, 2016; Boakye, 2018). The next section provides a discussion on studies which argue that energy efficiency enables a firm to attain positive financial performance.

Emperical literature supporting a positive relationship between energy efficiency and financial performance

Energy efficiency stands as one of the best strategies a firm can use to suppress its cost. It brings infinite cost saving advantages to firms which enhances its profitability. Firms that actively invest in environmental sustainability initiatives are likely to enhance their financial performance through operational efficiency such as energy saving and efficiency. Energy efficiency enhances a firm's competitiveness. This enables a firm to enjoy benefits associated with being a market leader. One of the advantages is being able to charge a premium on its products/services which translates into positive profit margins. Some key energy saving strategies such as energy rationing can enable a firm to enjoy cost savings which minimises risks associated with energy dependency and shortages. Since most traditional production processes consume huge volumes of energy which account for a significant percent of the total costs, attaining energy efficiency in such processes enables a firm to rip cost saving benefits which translates into profits (Internnational Energy Agency, 2014; IEA, 2015; Whelan & Fink, 2016; European Commission, 2017; Martí-Ballester, 2017; Alshehhi, Nobanee & Khare, 2018; Soepardi, Pratikto, Santoso, Tama & Thollander, 2018).

Neeveditah et al. (2017) assert that a firm can increase its profitability by saving energy. The study underscores that firms use a lot of energy daily in terms of lighting offices and powering machines. Hence, cutting down energy use by switching off lights and machines when they are not used saves the firm a lot of money. Alternatively, firms can also attain energy efficiency by using renewable energy such as solar power. Renewable energy is relatively cheaper and can save the firm a lot of money which can be invested and increase the value of return on equity. Moreover, renewable energy is sustainable and can allow a firm to reduce the probability of energy shortages such as the case with fossil fuel energy. This is supported by empirical findings by Sahu (2014), who compared the use of renewables and non-renewable energy sources as used by different firms. The study found that firms which used renewable energy sources of energy such as natural gas reported positive financial performance than those which used fossil fuels such as coal and petrol.

Fan et al. (2017) analysed the effect of energy efficiency on the profitability of firms in China. The study used both accounting and market-based measures of financial performance. The study established a positive relationship between energy efficiency and most of the accounting-based ratios. Fan et al. (2017) urged firms to to fully invest in environment isssues seriously as there are momentous benefits associated with such investments. On that note, firms are likely to avoid risks associated with increased energy prices and scarcity.

A study by Martí-Ballester (2017) investigated whether investment in sustainable energy systems can improve a firm's financial performance. The study considered 574 companies from 36 countries over a period of 5 years. The results indicated that firms which highly invest in efficient sources of energy are likely to improve their profitability instantly. The author argues that in the short run after adopting sustainable energy systems, it improves efficiency in energy use and other systems which translates into improved firm financial performance. These results disagree with several studies (De Jong et al., 2014; Chen et al., 2018; Haninun et al., 2018) which argue that environmental sustainability investments are likely to improve firm financial performance in the long run where the new systems and technology improve productivity, corporate image and improved investor rating of the firm.

Endrikat et al. (2014) conducted a meta-analytic study to demystify the inconclusiveness in the relationship between corporate environmental and financial performance. The study reviewed 149 studies which previously investigated the link between these two variables. The study established a positive and partially bi-directional relationship between environmental sustainability commitment and firm financial performance. The partial bi-directional relationship indicates that these two variables; environmental sustainability commitment and firm financial performance can influence each other. For example, a firm with a strong financial performance can invest more in environmental sustainability initiatives such as energy efficiency because of the availability of resources to fund the investments. The authors remarked that for firms to realise gains from environmental sustainability commitment, they should endeavour to proactively participate other than to be reactive when they are forced by legislation. More importantly, the study attributed the inconclusiveness of existing literature based on the multi-dimensionality of variables used by different studies.

Arslan-Ayaydin and Thewissen (2015) analysed the link between environmental sustainability and financial performance. The study established a positive relationship between energy efficiency and financial performance. It was noted that firms can reduce their negative externalities by attaining energy efficiency. Similarly, Zhang (2016) investigated the link between energy efficiency and firm performance in Sweden. The results showed a positive relationship between energy efficiency and firm performance. The study recommended that firms should commit towards to attaining energy efficiency. ene

Alternatively, Horváthová (2016) suggests that firms can match their environmental sustainability initiatives to improved financial performance by excelling in green innovation. Green innovation can allow a firm to cut energy cost through systems that reduce the amount of energy required to produce a unit. The resultant cost savings emanating from innovation are linked to the hypothesis by Porter (1995), who argues that costs can be cut by improving efficiency in processes and products which are the key areas where energy inefficiency can cost firm millions of dollars.

Bergmann et al. (2017) established a positive relationship when energy efficiency was tested against financial performance. The argument from these findings was that attaining energy efficiency is beneficial to firms. This is because it can enable a business to meet its financial goals and operate on a going conern basis. Bergmann et al. (2017) further noted that firms can unlock indirect benefits such as reduction in carbon emissions and climate change mitigation by attaining energy efficiency.

Emperical literature supporting a negative relationship between energy efficiency and firm financial performance

Some studies argue that efforts to attain energy efficiency may reduce the profitability of a business. For instance, a significant number of firms are reluctant to invest in energy efficiency driven technologies due to lack of clear and tangible evidence on the financial gains of such investments (Delmas, Nairn-Birch & Lim, 2015). Consequently, the call to proactively participate and invest in energy saving technology is received with much resistance across the globe.

Qian (2012) investigated Australian firms' environmental performance behaviour. The findings revealed that energy efficiency reduced the financial prospects of the firms considered. It was deduced that some firms still benefit from unsustainable use of energy. Surprisingly, it was noted that listed firms which did not have environmental sustainability as one of their strategic goals reported higher financial performance. Nevertheless, poor environmental performance may expose a firm to serious external scrutiny, which can erode its profits significantly. This is because of the emergence of environmental pressure groups and whistleblowers, who are willing to use their resources to fight against environmental damage. Hence, profitability that is linked to environmental pollution is not sustainable.

Empirical literature supporting an insignificant relationship between energy efficiency and financial performance

Pons et al. (2013) assessed the link between energy efficiency and the profitability of firms. The findings revealed that being effiecient in terms of energy use may not have an effect on the profitability of a business. The results indicated that although new technology was crucial to attain energy efficiency, its effect on financial performance was insignificant. Another study by Boakye (2018) also explored this phenomenon under discussion using small businesses. The findings also indicated that being energy efficient may not convice the market as measured by Tobin's Q. Baokye concluded that the insignificant relationship established could be a result of information asymmetry. On that note, investing in energy efficiency only maybe insufficient to convince investors to invest in the business based on the future value of the firm. Rather, investors can be convinced if a firm goes above just energy efficiency and acquire environmental certification such as ISO 4001 (Pavlinovic, 2013).

Despite the divergence in empirical findings regarding the energy efficiency and financial performance nexus, the author of this study believes that firms can benefit emensely from energy efficiency intiatives. Attaining energy efficiency can enable a firm to reduce cost of production and energy costs which can enhance the profitability of the business. Furthermore, a firm can also unlock value from investors and other stakeholders interested in dealing with environmentally sensitive firms. This can enhance the image of the company leading to positive financial outcomes. Also, investing in renewable sources of energy such as hydro, solar and biogas can help listed firms to attract green funding from green investors which enhances their financial performance. Having an understanding that this study is grounded on the stakeholder theory, the reaction off different stakeholders from the firm's energy efficiency initiatives will be noticeable in the different measures of financial performance. Hence, this study proposes that energy efficiency positively influences different measures of financial performance as hypothesised below;

$H1_1$*: There is a significant positive relationship between energy efficiency and the financial performance of firms listed on the JSE.*
$H1a_1$*: There is a significant positive relationship between energy efficiency and ROE of firms listed on the JSE*
$H1b_1$*: There is a significant positive relationship between energy efficiency and ROA of firms listed on the JSE.*
$H1c_1$*: There is a significant positive relationship between energy efficiency and EPS of firms listed on the JSE.*
$H1d_1$*: There is a significant positive relationship between energy efficiency and Tobin's Q of firms listed on the JSE.*
$H1e_1$*: There is a significant positive relationship between energy efficiency and share price of firms listed on the JSE.*

5.3.2 Relationship between Water Efficiency and Financial Performance

All human life activities depend on water. Regardless of the crucial role of clean water accessibility, there is a serious water scarcity in South Africa. Water has become a scarce resource globally. On this note, it is germane for firms to judiciously manage water. Water scarcity can affect firm financial performance negatively. The water challenge is a threat to business viability since water is needed in the production process. Sadly, firms in South

Africa are likely to face business interruptions if they do not address the looming water challenge in the country. This calls for the business fraternity to develop a consortium of strategies aimed at minimising usage of water while promoting reuse/recycling (Kurunthachalam, 2014; Raj, 2015; Askham & Van der Poll, 2017; James, 2017).

Firms should invest beyond their own water consumption needs but also help their supply chain members to eliminate wasteful ways of water consumption. Most manufacturing firms have already started risking the flow of their production processes due to water inefficiencies. Inefficient water management can expose a firm to unnecessary costs which can affect the firm's profitability negatively. For instance, Coca Cola was forced to close its plant in India due to water shortages. This costed the firm a lot of revenue in terms of lost sales and stranded assets (Linneman, Hoekstra & Berkhout, 2015; Whelan & Fink, 2016; Askham & Van der Poll, 2017).

Water efficiency is crucial for a firm and its diverse stakeholders (Appiah et al., 2017). Appiah et al. (2017) assert that firms can save a lot of money through efficient water systems which relieves them of high cost of treating contaminated water. In their study on European firms, Zamfir, Mocanu and Grigorescu (2017) reported that firms located in the United Kingdom, Hungary and Slovakia which came up with ways to minimise water usage while concurrently maximising re-usage recorded an increase in firm financial performance. From that it is clear that water efficiency unlocks momentous financial benefits to firms (Zokaei, 2013). The author of this study believes that water efficiency can assist firms to cut cost in terms of reducing water bills which capacitates the firm to make profits. The section that follows presents a discussion of studies which reported a positive relationship between water efficiency and financial performance.

Empirical literature which supports a positive relationship between water efficiency and financial performance

Ong et al. (2014) assessed the impact of environmental improvements on the financial performance of leading companies listed in Bursa Malaysia. The study used materials consumption, energy consumption, water consumption, biodiversity, GHG reduction and waste reduction to measure environmental performance. Ratios such as ROA and ROE were used to measure financial performance. The study's findings revealed that water efficiency is positively related to financial performance. Ong et al. (2014) further underscore that water efficiency has momentous costs benefits which directly boost the financial performance of a firm. When firms embark on water saving initiatives such as recycling, reduction in water consumption and formulating water sustainability policies, the firm is likely to experience superior firm financial performance (Ong et al., 2014).

Tasneem et al. (2016) posited that water efficiency improves the green image of the firm. This improves the value of the firm by investors and other stakeholders which boosts demand for the firms shares and its products. Existing literature links improved firm's value to superior financial performance. A firm which invest intensively in water efficiency can earn green trust from its customers and investors. Recently, green customers highly regard firms which are environmentally sensitive, and are willing to become loyal customers to such firms and pay a premium price to its products. This significantly contributes to enhanced financial performance.

Empirical literature which supports a negative relationship between water efficiency and financial performance

Appiah et al. (2017) found a negative relationship between water efficiency and financial performance of firms. This shows that investments in new technology to recycle and reuse water can be costly to a firm. These costs may outweigh the benefits of such initiatives leading to losses in the short run.

Raj (2015) conducted a study to investigate the relationship between corporate water risk, water accounting and financial performance of metal mining firms. The study used GRI indicators to measure water consumption. These include annual water withdrawal, total water discharge and water recycled. The study adopted ROA, ROE and EBITA as measures of financial performance. Linear regression was used as a data analysis tool. The results showed that increased water consumption was associated with high financial performance and water efficiency initiatives such as water recycling were negatively related to financial performance. Raj (2015) explained that since the sampled firms were mines, more production means more water consumption which results in superior financial performance. The above results favour the profit maximisation goal but violates the environmental sustainability principle. On that account, firms are encouraged to invest in water efficiency to strike a balance between the economic goals and environmental performance.

Empirical literature which supports an insignificant relationship between water efficiency and financial performance

Nyirenda et al. (2014) investigated the effect of environmental sustainability on the financial performance of a mining firm listed on the JSE. The study used carbon reduction, energy efficiency and water usage as measures of environmental sustainability while return on equity was used to measure financial performance. The results showed an insignificant relationship between water efficiency and financial performance. Nyirenda et al. (2014) argued that the insignificant relationship established could have been because the concerned mining firm was only investing in water efficiency for complying with regulations in the mining industry without much innovation. This inconclusiveness of literature calls for more empirical studies to demystify the nexus between water efficiency and financial performance of firms. Raj (2015) supports this assertion and alludes that there is limited information on the relationship between water sustainability and firm financial performance.

The author of this study is of the view that attaining water efficiency can help listed firms in saving costs associated with paying excessive water bills and the possible opportunity cost emanating from disruptions in business activities due to water shortages. It has been noted that a significant number of firms end up paying excessive water bills because in some instances, the water is left running while some is lost through licking pipes. Hence, adopting water efficiency measures such as harvesting rainwater for other purposes, fixing licking taps and water recycling and reuse can positively influence financial performance as measured by ROE, ROA, EPS, share price and Tobin's Q. This can ensure that the business does not experience water shortage risk which may see their share price losing value. Essentially, attaining water sustainability can help firms to boost their share price as the business can attract favourable ratings from the market. This is because several stakeholders such as investors, banks and customers prefer businesses which are environmentally responsible as this may mean the business will stand a chance to operate as a going concern. Water efficiency has become a crucial metric to evaluate the extent to which businesses are committed towards sustainable development goals in South Africa and worldwide. In South Africa, this is exacerbated by the water challenge which have affected several big cities such as Cape town until an emergence was announced. Therefore, firms which come up with proactive ways of addressing the water crisis in South Africa are likely to boost their image and gain legitimacy in the view of stakeholders such as the community and the government which may positively influence financial performance. Based on the above evidence, this study posits that water efficiency positively influences the financial performance of listed firms. Hence, the following hypotheses are formulated.

***H2$_1$**: There is a significant positive relationship between water efficiency and the financial performance of firms listed on the JSE.*

***H2a$_1$**: There is a significant positive relationship between water efficiency and the ROE of firms listed on the JSE.*

***H2b$_1$**: There is a significant positive relationship between water efficiency and the ROA of firms listed on the JSE.*

***H2c$_1$**: There is a significant positive relationship between water efficiency and the EPS of firms listed on the JSE.*

***H2d$_1$**: There is a significant positive relationship between water efficiency and the Tobin's Q of firms listed on the JSE.*

***H2e$_1$**: There is a significant positive relationship between water efficiency and the share price of firms listed on the JSE.*

5.3.3 Relationship between Waste Management and Financial Performance

Waste reduction measures have drawn the attention of researchers globally over the past decade. Firms are blamed for irresponsibly disposing their waste which pollutes the environment. Investing in technologies which improve waste management has several cost advantages for businesses which enhance performance. Investing in technologies which help in waste management enables a firm to boost its financial performance in the long run. Waste reduction is regarded as one the key predictors of high growth and business' profitability. Waste is assocoiated with massive costs in a business since it is a sign of inefficiency. Hence, a firm can boost its profitability figure by minimising environmental costs (Raj & Seetharaman, 2013; Jo et al., 2015; Dube, 2017). However, the cost reduction advantages start to be observable starting from the second year from which the investment was made. This serves to motivate firms which are reluctant to invest in waste management technologies due to their short-term approach to appraise investments (Jo et al., 2015).

Another advantage imbedded in waste management is the sale of recycled materials to industries and individuals who use such as raw materials (Raj & Seetharaman, 2013). Furthermore, recycled materials can also be used as raw materials in the firm's production process. This enhances the firm's financial performance by cutting costs on raw materials. Similarly, Saari (2017) analysed the benefits associated with waste management in organisations. The study found that a few companies in the surveyed firms were making extra revenue from the sale of byproducts and recycled materials. Existing examples such as Patagonia Inc have managed to obtain value from recycling and minimising waste (Kiron et al., 2017). The firm was able to realise a revenue growth of 14% while its profits increased by 300% when it initiated a campaign to encourage its clients to reuse their products instead of dumping them.

Firms can easily cut waste and costs simultaneously if they can adopt the lean strategy, which focuses on zero tolerance to waste. "Lean is a practice that helps companies to identify and eliminate seven types of waste, namely overproduction, waiting, transportation, defects, inappropriate processing, unnecessary inventory and unnecessary motion" (Rahman, Ismail & Ariffin, 2016:32). The lean waste management strategy allows a firm to build close relationships with its customers which enables it to understand customer product/s specifications. As a result, this helps the firm to cut costs in terms of producing unwanted products but rather focus on increasing efficiency which translates into improved financial performance (Khanchanapong, Prajogo, Sohal, Cooper, Yeung & Cheng, 2014). The lean waste management strategy has been used widely and generated positive financial benefits to firms which adopted it. For example, companies like Toyota adopted the lean strategy to waste management and recorded improved sales in that year (Rahman et al., 2016). Excelling in waste management positively influences other environmental variables such as energy consumption, water usage and carbon emissions (Verrier, Rose, Caillaud & Remita, 2014).

Emperical literature which supports a positive relationship between waste management and financial performance

Song, Zhao and Zeng (2017) studied how environmental management influences a business' financial prospects. The study results established that a firm's environmental management behaviour such as waste reduction and recycling positively influence a firm's ability to meet its financial goals. Managing the environment through initiatives such as waste reduction can be a good strategy to reduce production costs which translates into desirable firm financial performance (Graham & McAdam, 2016).

A plethora of researchers have also submitted that waste reduction strategies can effectively enhance the performance of a business. The direction of the relationship is reported to be positive. Findings from Maleka et al. (2017) also supported this view. The study analysed JSE listed firms and concluded that waste management is positively linked to financial performance. Other studies also found that effectively cutting on waste can help a firm to attain its financial goals and delight shareholders (Ochiri, Wario, Odhiambo & Arasa, 2015; Henri, Boiral & Roy, 2016).

Myeza (2017) investigated how waste management influences the ability of rims to attain their financial goals. The study used a packaging company. The study observed the behaviour of the profit figure before and after new and innovative waste management technologies were introduced in the firm. The results revealed that the new waste management technology successfully reduced waste in terms of waiting time by 78%, rework by 53%, and job-specific waste by 6%. Collectively, the waste reduction efforts boosted the firm's profitability by 17%. The study concluded that firms can largely benefit from waste management investments as they translate into positive financial performance.

Ochiri et al. (2015) analysed the likelihood of waste reduction to influence the performance of firms in Kenya. The study indicates that waste reduction strategies enable a firm to cut costs significantly by eliminating storage space, breakages and landfill space demand. Significant cost savings brought by waste reduction directly and positively improve the financial performance of firms.

Bartolacci et al. (2015) studied the ability of firms to attain their financial goals through waste management strategies. The study used a sample of 110 Italian provinces, and data was collected for the period between 2010 and 2013. Bartolacci et al. (2015) categorised waste management into the following: prevention, reuse and preparation for reuse, recycle, recovery and disposal. Financial performance was measured using value added. It was established that waste reduction strategies are key predictors of financial performance.

Emperical literature supporting a negative relationship between waste management and financial performance

Investing in assets and technologies for waste collection and treatment may erase the potential of a firm to be profitable (Sukholthaman & Sharp, 2016). The authors argued that such results are because implementing a waste reduction strategy can be costly. During the initial stages, the firm must invest in trucks, people to sort the waste, waste treatment and training of the workforce. The cost of waste sorting can negatively impact the cash flows of the firm in the short term. For instance, the firm has to hire extra employees to deal with waste sorting. Payroll is one of the elements which makes up the biggest part of the cost structure of a firm. Waste management also entails changing the entire system which might require the firm to invite experts to come and train its employees. Since most external training bills are based on hourly rates, the costs of training alone can erode the firm’s profits resulting in losses.

Empirical literature supporting an insignificant relationship between waste management and financial performance

Ong et al. (2014) conducted a study in Bursa Malaysia to ascertain if environmental excellence can affect the financial prospects of a firm. Environnemntal varibles included:

materials consumption, energy consumption, water consumption, biodiversity, GHG reduction and waste reduction. These were tested against ROA and ROE. No significant relationship was established among the key variables of the study. This shows that environmental sustainability commitment does not predict financial performance outcomes of a business.

Neeveditah et al. (2017) investigated the association between environmental management systems and business profitability. The study used listed firms from Mauritius. It was established that waste reduction does not influence a firm's profitability in any way. Neeveditah et al. (2017) also found that most firms including the surveyed firms were using reactive waste management strategies for compliance's sake as opposed to proactive measures where they voluntarily invest in innovative technologies which can cut down waste while at the same time giving them a competitive edge as well as improved financial performance.

Considering studies supporting an insignificant relationship, Jo et al. (2015) argue that it might be caused by insufficient investment in environmental performance. Consequently, this might fail to boost the profitability figure as intended by most managers. Trumpp and Guenther (2017) explain this phenomenon using the "theoretical framework of a 'too-little-of-a-good-thing' (TLGT) effect." According to this theoretical underpinning, the strength between the two key variables is determined by the level of environmental performance.

The author of this study is of the view that high environmental performance in terms of effective waste management amounts to positive financial performance. This is because firms can benefit financially from waste recovery, recycling and resue of some of the components in the production process. Due to incidences of unfavourable harzards caused by mismanaged waste, several stakeholders such as customers, environmental pressure groups, the government and responsible investors have started extending preference to firms which excel in waste management. Effectively and efficiently managing waste can enable a firm to eliminate costs associated with procuring of new raw materials. Additionally, reducing the amount of waste that goes to the landfill enables firms to lower transportation costs and these savings can be used to improve other areas of the business which may result in positive financial performance. More importantly, firms which are proactive in managing their waste at all stages of their business circle can attract favourable ratings and loyalty from environmentally sensitive stakeholders such as the community, investors, the government, emplyees and supply chain partners which may boost their financial performance. From the above analysis, this study hypothesises that:

$H3_1$*: There is a significant positive relationship between waste management and the financial performance of firms listed on the JSE.*

$H3a_1$*: There is a significant positive relationship between waste management and the ROE of firms listed on the JSE.*

$H3b_1$*: There is a significant positive relationship between waste management and the ROA of firms listed on the JSE.*

$H3c_1$*: There is a significant positive relationship between waste management and the EPS of firms listed on the JSE.*

$H3d_1$*: There is a significant positive relationship between waste management and the Tobin's Q of firms listed on the JSE.*

$H3e_1$*: There is a significant positive relationship between waste management and the share price of firms listed on the JSE.*

5.3.4 Relationship between Carbon Emission Reduction and Financial Performance

Existing literature about carbon emission reduction and firm financial performance nexus is inconclusive (Rokhmawati et al., 2017). This section discusses empirical studies about carbon emission reduction and profitability nexus. There has been a rising interest in studies that focus on demystifying the link between these two variables (Rokhmawati & Gunardi, 2017). This is motivated by the fact that firms emit a lot of greenhouse gases during their production processes which causes severe damage to the environment. There is great scope for firms to realise high margins on their return on investment in carbon reduction initiatives (Carbon Disclosure Project, 2014). Horváthová (2016) concurs and elucidates that firms can largely benefit from minimising their emissions. The study argues that excess emissions are a sign of inefficiency. Hence, once a firm can attain efficiency by reducing emissions, it is more likely to enjoy cost benefits. However, the gains usually start to be well pronounced in the second accounting period because in the first year the firm is still recovering costs incurred in acquiring green technology (Horváthová, 2016).

Attaining carbon emission reduction confronts a firm with a trade-off of either incurring loss in the short run and enjoy huge profits and increased corporate value in future and vice versa. In support of the above assertion, Delmas et al. (2015) found that cutting down on carbon emissions can temporarily reduce financial performance in the first year but only to start increasing exponentially from the second year. More importantly, the study remarks that, regardless of the short-term fall or insignificant effect of carbon emission reduction on a firm's financial performance, interestingly, investors can project satisfactory performance in the firm's financial indicators using the Tobin's q. This proves to be a constructive recommendation to most firm's management who are predominated by short-term financial targets.

Existing evidence suggests that a firm can improve its financial performance by cutting down its carbon emission (Kiron et al., 2017). For instance, by cutting down its carbon emission by 22% in its supply chain, Walmart realised an incremental in its global profits by 4% (Kiron et al., 2017). This practical example shows that it is possible for firms to reap positive financial benefits from cutting on their emissions. High carbon emissions are associated with high level of inefficiency. In other words, a firm can derive much value from its production process by reducing carbon emissions. This entails excelling in operational efficiency which ensures that all wasteful methods are eliminated.

Empirical literature supporting a positive relationship between carbon emission reduction and financial performance

Fujii et al. (2013) used Japanese firms in the manufacturing sector to evaluate the effect of investing in environmental intiatives such as minimising emissions on the the financial returns of firms. The study found that successfully minimising emissions positively inffluences profitability of a business when ROA is used. Similarly, Charlo, Moya and Muñoz (2015) also discovered that enhanced financial returns are associated with firms actively involved in emissions minimisation.

Cucchiella et al. (2017) assessed carbon emission reduction and the effect on profitability. The study used large Italian firms. The results indicated that cutting down carbon emissions offers business sustainable benefits. Yu and Tsai (2018) concur and allude that efforts by a firm to cut down its carbon emissions improves its longevity and sustainability. This is because it is now crucial than ever to excel in environmental performance. For instance, in South Africa it is now mandatory for firms listed on the JSE to disclose their environmental impact and different measures employed to mitigate the impact. To show the seriousness of environmental responsible behaviour, the FTSE/JSE responsible investment index has been established to continuously evaluate firms on their ESG performance.

Lewandowski (2017) assessed whether emission reductions had an effect on the profitability of firms using 1640 international firms between 2003 and 2015. Lewandowski (2017) reported that emission reductions were directly linked to return on sales. The effect was stronger for companies which excelled in carbon emission reduction initiatives compared to the laggards. However, using Tobin's Q, the results showed a negative relationship. It can be deduced that in some instances, carbon reduction initiatives alone cannot successfully improve a firm's image from the lenses of investors. However, it takes a series of factors to jointly improve investors' future perception on the value of the firm.

Capece et al. (2017) scrutinised the link between reduction in emissions and financial performance of Italian firms. The results indicated that firms actively involved in initiatives to cut down emissions showed positive financial returns. Other studies have also concurred with the above findings and indicated that superior financial performance is attained when firms can keep their emissions at a lower magnitude (Busch & Hoffmann, 2011). The positive financial benefits accrue from a positive image gained by a firm due to being environmentally responsible. Additionally, low levels of carbon emissions might also mean that the firm's operations are efficient which cut costs in all areas within the firm leading to high levels of profitability.

Gallego-Álvarez et al. (2015) assessed whether emissions reduction was correlated with profitability in any manner using 89 companies over a 3year period. Essentially, Gallego-Álvarez et al. (2015) established that emission reductions were directly linked with excellent performance. This entails that a firm can maximise profits when they cut down their emissions. The cost savings can be because the firm can now operate without environmental penalties and lawsuits by environmental pressure groups.

Empirical literature supporting a negative relationship between carbon emission reduction and financial performance

Existing literature points to a strand of studies which advance the argument that a firm can realise more returns by not controlling its emissions. This line of thought adopts the traditional economics view that environmental participation is costly to the firm. Hence, the argument is that investing in technology and systems to cut carbon emissions can reduce the profits of the firm (Hatakeda, Kokubu, Kajiwara & Nishitani, 2012; Lee et al., 2016). In support of this view, Rokhmawati et al. (2017) reported that high emissions were directly related to profitability. This entails that firms still make gains from using fossil fuels because the legislation is too weak to make firms cut down their emissions. Hence, in the absence of a strong environmental legislation other firms may continue to make profits from unsustainable sources to power their industries and business operations at the expense of the environment.

Rokhmawati and Gunardi (2017) analysed how emissions are related to FP of listed Indonesian firms. The study established that excessive emissions were directly linked to superior FP. The study made an important analysis that in the case where implementing carbon emission reduction is expensive than non-participation, firms end up not heeding the call to cut down emissions. Hence, the argument was that environmental regulation should be executed and laggards should be punished if all firms are to participate in environmental protection initiatives.

Emperical literature supporting an insignificant relationship between carbon emission reduction and financial performance

Worae and Ngwakwe (2017) assessed the effect of environmental investments on a firms' financial prospects using listed companies and data from 2008-2014. Employing the Granger causality analysis, the results showed a unidirectional causal relationship. The authors argued that sometimes environmental sustainability commitment may not influence the profitability of a firm in any manner if it is not one of the key success factors in that particular industry. In that case either a weak or strong environmental commitment may not produce any result either positive or negative.

Neeveditah et al. (2017) explained an insiginificant relationship from their findings based on the fact that most firms only participate in carbon emission initiatives to the extent only required by the legislation. As such, this limits their potential to find innovative ways to cut emissions while simultaneously boosting their profits. However, a study by Wong, Lai, Shang, Lu and Leung (2012) argue that such a result can be because carbon emission reduction is difficult to measure and quantify so are the benefits.

On the other end, Trumpp and Guenther (2017) reported a u-shaped when emission reductions were tested against financial performance. Trumpp and Guenther (2017) argued that the level of environmental investment determines the direction of the relationship. The argument was that high environmental investments are hypothesised to result in a positive relationship and vice versa.

Misani and Pogutz (2015) also established that emission reduction had no effect on the profitability of a firm. Having used carbon intensive firms from 2007 to 2013 and testing emission reductions against the Tobin's Q, the findings suggested that investors will be indifferent on whether to invest in future or not. The study also noted that a firm is likely to record enhanced financial performance when carbon emission reduction is moderate as compared to when it is low or high. Based on the inconclusiveness of existing findings, there is need for more empirical research to clarify the nexus between carbon emission reduction and firm financial performance (Liu et al., 2016).

This study proposes that investing in technologies which cut carbon emissions increases the financial performances of firms. This is because firms can eliminate inefficiencies in their production systems which can result in positive ROE, ROA, earnings per share (EPS) and possibly an improvement in the share price and Tobin's Q emanating from investors attracted by firms which commit seriously towards environmental protection. Moreover, the author of this study is of the view that listed firms can earn green trust from green oriented stakeholders such as customers, the government and green investors which enhances the value of their shares. Green trust can help listed firms to sell their products/services at a premium which enhances financial performance. This is consistent with the empirical findings discussed above. The large part of the empirical literature posits that there is a positive and significant relationship between carbon emission reduction and financial performance. Hence, the following hypotheses are proposed:

$H4_1$: *There is a significant positive relationship between carbon emission reduction and the financial performance of firms listed on the JSE.*
$H4a_1$: *There is a significant positive relationship between carbon emission reduction and the ROE of firms listed on the JSE.*
$H4b_1$: *There is a significant positive relationship between carbon emission reduction and the ROA of firms listed on the JSE.*
$H4c_1$: *There is a significant positive relationship between carbon emission reduction and the EPS of firms listed on the JSE.*
$H4d_1$: *There is a significant positive relationship between carbon emission reduction and the Tobin's Q of firms listed on the JSE.*
$H4e_1$: *There is a significant positive relationship between carbon emission reduction and the share price of firms listed on the JSE.*

5.3.5 Relationship between Material Efficiency and Financial Performance

Exisiting empirical literature about material efficiency and its effect on firm success is seemingly sparse from both a developed country and developing countries' perspective. This area has been getting less attention as compared to other environmental sustainability variables, yet studies agree that material efficiency can allow a firm to excel in other environmental performance indicators. This is because material efficiency can lead to energy efficiency, water efficiency, waste reduction and carbon emission reduction which enable a firm to attain excellent financial performance. Hence, this study aims to close this lacuna and add value to the ongoing role on the importance of environmental performance. One way to motivate firms to particiapate in environmental initiatives is through solid evidence that excelling in environmental protection can enhance financial viability. To that effect, financial performance is introduced as a way to motivate managers to participate fully towards environmental protection.

Material efficiency is one of the widely suggested strategies to cut cost in an organisation and attain superior financial performance (Greenovate, 2012; Vinayagamoorthi, Selvam, Lingaraja & Rajesh, 2015; Boakye, 2018). A significant number of firms in Europe which have adopted this strategy reported enhanced financial performance. Cutting costs through material efficiency is sustainable and can give a firm unmatched competitive advantage by reducing resource scarcity risk. For instance, with widely documented fear of possible resource scarcity in terms of water and energy supply, firms which attain material efficiency will require less of these resources hence, bracing themselves for these unfavorable conditions which will see most firms closing shop (Greenovate, 2012).

According to Allwood et al. (2013), attaining material efficiency helps a firm to cut costs of production significantly by reducing the amount of raw materials and inputs required in the production process. The major savings are noticeable in the areas of energy savings and amount of water required to produce a unit of a product. Since energy and other raw materials bills constitute a significant amount of a firm’s cost, attaining material efficiency enables a firm to enjoy cost benefits (Allwood et al., 2013).

Fischer and O’Brien (2012) assessed the effect of material efficiency on financial performance. The study established that material efficiency positively influences financial performance. The effect was found to be high on return on sales. Fischer and O’Brien (2012) argued that material efficiency enables a firm to cut cost of raw materials and other related inputs. These cost savings are then passed to customers in form of low prices leading to high return on sales. More importantly, the study noted that investments in material efficiency may payback in approximately less than a year. Nevertheless, this may only hold in the context of “low hanging fruits” such as attaining material efficiency through material saving or recycling. The payback period for material efficiency maybe longer than a year in the context of more sophisticated strategies such as new light material designs.

A study by Unam (2012) reported that there is a strong positive link between material efficiency and profitability. “The implication of this is that through efficient management of materials, a manufacturing firm can achieve significant cost saving, improvement in production efficiency, and increase in profitability" (Unam (2012:50). This is because a significant amount of costs are hidden in materials. Hence, if a firm can attain efficiency through strict material handling, use of alternative materials and aligning the production process, it is guaranteed that such a business will record superior performance. According to Ong et al. (2014), firms with material efficiency policies and standards can manage their production systems well by ensuring that the material efficiency goal is shared in the entire supply chain. This enables the firm to eliminate costs associated with wasteful ways of production and be profitable (Unam, 2012).

In their study on Indian firms, Vinayagamoorthi et al. (2015) found that attaining material efficiency can send a strong signal to the government on the firm's environmental responsibility behaviour. This can allow the firm to get subsidies and funding from the government and other organisations which fund green initiatives. To that effect, material efficiency enhances the firm's overall financial performance. More importantly, a firm is able to mitigate risks associated with scarcity of resource while at the same time gaining green trust from its key stakeholders. Moreover, operating with lower resource inputs reduces the economic vulnerability to price volatility at the global level (International Resource Panel, 2018).

A recent report by International Resource Panel (IRP) (2017) assessed the economic implications of material efficiency. The report found that material efficiency enables a firm to have sustainable revenue streams which far outweigh the cost associated in initiating the material efficiency strategies. Material efficiency strategies such as light-weight design can boost the firm's sales which translates into superior financial performance (IRP, 2017). For instance, 21st customers prefer portability over bulkiness. Hence, a firm which leverages on product modification using light material and new design will likely grow its profit with a significant margin. If well executed, material efficiency can be used to differentiate the firm from its competitors and increase its market.

Empirical literature supporting a negative relationship between material efficiency and financial performance

Nevertheless, attaining material efficiency can be costly to a firm as it requires huge investments in technology and new product designs. These can come up with exorbitant costs, which negatively impact the financial performance of a firm. Additionally, there is scarcity of engineers worldwide. Hence, the few who are there are highly priced in the labour market making it difficult for a firm to secure their services for a long period of time.

The review of empirical literature above shows that there are more studies which found a positive and significant relationship between material efficiency and financial performance than those that found a negative relationship. This support the view that firms can benefit financially by attaining material efficiency. For example, using less material and using light weight material means the firm can produce more units with less material which can increase their profits. Essentially, firms can also increase the demand of their products by eliminating unwanted material. Moreover, with the rise of green consumerism, firms which produce products that are environmentally degradable can easily gain support from several stakeholders such as customers, environmental pressure groups and the government which can make the business profitable. Hence, this study proposes to test the following hypotheses:

$H5_1$: *There is a significant positive relationship between material efficiency and financial performance of firms listed on the JSE.*
$H5a_1$: *There is a significant positive relationship between material efficiency and ROE of firms listed on the JSE.*
$H5b_1$: *There is a significant positive relationship between material efficiency and ROA of firms listed on the JSE.*

$H5c_1$: *There is a significant positive relationship between material efficiency and EPS of firms listed on the JSE.*

$H5d_1$: *There is a significant positive relationship between material efficiency and Tobin's Q of firms listed on the JSE.*

H5e$_1$: *There is a significant positive relationship between material efficiency and share price of firms listed on the JSE.*

5.3.6 Relationship between Green Products and Services Innovation and Financial Performance

Green innovation in terms of green product designs allows a firm to renew its value proposition in the market resulting in a favourable position (Xue et al., 2019). According to Chen et al. (2016), green products can help firms to avoid costs associated with environmental penalties. In addition, green products can also open new markets for the firm by appealing to environmentally sensitised customers. For firms that consider growing, this can be a cost effective and sustainable expansion strategy. This is because green products present a new opportunity for firms to expand into new markets that have never been tapped before. Hence, a firm is able to broaden its future revenue streams leading to enhanced financial performance. This is discussed in the next section.

Green products development can be a sustainable mechanism for firms to cut costs (Cheng, Yang & Sheu, 2014; Kushwaha & Sharma, 2015). There is a consensus among studies from different industries that green product development initiatives such as eco-design, eco-labelling, product innovation and recyclable products result in enhanced financial performance (Leenders & Chandra, 2013; Lin, Tan & Geng, 2013; Dangelico & Pontrandolfo, 2015; Kushwaha & Sharma, 2015).

Ar (2012) adopted a survey method to assess the effect of green product innovation on profitability. The study adopted a questionnaire to collect data from 140 firms in Turkey. It emerged that green product innovation was positively related to financial performance. Moreover, the study established that firms can gain superior competitive advantage by investing in green products and services innovation.

Cheng et al. (2014) analysed the effect of eco-innovation and performance of Taiwanese firms. The study findings indicated that eco-product designs positively influence the performance of firms. Cheng et al. (2014) argued that innovation supports the recent green business models which are ideal in current markets characterised by green oriented customers. Furthermore, with the vastness of information and interactive platforms such as social media, customers are now easily accessing product and different company brand reviews. This means that a firm with negative reviews in terms of its product and services inability to meet the customers' green expectations is dropped right away.

Chen, Ngniatedema and Li (2018) proved that green initiatives were positively related to profitability by assessing green initiatives of firms in different regions. Even though the effect varied from one region to another, a positive relationship was established between green products innovation and profitability. Additionally, the study noted that the positive financial returns of green initiatives are usually realised in the long run. In the long, the firm could have recovered all the costs incurred in purchasing new machines, new technology and new product designs. These tend to strain the firm's cash flows in the short run.

In supporting the positive relationship hypothesis, Przychodzen and Przychodzen (2015) reported that green products and services innovation allow firms to earn higher profits which allows themto fund their growth. A similar study conducted in Brazil confirmed that green products and services innovation positively influence financial performance.

Empirical literature supporting a negative relationship

Some studies cite that green products services innovation can negatively affect the firm's profitability (Rexhäuser & Rammer, 2014). A significant amount of investment is required in new technology and process before implementing the design and production of green products and services. This may lead to significant cash outflows which might take long to recover.

Other studies are of the view that green products and services innovation strategies such as green packaging and eco-labelling can make the final price of the product unreasonably high. For instance, Orzan, Cruceru, Bălăceanu and Chivu (2018) analysed the effect of behaviour and attitudes of Romanian consumers towards green packaging. The study found that consumers may be discouraged from buying highly priced green products and continue buying less priced environmentally unfriendly products. This negatively impacts on the financial performance of the firm. Similarly, Seo, Ahn, Jeong and Moon (2016) assessed attitudes of customers towards green products. The findings showed that that green products increase the cost of production which is later passed on to customers in form of higher prices. This may drive away customers leading the business to run losses.

The author of this study is of the conviction that firms can benefit emensely by investing in green products and services. This is because several stakeholders such as customers, suppliers and investors prefer brands which excel in the green agenda. This means investors are prepared to pay a premium on shares for firms which excel in green issues because they anticipate that the business will continue to operate as a going concern into the forseable future. Performing well in terms of green products and services can also enable a business to score a positive rating from its customers which enhances its market value. Based on this, the following hypotheses are proposed:

H6$_1$: *There is a significant positive relationship between green products and services and financial performance of firms listed on the JSE.*
H6a$_1$: *There is a significant positive relationship between green products and services and ROE of firms listed on the JSE.*
H68$_1$: *There is a significant positive relationship between green products and services and ROA of firms listed on the JSE.*
H6c$_1$: *There is a significant positive relationship between green products and services and EPS of firms listed on the JSE.*
H6d$_1$: *There is a significant positive relationship between green products and services and Tobin's Q of firms listed on the JSE.*
H6e$_1$: *There is a significant positive relationship between green products and services and share price of firms listed on the JSE.*

5.3.7 Relationship between Environmental Compliance and Financial Performance

Environmental compliance plays a crucial role in the survival of a firm (Neeveditah et al., 2017). However, the effect of environmental compliance on financial performance is indistinct (Martín-de Castro, Amores-Salvadó & Navas-López, 2016). There is a need for more empirical studies to demystify this relationship especially from an emerging market perspective since the institutional environment might differ from that of developed countries so is the effect on financial performance (Riaz et al., 2019).

Existing empirical literature shows that environmental compliance in terms of environmental certification and being an ISO 4001 affiliate positively influence the financial performance of firms especially in emerging economies (Porter & Van der Linde, 1995; Hillary & Burr, 2011; Yang & Yao, 2012; Mensah, 2014) because ISO 4001 comes with efficient strategies to help a firm not just to comply but to eliminate inefficiencies. This drives the firm to innovate which significantly cuts its cost of production (He & Shen, 2017). Environmentally compliant firms are better positioned to increase their sales growth and market share which subsequently leads to superior financial performance (Atasu, Sarvary & Wassenhove, 2008). More importantly, environmental compliance through the adoption of international standards such as ISO 4001 positively influences the future value of a firm as indicated by a positive Tobin's Q (Jacobs, Singhal & Subramanian, 2010; Wahba, 2010). These two studies agree that environmental compliance improves the share price of the firm.

Empirical literature supporting a positive relationship between environmental compliance and financial performance

Lo, Yeung and Cheng (2012) investigated the effect of environmental compliance on financial performance. The study used adoption and implementation of ISO 40001 as a measure of environmental compliance. The sample firms were selected from the fashion and textile industry which are also heavy polluters and cause massive environmental damage. The findings revealed that the adoption of ISO 4001 standards positively influences financial performance. During the study, firms which adopted ISO 4001 standards recorded an increase in both return on assets (ROA) and return on sales (ROS). Lo et al. (2012) explained that the increase in profitability is attributed to enhanced efficiency of systems derived from the adoption of ISO 4001 standards.

Another strand of literature submits that a firm is likely to avoid costs which come with fines and penalties emanating from non-compliance. Even though the cost of maintaining an environmentally compliant status might be relatively high, fines and penalties emanating from environmentally irresponsible behaviour can be unbearable (Clark, Feiner & Viehs, 2015). For instance, BP is still haunted by a case emanating from the 2010 oil spill in the Gulf. In 2018, it was estimated that the total cost for the penalty might be approximately US$144.89 billion as compared to the US$62.59 billion reported in BP's financial statements (Gyo Lee, Garza-Gomez & Lee, 2018). Such a penalty can leave a firm with serious cash flow problems.

Furthermore, a firm is likely to avoid penalties and fines if they comply with environmental policies and standards such as ISO 4001 standards (Sorooshian & Ting, 2018). Environmental compliance enables firms to attain operational efficiency in terms of meeting quality requirements and product specifications which improve the firm's competitive advantage in the entire industry (Boakye, 2018). Recently, the supply chain has been greatly transformed where environmental compliance is the first consideration that suppliers check if they are to consider you as their supply chain partner or customer. This entails that firms which do not comply are likely to have outdated business models which augments chances of business failure.

A study by De Jong, Paulraj and Blome (2014) unpacked the inconclusiveness of studies linking ISO 14001 certification and financial performance in both the short and long run. The study found that ISO 14001 certification improves the financial performance of a firm in both the short and long run. More importantly, the increase in financial performance was well pronounced in the long run than in the short run. When comparing firms with ISO 14001 certification and firms without, the study found that firms with ISO 14001 certification report positive financial performance than their counterparts.

Firms that proactively invest in environmental systems get a chance to innovate and harvest financial returns from such investments (Neeveditah et al., 2017). Additionally, attaining excellence in environmental compliance is linked to positive corporate image and favourable brand reviews (Murphy, 2002), which leads to enhanced financial performance. When a firm is viewed as environmentally sensitive, it gains legitimacy from the perspective of its customers and society at large. This enables the firm to sell its shares at a premium which increases its profitability (Jabbour, Santos & Nagano, 2008).

Afagachie (2013) weighed on the nexus between environmental sustainability and financial performance. The study employed a mixed methodology where both the quantitative and qualitative research methodology were adopted. The findings of the study revealed a positive relationship between environmental policy and financial performance.

Empirical literature supporting a negative relationship between environmental compliance and financial performance

The adoption of international environmental standards such as ISO 4001 negatively affects financial performance (Miroshnychenko et al., 2017). Environmental compliance is costly to a firm as investments in technology and environmental compliance certificates drain the cash flows of a firm in the short run. Boakye (2018) investigated the relationship between environmental sustainability of firms listed on the AIM in UK. The study utilised SMEs as the sample. The results of the study revealed a negative relationship between environmental compliance and financial performance as measured by Tobin's Q. Boakye (2018) underscored that the negative relationship established between environmental compliance and financial performance might be because SMEs do not fully invest in environmental systems such as ISO 4001 and other environmental certifications. This inversely impacts on their efficiency which translates into a negative market valuation by potential investors.

Empirical literature supporting an insignificant relationship between environmental compliance and financial performance

Another line of thought argues that attaining environmental certification especially in the context of developing countries does not really add value to the firm (Riaz et al., 2019). The argument is that most investors are still driven by the profit maximisation goal that the issue of environmental compliance is treated as secondary. On the other end of the of the spectrum, stakeholders such as customers react negatively to environmental certifications as they still perceive it as one of the marketing gimmicks used by firms to increase sales without necessarily adding value towards environmental protection (Riaz et al., 2019). Riaz et al. (2019) further note that environmental policies in emerging markets are still weak and rarely enforced which makes most firms not to commit as they see their non-compliant counterparts doing well and unpunished. The few firms which comply does so based on mimetic and isomorphic pressure in the market. Consequently, firms end up not attaining superior performance because they do not innovate beyond the level deemed as compliant.

Other studies note that most firms adopt ISO 14001 certification as a strategy to gain legitimacy from the society (Boiral & Henri, 2012). In fact, these firms do not implement the efficiency driven strategies as stipulated by the ISO 4001. “In return, as firms fail to execute these standards over time, their projected efficient advantages based on the implementation reduce, and the response of the investors consequently deteriorates” (Riaz et al., 2019:4). The symbolic approach to ISO 4001 adoption can negatively affect the image of the firm as it is usually treated as deception and malpractice by stakeholders (MacLean, Litzky & Holderness, 2015). Hence, ISO 4001 certification does not bring any tangible financial benefits if it is adopted for wrong reasons other than its efficiency enhancing purpose.

Naila (2012) analysed the relationship between environmental compliance and financial performance of firms listed on the Dar Es Salaam Stock Exchange. The study used capital expenditure on pollution control technology and ISO 14001 certification to measure environmental compliance. Financial performance was measured using return on investment (ROI). The findings of this study established no relationship between environmental compliance and financial performance. This means that firms neither make losses nor profits by complying with environmental regulations (Naila, 2012).

He, Liu, Lu and Cao (2015) assessed the effect of ISO 14001 adoption on the performance of Chinese firms. The nexus between ISO 14001 adoption and financial performance was found to be insignificant. The study indicated that the adoption of environmental standards such as ISO 4001 increases the firm’s cost which impacts negatively on the profitability. Nevertheless, the study established that a firm can still enjoy other non-financial benefits which come with a full environmental compliance status.

Even though there is divergence on the findings related to the relationship between environmental compliance and financial performance, the greater part of the empirical literature supports the view that there is a significant and positive relationship between environmental compliance and financial performance. The author of this study also believe that firms can unlock financial benefits if they can comply with environmental policies. Essentially, firms can enhance their profitability by investing beyond just compliance as this can allow them to benefit from environmental investments such as ISO 14001 and internal environmental policies. Consistent with the Porter hypothesis, the author of this study argues that environmental compliance can help listed firms to be proactive and find creative ways to reduce costs and boost their profitability as measured by EPS. The major argument derived from the Porter hypothesis is that environmental pollution is clear evidence that the firm's operations and processes are highly inefficient. Additionally, if the firm incurs costs because of committing to environmental sustainability initiatives means the firm is doing it for compliance only for which it can achieve better cost savings benefits by being proactive and innovative. Firms which are viewed as legitimate by their different stakeholders such as the community, customers and investors can boost profitability by selling their green products at a premium. Furthermore, firms which excel in environmental compliance are likely to attract favorable ratings from the market which can boost the value of their shares and hence, an appreciation in their share price. Against this backdrop, the following hypotheses are stated:

$H7_1$: *There is a significant positive relationship between environmental compliance and financial performance of firms listed on the JSE.*

$H7a_1$: *There is a significant positive relationship between environmental compliance and ROE of firms listed on the JSE.*

$H7b_1$: *There is a significant positive relationship between environmental compliance and ROA of firms listed on the JSE.*

$H7c_1$: *There is a significant positive relationship between environmental compliance and EPS of firms listed on the JSE.*

H7d$_1$: *There is a significant positive relationship between environmental compliance and Tobin's Q of firms listed on the JSE.*

H7e$_1$: *There is a significant positive relationship between environmental compliance and share price of firms listed on the JSE.*

5.3.8 Relationship between Stakeholder Engagement and Financial Performance

Stakeholder engagement in the context of environmental sustainability has started to gain momentum recently (Laari et al., 2016; Miroshnychenko et al., 2017). Most studies have used green supply chain management (GSCM) to describe stakeholder engagement. GSCM practices involve actions taken by the firm to influence suppliers and customers as end users of products to participate in environmental sustainability initiatives (Miroshnychenko et al., 2017). GSCM initiatives include agreements on green product designs, environmental communication, type of material to be used in the supply chain and collaborations between the firm, suppliers and customers (Golicic & Smith, 2013; Laari et al., 2016). Such collaborations enable the firm to enjoy first mover advantages which results in superior financial performance (Dangelico & Pontrandolfo, 2015). More importantly, stakeholder engagement through GSCM increases the firm's share price (Bose & Pal, 2012). This entails that intentions and actions by a firm to collaborate with its stakeholders such as suppliers and customers enhance the firm's market value (values (Laari et al., 2016; Parida & Wang, 2018). It follows that stakeholder engagement positively influences market-based measures of financial performance.

The ability of a firm to successfully manage its stakeholders manifests in a health financial performance (Ramakrishnan, 2008). Ramakrishnan (2008) found that firms which continuously build relationships with their stakeholders get favourable brand ratings which improves their share price in the long run. Satisfied stakeholders are likely to be brand ambassadors of the firm which positions it as the best in relation to its competitors.

Recently, the focus has shifted from sorely depending on attaining excellence on the tangible assets side to more value creation through developing symbiotic relationships (Hack, 2017). Building symbiotic relationships with stakeholders enables the firm to sustain its positive financial performance (Laughland & Bansal, 2011). Moreover, maintaining health relationships with stakeholders assures the firm of continued support even in times of financial distress (Laughland & Bansal, 2011). For instance, with many listed companies filing for business rescue due to financial problems in South Africa, the business rescue process becomes easy if the firm has strong relationships with its stakeholders such as banks and suppliers. In the case of such a strong relationship, banks can extend post commencement funding to the firm while suppliers can extend trade credit facilities, hence, allowing it to bounce back.

Empirical literature supporting a positive relationship between stakeholder engagement and financial performance

Golicic and Smith (2013) conducted a study over a 20-year period. The aim was to evaluate the nexus between GSCM and financial performance. The study established a significant positive relationship between the GSCM and financial performance. It was deduced that stakeholder engagement through GSCM enhances the firm's market valuation by investors. Geng, Mansouri and Aktas (2017) investigated the effect of GSCM and performance using Asian firms. The study was meta-analytic and assessed 50 articles on GSCM. The findings revealed that GSCM positively influence financial performance. "Intangibles like trusting relationships with suppliers, employee learning and growth, reputation and goodwill are key drivers of corporate competitiveness and profitability" (Ramakrishnan, 2008:4).

Internal stakeholders such as employees also play a crucial role in influencing the viability of environmental sustainability initiatives adopted by a firm (Muposhi & Dhurup, 2016). Firms that wish to yield positive financial performance from environmental sustainability initiatives should collaborate with their employees from the onset. Through training and development, employees can be green ambassadors of the firm, which enhances brand value and loyalty from the perspective of its customers (Muposhi & Dhurup, 2016). This consequently drives sales up as employees are capable of clearly communicating the benefits of green initiatives to customers.

Excellence in stakeholder communication can also positively impact on firm financial performance (Boakye, 2018). All stakeholders do not prefer to be left in the dark regarding the operations of the firm (Lannelongue et al., 2015). Firms which continuously engage their stakeholders through newsletters, memos and through their websites are likely to gain trust and loyalty from stakeholders (Boakye, 2018). This can attract investors in the company and suppliers which gives the firm an unmatched competitive advantage. Constant stakeholder engagement makes investors to perceive the firm as transparent (Cheng et al., 2014). In the case of listed firms, transparency is one of the crucial factors which assist investors in deciding whether to invest in that company or not. Based on that, Cheng et al. (2014) reported that stakeholder engagement is positively related to financial performance. Additionally, Lannelongue et al. (2015) remark that when a firm invests in stakeholder communication, this enhances their environmental sustainability initiatives through stakeholder feedback, support and buy in. This translates into superior financial performance and sustainable competitive advantage (Lannelongue et al., 2015).

Stakeholder engagement enhances the longevity and financial performance of a firm (Haninun et al., 2018). Stakeholders possess the resources required by a firm to execute its environmental sustainability initiatives (Laughland & Bansal, 2011). The Resource Based View (RBV) theory submits that having access to key resources gives a firm a competitive advantage over others. For instance, a firm requires new technology from suppliers while at the same time it is its employees who will ensure that the new technology is accepted. Hence, when stakeholders are continuously engaged on environmental related issues and projects which the firm plans to execute, they are likely to support the firm. This unlocks value and sustainable synergies which translates into superior financial performance. This view is supported by the Signaling theory which explains that management should share relevant information with its stakeholders to eliminate information asymmetry. When such is achieved, the firm is likely to enjoy momentus benefits in terms of financial performance which spans into the long run (Haninun et al., 2018).

According to the Legitimacy theory, excelling in stakeholder engagement improves the legitimacy of the firm from the perspective of the society (Dowling & Pfefeer, 1975). When synchronisation between the values of the firm and that of the society is attained, the firm gets approval from the society on its environmental sustainability initiatives. Given how strong the society is becoming in South Africa, firms which continuously engage this group of stakeholders attains its financial goals by avoiding lawsuits and product boycotts. Recently, there have been massive strikes within mining communities in South Africa where local communities complained that their rights were undermined by these companies. This practically shows that if a firm fails to engage the society, then chances of business closure are imminent. Improving a firm's legitimacy through stakeholder engagement can enhance the value and image of the firm which translates into a superior competitive advantage.

Empirical literature supporting a negative relationship between stakeholder engagement and financial performance

Nevertheless, some studies argue that stakeholder engagement can bring unnecessary costs to the firm which can weaken its profitability (Eunice, 2014; Jones, Harrison & Felps, 2018). The argument is that stakeholder engagement especially for green initiatives require huge investments of money. Hence, given the stiff competition that listed firms encounter, this can negatively affect the firm resulting in losses (Eunice, 2014). In support of the negative relationship between stakeholder engagement and financial performance, other studies argue that investment in stakeholder initiatives can disadvantage them in terms of resource allocation (Zhong, 2013). This is usually the case in most emerging markets where environmental policy and regulations are relatively weak. This means that non-participating firms will remain better off at the expense of their counterparts who take environmental sustainability issues seriously.

Stakeholders may also have different needs which may make the firm to lose focus on its main goal. There is also a tendency by management to fund their personal interests in the name of stakeholder engagement. This negatively impacts on the financial performance of a firm (Cennamo, Berrone & Gomez-Mejia, 2009). Dam and Petkova (2014) investigated the relationship between stakeholder engagement in the form of collaboration on environmental sustainability initiatives between the firm and its suppliers. The study found that stakeholder engagement in this case was negatively related to financial performance as measured by share price. The argument behind such a result was that markets can respond negatively to announcements by a firm that they are engaging in environmental sustainability initiatives. This is because most stakeholders associate such moves with greenwashing (Griese et al., 2017; Khandelwal et al., 2019).

Empirical literature supporting an insignificant relationship between stakeholder engagement and financial performance

Evidence from existing literature shows that there are limited studies which reported an insignificant relationship between stakeholder engagement and financial performance. Most empirical findings are scattered around the positive and negative relationship between the two variables. Among the few which reported an insignificant relationship is a study by Zaccheaus, Oluwagbemiga and Olugbenga (2014), who analysed the relationship between stakeholder engagement and financial performance. The study used Nigerian listed firms and established an insignificant relationship between stakeholder engagement on environmental issues and financial performance as measured by share price.

Stakeholder engagement is very crucial towards a firm's success especially regarding environmental investments. Initiatives such as stakeholder communication, collaborating with stakeholders on environmental sustainability initiatives and stakeholder feedback can enable a firm to unlock value which can enhance financial performance. Moreover, the resources required by firms to pursue environmental sustainability initiatives are locked among key stakeholders such as investors, suppliers and the government. Thus, firms which can successfully signal strong messages to stakeholders that they are genuinely commited towards environmental sustainability initiatives are likely to get enough support from various stakeholders which enhances their profitability. Also, a well executed stakeholder engagement strategy can help listed firms to attract a favourable rating from stakeholders which enhances the future value of the business as measured by the Tobin's Q. Moreover, active stakeholder engagements can help firms to send strong signals about their environmentally responsible behaviour which can earn them green trust from stakeholders which enhances their image. Firms with a positive image can command a premium on their products because of the goodwill the brand has. This stands a low hanging fruit strategy to enhance financial performance. Essentially, stakeholders' perceptions of the firm have a bearing on the market performance of the brand so as the share price. Based on the above evidence, this study hypothesis that:

$H8_1$: *There is a significant positive relationship between stakeholder engagement and financial performance of firms listed on the JSE.*

$H8a_1$: *There is a significant positive relationship between stakeholder engagement and ROE of firms listed on the JSE.*

$H8b_1$: *There is a significant positive relationship between stakeholder engagement and ROA of firms listed on the JSE.*

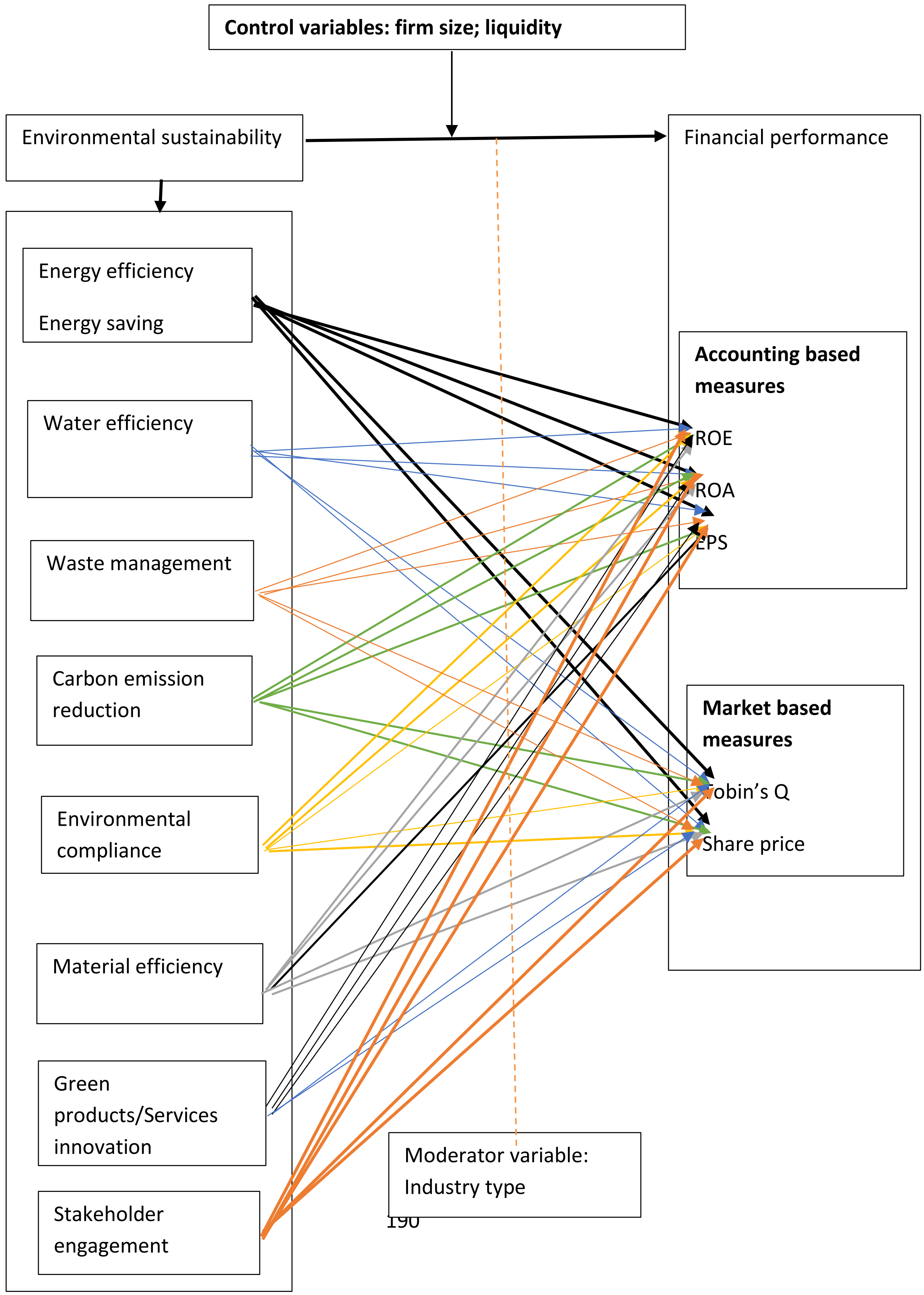
$H8c_1$: *There is a significant positive relationship between stakeholder engagement and EPS of firms listed on the JSE.*

$H8d_1$: *There is a significant positive relationship between stakeholder engagement and Tobin's Q of firms listed on the JSE.*

$H8e_1$: *There is a significant positive relationship between stakeholder engagement and share price of firms listed on the JSE.*

5.4 CONCEPTUAL FRAMEWORK

Figure 5.1: Proposed framework: Link between environmental sustainability and financial performance of firms listed on the JSE



Source: Author compilation (2020)

As indicated in figure 5.1 above, environmental sustainability as measured by energy efficiency, water efficiency, waste reduction and carbon emissions reduction will be tested against financial performance variables such as ROE, ROA, EPS, share price and Tobin's Q. Adopting a multi-deminsional measure of both the independent and dependent variable can enhance the quality of the findings. This was missing in existing studies which tested this relationship before. Hence, this comprehensive model linking environmental sustainability variables and financial performance can enable the researcher to test new variables which can produce new knowledge as well as adding value theoretically. Furthermore, this allows the researcher to test and single out the specific environmental sustainability variables which significantly and positively influence financial performance which will go a long way in assisting managers to make decisions regarding environmental sustainability investments. The model also incorporates industry type as a moderator variable which help to understand the mechanism through which the link between environmental sustainability commitment and financial performance can be strengthened.

5.5 SUMMARY

The major purpose of this chapter was to assess if environmental sustainability commitment translates into improved financial performance. Environmental sustainability was measured using energy efficiency, water efficiency, waste management, carbon emission reduction, material efficiency, green products and services innovation, environmental compliance and stakeholder engagement. Each of these variables was linked to measures of financial performance. Mixed findings were found in the existing empirical literature. This broadens the debate on whether environmental sustainability commitment may influence firm profitability. This chapter draws the conclusion that more new evidence is required to enrich the existing findings. The next chapter will unpack the research methodology adopted in this study.

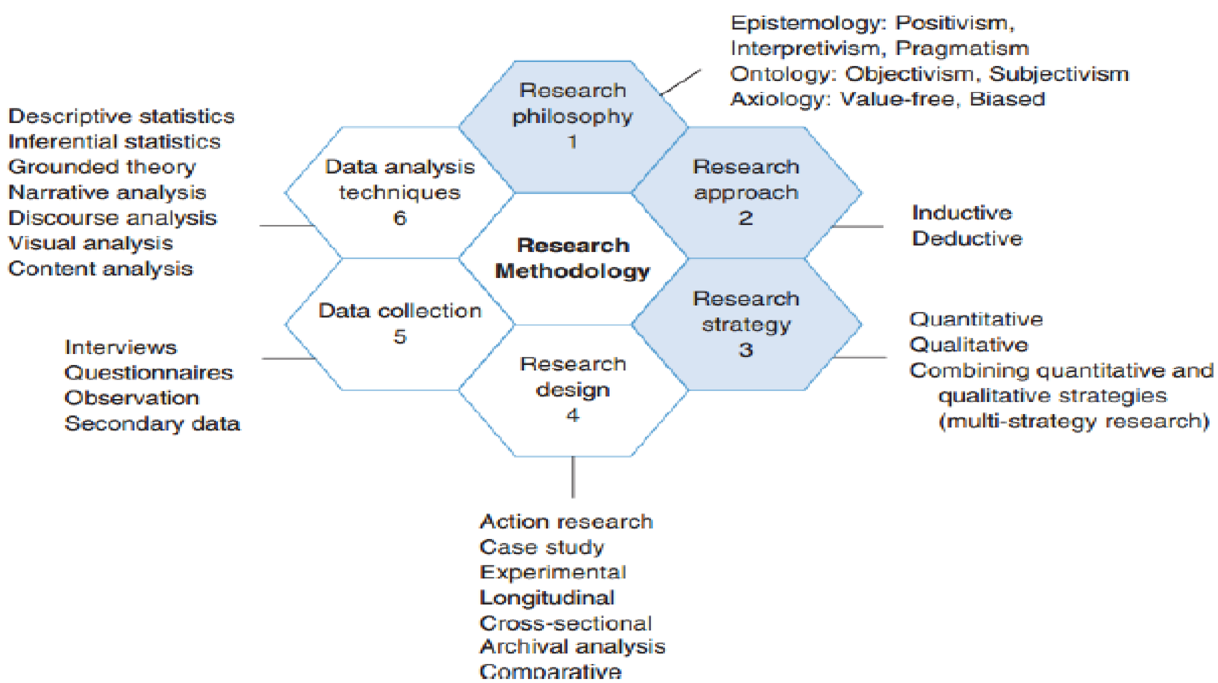
CHAPTER 6

RESEARCH METHODOLOGY

6.1 INTRODUCTION

It is crucai to provide a detailed methodology on how the researcher went out to gather the data and process it to answer the research problem. Hence, this chapter intends to unpack the research methodology to provide readers with a step by step process adopted to answer the research questions. This is intended to provide a roadmap on how to achieve the research objectives. A research methodology details all the crucial steps taken by the researcher to conduct the study. The chapter starts by discussing the different research philosophies which inform the research approach and research design adopted in this study. The honeycomb of research methodology is going to be used to guide the methodology of the study.

Figure 6.1 The honeycomb of research methodology



Source: Wilson (2014)

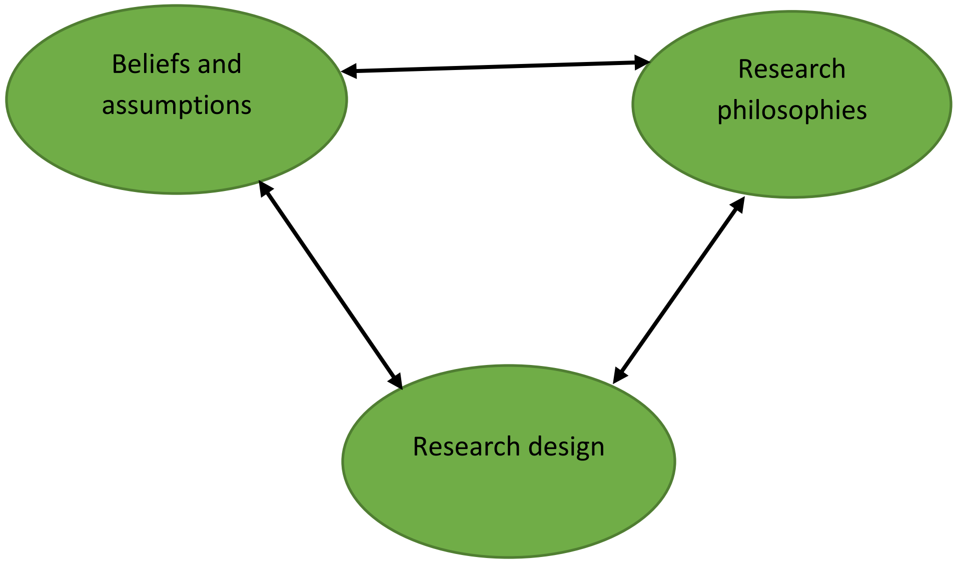
Figure 6.1 shows the honeycomb of research methodology used to guide the methodology of this study. The research methodology of this study will adopt each of the steps from the honeycomb of research methodology.

6.2 RESEARCH PHILOSOPHY

All research conceptualisation is guided by certain key assumptions (Antwi & Hamza, 2015). Unknowingly, when researchers engage in research, there are basic assumptions that guide them to choose a certain topic over others, developing research questions and finally choosing the type of methodology they intend to use (Saunders & Lewis, 2012). These assumptions can be epistemological, ontological and axiological assumptions.

Epistemological assumptions describe knowledge and how it is understood, captured and shared. The important consideration under epistemological assumptions is that the researcher should identify what is acceptable in that field of study (Antwi & Hamza, 2015). Knowledge accrues over time and should be testable for it to qualify as knowledge that can be shared in a certain field. Ontological assumptions explain how researchers interpret reality. Reality is construed differently based on the field of research and it shapes one’s philosophy and the entire methodological process (Antwi & Hamza, 2015). For instance, a researcher whose ontological assumptions are derived from the natural sciences, tend to adopt the positivist research philosophy while those who believe that reality can be shaped subjectively can adopt the phenomenology research philosophy. Axiological assumptions deal with values and ethical behaviour of the researcher. Ethics form a crucial element of quality research. How individuals conduct themselves and others in pursuing their research should be bound by ethical values. The issue of ethics in research is discussed in detail in section 6.12 of the methodology. The above discussion suffices to say that all research is shaped by one’s assumptions on existing knowledge, how they construe reality and as a product of one’s values. One’s values are crucial in determining the research philosophy and data collection methods chosen by the researcher. More importantly, values and ethics also determine the integrity of the research (Saunders & Lewis, 2012). It follows that the ability to combine this set of assumptions helps the researcher to produce a marvel research.

Figure 6.2: Research philosophy development



Source: Saunders and Lewis (2012)

Figure 6.2 shows how a research philosophy is developed. Each of these underlying assumptions determines the research philosophy adopted by the researcher. Saunders and Lewis (2012) identify positivism, critical realism, interpretivism, postmodernism and pragmatism as research philosophies in research. Other studies argue that there are two main research philosophies which are the positivism and the interpretivism philosophies (Creswell & Creswell, 2017; Bell, Bryman & Harley, 2018). Nevertheless, all five research philosophies will be discussed in the next section after which the best research suited for this study is selected.

6.2.1 Positivism

The positivism philosophy argues that knowledge is objective and quantifiable (Antwi & Hamza, 2015). According to Saunders, Lewis and Thornhill (2019), in terms of ontology, an independent view is adopted while, epistomogically the proponets adopt cause and effect grounded in scientific perspectives. Bell et al. (2018) assert that the positivism approach is centred on the scientific approach which believes that natural science can be applied to social sciences as well to make generalisations. In this philosophy, the proponents believe that reality can be objectively construed and that the information about a phenomenon can easily be collected with no researcher intervention (Creswell &

Creswell, 2017). This suffice to say that the researcher's role is limited to distribute a data collection instrument and to leave the participants to complete it on their own. This explains value free axiology used in positivisim where the researcher is totally detached from the participants (Saunders et al., 2019). Consequently, observations and experiments tend to be major instruments used by positivist researchers. Furthermore, the positivism philosophy is based on theories that are used to guide quantitative studies.

6.2.2 Critical Realism

This philosophy is based on the structured ontology which forms the lenses to understand what is seen and experienced (Saunders et al., 2019). The critical realism believes in the independence of reality and that it is beyond what we may perceive as true. In terms of epistemology, critical realism is based on the understanding that reality is historically construed. To understand a research phenomenon, critical realists embark on two crucial steps which are; relying on the senses to observe something and create experiences from it. The second step involves cognition where the mind is activated to recall past events which can help in understanding what could have caused what was observed. Thus, critical realism argues that what is first observed is just but empirical evidence, hence, understanding actual reality may require backward mental processing (Saunders et al., 2019). Therefore, this implies that depending on emeprical evidence only in research is not sufficient in the view of critical realism. Based on the understanding that reality about organisational circumstances can be derived from structured historical events, critical realists often adopt epistemological relativism where they can be subjective inorder to fully understand the phenomenon. In terms of axiology, critical realism philosophy acknowledges that issues of bias maybe common in understanding a phenomenon, hence, the emphasis on objectivity to eliminate bias (Saunders et al., 2019).

6.2.3 Interpretivism

The interpretivism research philosophy is an antagonist to the positivist research philosophy. The interpretivism philosophy is subjective in nature (Saunders & Lewis, 2012) and is driven by the desire to understand human behaviour (Bell et al., 2018). It employs qualitative research methods to help understand and explain human behaviour.

This philosophy is of the view that reality cannot be understood from a natural science perspective but requires a strong researcher's participation and engagement with the participants so as to better understand how they construe reality which basically explains their ontology (Saunders et al., 2019). Based on this stance, the interpretivism philosophy proponents argue that it is mainly through the understanding of one's feelings, emotions and attitude as well as body language that reality can be shaped and clearly explained (Bell et al., 2018). In the context of business organisations, Saunders et al. (2019) submit that interpretivism is based on the understanding that human beings are unique based on their cultural, language and historical backgrounds which entails that researchers should immerse themselves in the context of participants if they are to derive meaningful conclusions. Based on that interpretivism is further broken into; phenomenology which tries to understand the experiences of participants, while hermeneuticists use cultural underpinnings to understand reality by investigating the beliefs, norms and symbols and symbolic interactionists derive meaning and reality by observing participants in social gatherings or meetings. The epistemology in interpretivism is based on narrations and understanding of unique stories from the participants. In terms of axiology, interpretivism is imbedded in values as the proponents believe that their core values play a significant role in enhancing the rigour of research since the research process requires them to be actively immersed in the research context.

6.2.4 Postmodernism

Postmodernism is premised on the power of language to question commonly acceptable concepts and uncover suppressed views (Saunders et al., 2019). Thus, this philosophy challenges the assumptions of positivism and argue that a phenomenomenon cannot be understood fully based on the objective view but through flexible and unstructured ways. In terms of ontological perspective, postmodernism argues that reality is social contructed through power relations. Because of power imbalances some reality may end up dominant while others are suppressed. Thus, the epistemology of postmodernism is based on uncovering hidden reality, suppressed voices and texts by challenging commonly accepted reality which became dominant due to power relations (Saunders et al., 2019). As such, the postmodernism philosophy is premised on deconstructing what is accepted as reality in order to validate the truth that has been marginalised (Derrida, 2016). This is achieved by questioning the power relations that have approved and sustained that reality (Saunders et al., 2019). Ideally, under this philosophy, researchers are encouraged to investigate and deconstruct existing data, knowledge and theories in order to validate and legitimised previously overlooked truth and reality. In terms of axiology, there is strong emphasis on values, but it is based on power relations between the researcher and the participants.

6.2.5 Pragmatism

The pragmatism philosophy is based on the idea that research is only useful if it can result in action (Saunders et al., 2019). Also, this philosophy endeavours to make both the objective and subjective perspective useful by basing its assumptions on theoretical underpinnings, ideas and hypotheses which are all premised on leading to practical actions. Ideally, pragmatist researchers quest to investigate a phenomenon is informed by a glaring exisiting problem which requires a tangible solution. To identify that a problem exists in the current knowledge, the pragmatists may start doubting it which then pushes them to initiate a concept which can successfully lead to action. Based on the desire to derive practical solutions, a pragmatic research may incorporate both the objective and subjective approach to gather quality data.

Research philosophy adopted in this study

This study is informed by the positivist research philosophy. The positivist research philosophy was adopted over the other philosophies because of its key assumptions which were perfectly suited to this study. For example, the researcher expected to adopt an independent ontological assumption by minimising interaction with participants, while adopting an epistemological assumption which is grounded in the scientific field where causal relationships were to be tested between environmental sustainability commitment and financial performance of firms listed on the JSE. Another important consideration to adopt the positivism philosophy was its axiology assumption where the researcher's values were not necessary in determining the research outcomes since independence with participants was maintained. Ideally, since the study aimed to make generalisations based on the processed quantitative data, it was crucial to adopt the positivism philosophy. This is supported by Adams and Lawrence (2018) who stated that the positivism philosophy is ideal when the researcher intends to make generalisations from the findings. Moreover, the positivism philosophy was adopted since the study intended to employ a quantitative research methodology to collect, analyse and make generalisations from the results.

6.3 RESEARCH APPROACHES

There are basically two research approaches: the deductive and the inductive approaches (Saunders & Lewis, 2012; Babbie, 2013; Antwi & Hamza, 2015). These two research approaches are linked to different research philosophies discussed above. A deductive approach uses literature to construct a conceptual framework/theory that will be tested through a set of data while an inductive approach collects data first and formulate a theory from the findings (Creswell & Creswell, 2017; Bell et al., 2018).

Table 6.1: Comparisons between the deductive and inductive research approaches

DEDUCTIVE APPROACH	INDUCTIVE APPROACH
Is informed by an existing theory which is tested	A theory is conceptualised after the findings
Utilises quantitative data	Utilises qualitative data
Researcher independence	The researcher is fully engaged in the entire research process
Takes a structured approach	Takes a flexible approach to accommodate changes encountered in the research process
Generalisability is emphasised	Generalisability is not important

Source: Wilson (2014)

On that note, in deductive approach, the researcher intends to approve or disapprove an already known theory on the basis of the phenomenon being investigated whereas the inductive approach is used when the researcher intends to investigate relationships from the primary data after which they can build a theory to explain that phenomenon (Wilson, 2014). The deductive approach is linked to scientific research (Saunders & Lewis, 2012), while the inductive approach is linked to the qualitative research which is subjective in nature (Creswell & Creswell, 2017).

In this study, the deductive approach was adopted. This study was informed by the Stakeholder theory and the Legitimacy theory. Hence, the deductive approach made it possible to test the applicability of these theories in the relationship between environmental sustainability and financial performance of JSE listed firms. Particularly, through the deductive approach, the Stakeholder theory was tested by evaluating how stakeholder engagement affects financial performance of the listed firms. Furthermore, the deductive approach was chosen because the study intended to test different hypotheses formulated to test the relationship between environmental sustainability and financial performance. This is supported by Collins (2010), who explains that a deductive approach is more suitable when the researcher intends to test for possible associations among variables. According to Gray (2013), the testing of the hypotheses is informed by already existing patterns of reality which the findings of the research will confirm, disapprove or make modifications. This approach was adopted following similar studies (Mans-Kemp, 2014).

6.4 RESEARCH STRATEGY/METHOD

The quantitative and qualitative research are the major research strategies/methods identified in existing literature (Wilson, 2014; Bell et al., 2018). The qualitative research strategy is defined as a method characterised by textual data and is subjective in nature (Antwi & Hamza, 2015). The qualitative research design is used when the researcher intends to gain insight into the feelings, emotions and observable behaviour from the participants about a phenomenon (Wilson, 2014). Furthermore, the qualitative research is associated with the inductive research approach.

The present study used the quantitative research strategy. Patten and Newhart (2017) define quantitative research as a strategy which utilises statistical methods to gather and analyse data. The quantitative research methodology has its roots in the natural sciences

(Antwi & Hamza, 2015) and is linked to the deductive research approach (Wilson, 2014). It was used because it made it easier for the researcher to generalise findings given that the data is quantifiable and statistical in nature. The objectivity nature of a quantitative research design also makes it a preferred design by most scientists. The essence of a quantitative research design is in its use of numeric data and its systematic approach to answer research questions and test hypotheses (Walliman, 2017). According to Wilson (2014), the quantitative research strategy has an advantage that the researcher can be able to collect a bigger sample which makes it possible for generalisation. In this study, the researcher intended to use a sample size of 100 firms, hence, this was only possible when using the quantitative research strategy. Furthermore, this study started with theories such as the stakeholder theory and the legitimacy theory which were later tested to check their applicability in explaining environmental sustainability commitment by firms listed on the JSE.

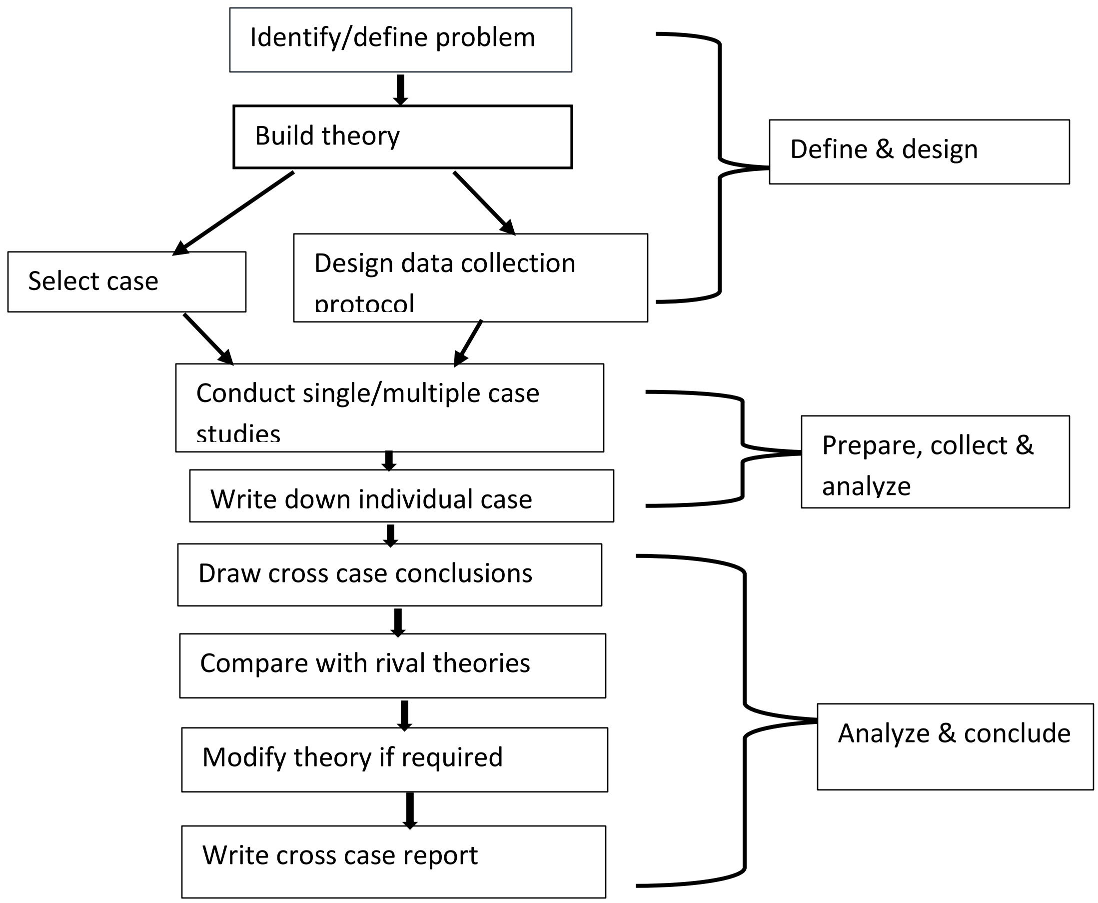
6.5 RESEARCH DESIGN

A research design integrates all units of a research report into a single logical piece (Cooper & Schindler, 2013). A research design details all the steps required to conduct research (Creswell & Creswell, 2017; Blaikie & Priest, 2019). It is crucial for a researcher to pick the rightful design for their study (LoBiondo-Wood & Haber, 2017). The choice is usually informed by objectives and hypotheses of the study.

6.5.1 Case study research design

This study used a multiple case study design. A case study is defined as the assessment of a problem from a targeted set of organisations that are perceived to possess the characteristics of the problems being investigated (Creswell & Creswell, 2017). To achieve the objectives of the study and to meet the population size required for a doctoral study, this study used 100 firms listed on the FTSE/JSE. This enabled the researcher to attain the number of observations that were perceived as sufficient to thoroughly investigate the environmental sustainability financial performance conundrum in South Africa. The multi case study research design is widely used in studies linking environmental sustainability to financial performance (Boakye, 2018).

Figure 6.3: Case study design steps



Source: Teegavarapu, Summers and Mocko (2008)

Figure 6.3 shows recommended steps to be taken by researchers adopting the case study design (Teegavarapu et al., 2008). Teegavarapu et al. (2008) suggested that a case study research design should be conducted in three major phases which are (1) define and design, (2) prepare, collect and analyse, and (3) analyse and conclude. Each of these key phases has sub steps as will be discussed below. According to Teegavarapu et al. (2008), the logic behind following these steps is to ensure consistency during data collection which will ultimately have an influence on the final results.

Phase 1: Define and design

Phase 1 of the case study research design consists of a series of steps. The researcher has to start by identifying the research problem. When using the case study research design, the researcher should start with a clear definition of the research problem

(Teegavarapu et al., 2008). Such an approach enables the researcher to answer the “how and why” questions associated with the case study research design. The research problem of this study was the unsatisfactory environmental sustainability commitment by firms listed on the JSE. Hence, using the multiple-case study research design it, was crucial to investigate why firms are slow to adopt environmental sustainability initiatives. Furthermore, the case study research design was conducted to assess how firms were reacting towards the call towards striking a balance between the raw material extraction rate and the regeneration rate of the environment. This was done by tracking how they report efficiency in terms of energy, water, waste management, carbon emission, stakeholder engagement, materials, green products and services and environmental compliance. Thereafter, this led the researcher to develop hypotheses in a bid to solve the research problem. The next step was to select cases to be included in the study. In this study, the researcher selected firms listed on the JSE as cases for the study. The data collection was established before data collection. This step is explained in detail in section 6.8 of the methodology. A case study research design should be properly planned and executed to improve the quality of findings (Teegavarapu et al., 2008).

Phase 2: Prepare, collect and analyse

Phase 2 is concerned with designing the actual case study and collecting data. After the cases have been selected in phase one, this phase now involves collecting the data based on the variables of interest. Data collection is covered in depth in section 6.8 of this chapter.

Phase 3: Analyse and conclude

The last phase is concerned with analysing the collected data. On that note, the researcher then compares the theory with the findings. This leads to either modification of the theory or confirmation. Data analysis is covered in more detail in section 6.9 of this chapter. A case study research design was used to test the existing theories adopted in the study.

Using the case study research design, a researcher can use either the cross-sectional or longitudinal research design to gather data from a selected multiple case study (Saunders

& Lewis, 2012). A cross-sectional research design is used when data for variables is collected once off at a specific time (Wilson, 2014; Bell et al., 2018). A cross sectional research design has a major problem that it cannot be used to collect data for many years. Thus, this study adopted the longitudinal research design which involves data collection over a long period of time (Ployhart & Vandenberg, 2010).

A longitudinal research design allows the researcher to collect multiples observations over a long period (Mans-Kemp, 2014). Based on that, a researcher can be able to note any changes in the variables under study and to ascertain whether there are causal relationships (Ployhart & Vandenberg, 2010). In this study, the longitudinal research design allowed the researcher to trace how the dependant variable (financial performance) reacted to changes in the independent variable (environmental sustainability) over the 8 years in which the observations were made.

The longitudinal research design works well with panel data where multiple firms can be considered in the study (Babbie, 2013; Boakye, 2018). This provides the flexibility to control for individual heterogeneity and multicollinearity. More importantly, panel data is advantageous in that it enhances consistency as the sample is observed repeatedly over several years (Mans-Kemp, 2014; García-Sánchez & Martínez-Ferrero, 2017).

6.6 POPULATION OF STUDY

LoBiondo-Wood and Haber (2017) define a population as a set or group of elements with certain features to be considered in a study. The population can easily be identified from the research questions. It is crucial to clearly define the population of the study as this has a bearing on the sample and sampling techniques to be used (Murphy, 2016). The population of the study was all the 400 firms listed on the JSE in South Africa. The list of the firms considered was obtained from the database of the JSE website. The logic behind considering firms listed on the JSE was that these firms are critically scrutinised in terms of sustainability engagement and reporting (JSE, 2016). Using listed firms enables a researcher to obtain quality data (Ong et al., 2014). Since investors like their equity to grow, hence, they would like to see firms listed on the JSE engaging in environmental sustainability practices to maximise returns from their investments. Criteria for choosing the population of the study was adopted following similar studies which have attempted to link environmental sustainability to financial performance (Nyirenda, 2014).

6.7 SAMPLE AND SAMPLING METHODS

6.7.1 Sample Selection

A sample is defined as a subset of the entire population which has similar characteristics as that of the population (Taherdoost, 2016). A sample should be sufficient enough to ensure that the researcher gets enough data which is representative of the entire population (Taherdoost, 2016). The sample of this study was 30 firms listed on the FTSE/JSE Responsible Investment Index. Nevertheless, 2 companies on the list had dual listings which made the number of firms to be 32 as shown in Table 6.2 below. The dual listing means the 2 plc companies are listed on the London stock exchange with a secondary listing in South Africa (JSE). These are company 11 PLC and 12 Ltd in the financial services sector as well as company 19 PLC and 20 Ltd in the manufacturing industry. This resulted in 256 observations for the period under consideration. The FTSE/JSE Responsible Investment Index is an index formed by the partnership between the JSE and the FTSE Russell in June 2015 in a bid to promote sustainable behaviour among listed firms. Such a remarkable initiative was considered due to the rising demand for responsible investing (JSE, 2020). Hence, the collaboration between the JSE and the FTSE Russell aimed at enhancing ESG issues among listed firms and providing investors with indepth information for them to make informed investment decisions. The FTSE/JSE consists of two indices which are the J113 and J110. The J113 consists of all firms which meet the listing requirements of the FTSE/JSE Responsible Investment Index which is 2.0 or above and whose market caps are evaluated daily. On the other hand, the J110 consists of the top 30 firms which excel in terms of ESG (JSE, 2019). Hence, this study considered the top 30 FTSE/JSE firms as a suitable sample of this study. The firms on the FTSE/JSE Responsible Investment Index have been actively involved in sustainability practices. Additionally, they have satisfied the reporting requirements for both the FTSE and the JSE (JSE, 2020). This list was considered useful in the study because it is updated twice a year that is in June and December. This assisted the researcher to access all the data required to test the hypotheses of the study. This addressed the issue of missing data which usually causes problems in research (Putz, 2017).

6.7.1.1 Inclusion and exclusion criteria

It is recommended for researchers to critically discuss issues related to inclusion and exclusion criteria when selecting their sample (Patino & Ferreira, 2018). This is helpful as it ensures that the researcher uses the sample with characteristics that allow them to attain their intended goal.

6.7.1.1.1 The inclusion criteria

Inclusion criteria is arrived at by considering key characterises of the sample that will assist the researcher to obtain accurate information sufficient to achieve the objectives of the study (Patino & Ferreira, 2018). The inclusion criteria used to select firms to be considered included the following:

I. The firm is currently listed on the FTSE/JSE Responsible Investment Index.
II. The firm should have been actively reporting on environmental sustainability for the past 8 years.
III. The firm's integrated sustainability reports have data required for the study.

6.7.1.1.2 Exclusion criteria

The exclusion criteria take out all the potential units to be considered in the research but whose characteristics can distort the results (Patino & Ferreira, 2018). All newly listed JSE firms were excluded from the sample. These were removed because they could not meet the timeframe criteria and that the data required could be insufficient which could negatively impact the final results.

Table 6.2 List of firms listed on the FTSE/JSE Responsible Investment Index

FTSE/JSE Responsible Investment Top 30 Index			
Constituents as at 18 June 2018			
(in alphabetical order according to instrument)			
Index Code	**Statistic Date**	**Firm Code**	**Industry**
J110	2018/06/18	0	Mining
J110	2018/06/18	1	Mining
J110	2018/06/18	2	Mining
J110	2018/06/18	3	Mining
J110	2018/06/18	4	Banking
J110	2018/06/18	5	Mining
J110	2018/06/18	6	Manufacturing
J110	2018/06/18	7	Health and pharmaceuticals
J110	2018/06/18	8	Retail
J110	2018/06/18	9	Mining
J110	2018/06/18	10	Mining
J110	2018/06/18	11	Financial services
J110	2018/06/18	12	Financial services
J110	2018/06/18	13	Services
J110	2018/06/18	14	Mining
J110	2018/06/18	15	Health and Pharmaceutical
J110	2018/06/18	16	Retail
J110	2018/06/18	17	Health and Pharmaceutical
J110	2018/06/18	18	Insurance & Financial services

J110	2018/06/18	19	Manufacturing
J110	2018/06/18	20	Manufacturing
J110	2018/06/18	21	Telecommunications
J110	2018/06/18	22	Banking
J110	2018/06/18	23	Health and Pharmaceutical
J110	2018/06/18	24	Financial services
J110	2018/06/18	25	Manufacturing
J110	2018/06/18	26	Oil and gas Chemical
J110	2018/06/18	27	Banking
J110	2018/06/18	28	Telecommunications
J110	2018/06/18	29	Retail
J110	2018/06/18	30	Telecommunications
J110	2018/06/18	31	Retail

Source: JSE 2019

Table 6.2 presents a list of top 30 firms listed on the FTSE/JSE Responsible Investment Index as at 18 June 2019. The list consists of 30 firms in their alphabetical order. These are top performing firms in terms of ESG ratings. This list is reviewed regularly. This means that some firms exit while others join the list based on their ability to meet the ESG ratings. The firms on this list are from different industries as indicated in Table 6.2. Listed firms were considered because they contribute extensively towards environmental pollution from their business activities such as mining, construction, transport and heating of offices. In terms of industry/sector category, 8 companies were from the mining sector, 4 in manufacturing, 3 in banking, 4 in health and pharmaceuticals, 4 in retail, 3 in telecommunications, 1 in energy and 5 in services. There was no company from the agricultural and tourism sectors in the sample considered as shown in table 6.2.

6.7.1.1.3 Industry/sector comparison

The researcher categorised the firms in the sample into Environmentally sensitive industries (ESI) and Less-environmentally sensitive industries (LESI). According to Jha and Rangarajan (2020), environmentally sensitive industries (ESI) are industries which are energy intensive and emit excessive amounts of carbon emission (Fethi & Rahuma, 2020). These industries are heavily regulated to minimize their environmental impact. On the other hand, less-environmentally sensitive industries (LESI) also exert pressure on the environment even though it is minimal. In this study the industry codes used by the JSE were used to groupd the firms. These codes are presented in the following table.

Table 6.3: Industry categorisation as per Johannesburg Stock Exchange criteria

Index Code	Index Name	ICB Industry Code	Codes Assigned
J500	Oil & Gas	0001	1
J510	Basic Materials	1000	2
J520	Industrials	2000	3
J530	Consumer Goods	3000	4
J540	Health Care	4000	5
J550	Consumer Services	5000	6
J560	Telecommunication	6000	7
J570	Utilities	7000	8

J580	Financials	8000	9
J590	Technology	9000	10

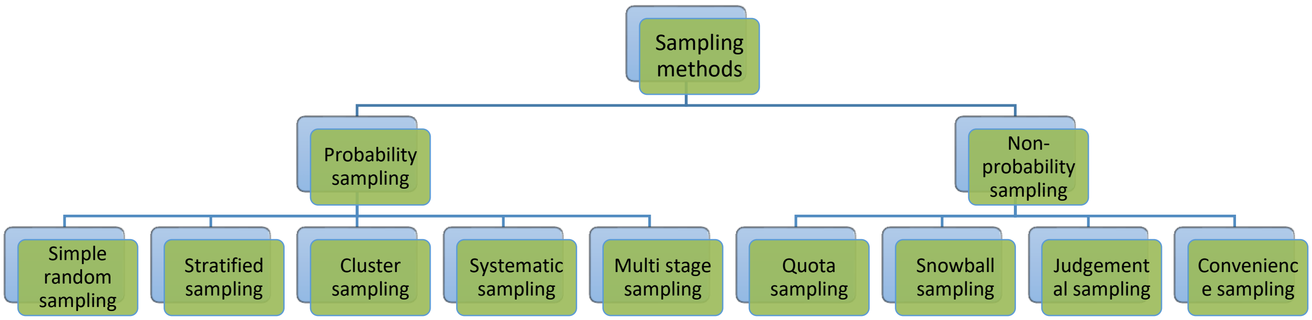
Source: Johannesburg Stock Exchange (2020)

Table 6.3: Industry categorisation shows industry categorisation as per the JSE criteria. Based on this categosation,16 firms fell under the ESI group. These firms were from the oil and gas industry, basic materails and health care. Considering the sectors, ESI firms were from mining, energy, manufacturing as well as health and phamaceuticals. On the other hand, an equal number of firms (16) were categorised into LESI. The firms were from industries such as consumer goods, telecommunications and financials. Specifically, these firms were affiliated to the retail, services and telecommunications. This study deliberately considered industrial comparison as a basis to fully understand which specific industries are likely to benefit from environmental sustainability commitment initiatives. This is a pertinent step aimed at resolving the inconclusiveness of existing studies. Additionally, this industrial/ sector comparison was crucial in order to provide accurate recommendations to concerned stakeholders on the effect of environmental sustainability commitment in their particular industries.

6.7.2 Sampling method

There are two major sampling methods which are probability and non-probability sampling methods (Taherdoost, 2016). These are adopted depending on the scope and objectives of the study. Each type of research can employ two or more research sampling techniques depending on the objectives of the study. Figure 6.4 below shows different sampling methods which a researcher can choose from.

Figure 6.4: Sampling methods



Source: Taherdoost (2016)

Figure 6.4 shows the two major sampling methods which researchers can use in their investigations. “Probability sampling means that every item in the population has an equal chance of being included in sample” (Taherdoost, 2016:20). Probability sampling method has five sub types which are simple random sampling, stratified sampling, cluster sampling, systematic sampling and multi-stage sampling.

On the other hand, non-probability sampling is judgemental in nature and the sample might not be representative of the total population (Saunders & Lewis, 2012). Non-probability branches into quota sampling, snowball sampling, judgemental sampling and convenience sampling. The purposive sampling technique was adopted in this study. Purposive sampling is defined as the discretion by the researcher to select participants who posess certain characteristics considered useful to obtain the objectives of the study (Etikan, Musa & Alkassim, 2016). Therefore, using purposive sampling, the researcher deliberately chose to focus on top 30 firms listed on the FTSE/JSE Responsible Index. According to Etikan et al. (2016), purposive sampling may take several forms among which is homogenous sampling. “This form of sampling focuses on candidates who share similar traits or specific characteristics” (Etikan et al., 2016). Homogenous sampling was deemed suitable because the firms considered were all actively involved in environmental sustainability reporting from 2011-2018. This made it possible to obtain rich data from the sample firms considered which enhances the riqour of findings. This sampling method was used because the firms were readily available from the JSE website. The purposive sampling technique was also used in order to save time and reduce costs (Etikan et al., 2016).

6.8 DATA AND DATA COLLECTION

This study utilised secondary data, which is annual financial statements of firms listed on the JSE. Secondary data is defined as data that has already been collected for other purposes (Struwig & Stead, 2013). It can be collected from data sources such as journals, newspapers, websites and articles among others. Most studies adopt secondary data because it saves time and it is less costly (Wilson, 2014). Moreover, secondary data enables the researcher to collect data over a long period of time.

Nevertheless, secondary data may also pose serious problems in the quality of the research. For example, since, the data was collected for other purposes it may not sufficiently answer all the research problems of the intended study. Furthermore, others criticise the accurateness of secondary data since it can be manipulated. To avoid such drawbacks, the researcher utilised a sample of JSE listed firms. The data provided by these firms is critically audited to enhance transparency (Amacha & Dastane, 2017).

Secondary data is widely used in studies linking environmental sustainability to financial performance (Ong et al., 2014; Amacha & Dastane, 2017; Boakye, 2018). Hence, it was adopted to maintain consistency with existing studies. Secondary data was used because it was readily available on the JSE website. Statistically, secondary data was used as it gave the researcher an opportunity to collect panel data for the sample companies for 8 years. Existing studies especially those conducted in South Africa on the relationship between environmental sustainability and financial performance tended to have a weakness of using a short period. In environmental sustainability commitment, this is a shortfall since, it takes time for environmental sustainability commitment benefits to be realised (Putz, 2017). Hence, a time frame of 8 years is sufficient enough to paint a brighter picture of how environmental sustainability commitment influences financial performance.

Financial performance data such as ROE, ROA, EPS, Tobin's Q and share price were collected from integrated annual financial statements on the firm's websites. Some of the financial data was obtained from the IRESS database. This data was easy to obtain because it is standardised, and each financial measure is reported the same across all firms. Data was collected from 2011-2018. The reason for considering this period was that integrated financial reporting was introduced in 2010 in South Africa. Hence, relevant data was obtainable from 2011 and beyond (Leigh, 2017).

Quantitative content analysis was used to collect data related to environmental sustainability variables such as materials efficiency, environmental compliance, stakeholder engagement, green products and services innovation. This data was sourced from sustainability reports following similar studies (Montabon et al. 2007; Karagiorgos, 2010; Ong et al., 2014; Boakye, 2018) for consistency. Firms voluntarily disclose their environmental impact through sustainability reports. In most cases, information related to sustainability issues is also found in integrated annual reports of firms (Reddy & Gordon, 2010; Garg, 2015).

Sustainability reports are widely used because they are a major tool used by listed firms to report all their environmental impacts and initiatives to mitigate such. Quantitative content analysis was used because it was difficult to find data related to the quantities of each unit of environmental variables such as material efficiency, green products and services innovation, environmental compliance and stakeholder engagement on the integrated annual reports. Unlike standardised financial performance measures, most environmental variables mentioned above are still subjectively reported in most integrated annual reports of firms (Sridhar & Jones, 2013; Tripathi, Kaushal & Sharma, 2013). "Content analysis generally includes determining the constructs of interest, seeking information about these constructs and codifying qualitative information to derive quantitative scales that can be used in subsequent statistical analyses" (Galant & Cadez, 2017:682). Furthermore, content analysis involves a systematic and replicable analysis of textual data (Galant & Cadez, 2017). It involves the classification of parts of a text through the application of a structured, systematic coding scheme from which conclusions can be drawn about the message content (Galant & Cadez, 2017).

6.8.1 Content Analysis Procedure

Using content analysis, the researcher developed key search words per each variable which were used to trace whether the variable was reported or not. The research used a dichotomous scale ranging from 0 and 1. The dichotomous scale was endorsed by Cooke (1989) indicating that it effectively eliminates bias usually experienced when one uses a five-point Likert scale. The argument was that, researchers are more likely to be subjective and biased when allocating intermediate points on the Likert scale. Hence, the dichotomous scale minimises this subjectivity and bias (Mans-Kemp, 2014). To demonstrate the content analysis procedure, two firms were used. These were a company with firm code 0 and a company with firm code 1. The table with all the firms is attached in Appendix 1. During data collection, a score of 0 was allocated when the variable was not reported and a score of 1 was allocated when the variable was reported in the financial year. This procedure was done on all environmental sustainability variables such as energy efficiency, water efficiency, waste management, carbon emission reduction, material efficiency, green products and services innovation, environmental compliance and stakeholder engagement. The total of each variable was presented at the end of each variable as shown in Table 6.5 below. The researcher utilised both textual data and pictorial presentation of information related to material efficiency, environmental compliance, stakeholder engagement, green products and services innovation. This approach was adopted following similar studies (Montabon et al., 2007; Aras et al., 2010; Chithambo, 2013; Chithambo & Tauringana, 2014; Mans-Kemp, 2014; Chen, Feldmann & Tang, 2015; Amacha & Dastane, 2017; Galant & Cadez, 2017; Boakye, 2018). The collected data was coded on Microsoft excel awaiting further processing.

Table 6.4: Content analysis procedure

Firm Code 0	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	0	1	1	1	1	1	1	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	0	1	1	1	1	1	1	1
Electricity savings	0	1	1	1	1	1	1	1
Total	1	4	4	4	4	4	4	4
Water efficiency								
Total volume of water recycled	0	1	1	1	1	1	1	1
Total volume of water reused	0	1	1	1	1	1	1	1
Reduction in water use	0	1	1	1	1	1	1	1
Total	0	3	3	3	3	3	3	3
Waste management								
Amount of waste recycled	0	1	1	1	1	1	1	1
Amount of waste reused	0	1	1	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	0	1	1	1	1	1	1	1
Total	1	4	4	4	4	4	4	4
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	1	1	1	1	1	1	1
Reductions in indirect emissions (scope 2)	1	1	1	1	1	1	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Material efficiency								
Use of lesser material	0	0	0	0	0	0	0	1
Easily recycled material	1	0	0	0	0	0	0	1
Use of biodegradable material	0	0	0	0	0	0	0	0
Improved raw material handling	1	1	1	1	1	1	1	1
Total	2	1	1	1	1	1	1	3

Green products and services innovation								
Eco design	0	0	0	0	0	0	0	0
Green packaging	0	0	0	0	0	0	0	0
Eco labelling	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 1	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Energy efficiency								
Reduction in energy use	1	1	1	1	1	1	1	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	1	1	1	1	1	1	1	1
Electricity savings	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Water efficiency								
Total volume of water recycled	1	1	1	1	1	1	1	1
Total volume of water reused	1	1	1	1	1	1	1	1
Reduction in water use	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Waste management								
Amount of waste recycled	1	1	1	1	1	1	1	1
Amount of waste reused	1	1	1	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1

Use of alternative raw materials with less waste	0	0	0	0	0	0	1	0
Total	3	3	3	3	3	3	4	3
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	1	1	1	1	1	1	1
Reductions in indirect emissions (scope 2)	1	1	1	1	1	1	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	0	0	0	0	0	0	1	0
Total	2	2	2	2	2	2	3	2
Material efficiency								
Use of lesser material	0	0	0	0	0	0	0	0
Easily recycled material	1	1	1	1	1	1	0	1
Use of biodegradable material	0	0	0	0	0	0	0	0
Improved raw material handling	1	1	1	1	1	1	1	1
Total	2	2	2	2	2	2	1	2
Green products and services innovation								
Eco design	0	0	0	0	0	0	0	0
Green packaging	0	0	0	0	0	0	0	0
Eco labelling	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1

Total	4	4	4	4	4	4	4	4

Source: Author own compilation (2020)

Content analysis has an advantage of flexibility in that the researcher is not only restricted by standardised quantitative data provided on the sustainability reports only but can choose any variable which they can easily convert the textual data into quantitative codes (Galant & Cadez, 2017). Additionally, content analysis enables the researcher to capture data that could have been difficult to collect using the standardised way (Montabon et al., 2007).

Nevertheless, content analysis suffers two major drawbacks such as researcher subjectivity and bias (Mans-Kemp, 2014). These may cause variability in the results. For instance, there is a general tendency by researchers to use different scales when coding data during content analysis. Some researchers have used a binary code such as allocating scores between 0 and 1 (Galant & Cadez, 2017) while others have adopted a three-point scale ranging from 0 to 3 (Karagiorgos, 2010) and others such as Chen et al. (2015) have used a scale ranging from 0 to 5 in their content analysis.

6.9 DATA ANALYSIS METHODS

6.9.1 Descriptive statistics

Descriptive statistics are used to summarise findings such that meaningful interpretations can be made. Descriptive statistics include means, mode, median and standard deviation. Descriptive statistics such as mean and standard deviation were used in this study to summarise findings of environmental sustainability variables and financial performance. Descriptive statistics are usually the first data analysis conducted by researchers to prepare the data for further sophisticated inferential statistics. More importantly, descriptive statistics determines which inferential statistics tools to use based on whether the data is normally distributed or not (Mans-Kemp, 2014).

6.9.2 Panel Regression Model

The Panel regression analysis model was used to analyse the relationship between environmental sustainability commitment and the financial performance of firms. The model was chosen because it allowed the researcher to analyse panel data from several companies and it has been used widely in similar studies (Nyirenda, 2014; Boakye, 2018; Ganda, 2018). The model uses either the fixed or random effects model (Williams, 2018). Hence, the researcher should choose either one of these models to analyse data. "The choice of model depends on whether the unobserved heterogeneity is constant and correlated with the independent variables or there is a random effect of individual cross section" (Boakye, 2018:167). Using this method, the pooled, fixed and random effects models were tested and compared.

6.9.2.1 The Fixed Effect Model

The fixed effect model is based on the assumption that there might be some items which might influence the variables of the study. Hence, the fixed effect model makes it easier to control for such variables (Snorrason, 2012). Moreover, the fixed effect is used to control for omitted variables in the data set for the period in which data was collected (Mans-Kemp, 2014). The fixed effect model assumes that the group means in a panel regression are fixed (Greene, 2011). The fixed effects model is widely used in panel studies (Hassett & Paavilainen-Mäntymäki, 2013).

6.9.2.2 The Random Effect Model

"The random effects regression model allows for the inclusion of time-invariant variables" (Mans-Kemp, 2014:183). It is mainly feasible when the panel data does not have omitted variables and when the data is extracted from a large population. To that effect, the random effect model is expected to utilise the available data yielding the smallest standard error (Bell, Fairbrother & Jones, 2019). The random effect model allows for variation among units being investigated (Torres-Ryna, 2014). It is a compromise between the fixed effect model and the pooled model. However, the random effects model is criticised for its lack of setting a provision for control variables.

6.9.2.3 Hausman Test

The Hausman test is used to evaluate the appropriate model to use between the fixed effects and the random effect model depending on the data set provided (Pedace, 2013). It is commonly used in studies linking environmental sustainability to financial performance (Boakye, 2018). The Hausman test null hypothesis states that the random effects is the preferred model (Snorrason, 2012). It follows that when the Hausman test is significant at (p < 0.05), then the fixed effect model will be the appropriate model (Hassett & Paavilainen-Mäntymäki, 2013).

Table 6.5: How to select the appropriate model

Fixed effect model (F-test)	**Random effect model (Breusch-Pagan test)**	**Appropriate regression model**
H_0 is not rejected: no fixed effect	H_0 is not rejected: no random effects	Data are poolable Use the pooled OLS regression model
H_0 is rejected: fixed effects	H_0 is not rejected: no random effects	Use the fixed effects regression model
H_0 is not rejected: no fixed effects	H_0 is rejected: random effects	Use random effects regression model
H_0 is rejected: fixed effects	H_0 is rejected: random effects	Consider the Hausman test results to choose the appropriate model

According to Park (2011), researchers should invest their time in assessing which appropriate model to adopt in their study. This has a bearing on the quality of the results and conclusions made based on the tested variables. When appropriately conducted, either the fixed effect or random effect model enhances the quality of the results as these models are advanced and can successfully deal with heterogeneity (Park, 2011). Hence, researchers are recommended to understand the underlying assumptions and conditions of each model before coming to the conclusion on which one to adopt.

6.9.2.4 Feasible Generalised Least Squares

The Feasible Generalised Least Squares model was finally adopted in this study over the fixed and random effects models. This is because the diagnostic tests conducted showed that the data had heteroscedastiscity and serial autocorrelation. Initially, the researcher intended to use either the random or fixed effect models based on the results of the Hausman test. Nevertheless, because the data had heteroscedascity and serial auto correlation, the researcher decided to use the feasible generalised least squares as the key regression model for analysing the data. When analysing panel data, heteroscedascity and serial auto correlation may cause problems in estimating the regression models (Bai, Choi & Liao, 2019). Hence, the Feasible Generalised Least Squares model becomes the best option to analyse the data. This method had been used in existing similar studies (Marashdeh, 2014). One of the advantages of the feasible generalised least squares regression model is that it can suppress both heteroscedastiscity and serial autocorrelation which results in quality and dependable results (Marashdeh, 2014; Bai et al., 2019). To that effect, all five models were analysed using this regression model.

6.10 VARIABLES

6.10.1 Dependant variable (Financial Performance)

The dependent variable of the study was financial performance. Financial performance is defined as an assessment of the extent to which a firm has attained its economic goals (Gentry & Shen, 2010). Ganda (2016) defines financial performance as a measure of the effectiveness and efficiency in which a firm attains its financial goals over a given period of time.

This study adopted both the accounting and market-based measures of financial performance. The use of both measures can strengthen the predictive and explanatory power of a model (Endrikat et al., 2014; Horváthová, 2016; Boakye, 2018). This consequently, improves the accurateness of the financial performance construct (Gentry

& Shen, 2010; Al-Matari et al., 2014; Sethibe & Steyn, 2016; Zhang, 2016; Jansson et al., 2017; Uwuigbe et al., 2018).

6.10.1.1 Accounting based measures of financial performance

This study adopted ROE, EPS and ROA as accounting-based measures of financial performance. These dependent variables have been adopted widely by existing studies linking environmental sustainability to financial performance (Nyirenda, 2014; Boakye, 2018). Each of these ratios will be presented below.

I. ROE

Return on equity is well understood as profits divided by the shareholders' equity (Kennon, 2017).

ROE is calculated as follows;

ROE= net profit/Owners' equity

II. ROA

"The return on total assets (ROA) measures the overall effectiveness of management in generating profits with their available assets" (Ong et al., 2014:388). ROA is calculated as follows;

ROA = (Net Profit before Interest and Tax / Total Assets) * 100

ROA was adopted in this study as one of the measures of financial performance because it has been used widely by other studies which have investigated the environmental sustainability and financial performance nexus (Trumpp & Guenther, 2017; Boakye, 2018).

III. EPS

EPS is calculated as follows;

$$\text{EPS} = \frac{\text{Profit or loss attributable to ordinary shareholders of the parent firm}}{\text{Weighted average number of ordinary shares issued}}$$

6.10.1.2 Market based measures

I. Tobin's Q

"The Q ratio is defined as the market value of a firm divided by the replacement cost of the firm's assets" (Fu et al., 2016:1). The Tobin's Q is highly regarded as a key ratio that informs future investment decisions in existing literature (Garcia-Castro et al., 2010; Rodgers et al., 2013; Fu et al., 2016). Regardless of its importance in measuring a firm's future value and hence, influence investors to entrust the business with their capital, there is a paucity of studies which have used Tobin's Q in studies linking environmental sustainability performance and financial performance of listed firms in South Africa. Therefore, the Tobin's Q was adopted in this study to close this gap and to enrich the financial performance model. Furthermore, Sethibe and Steyn (2016) assert that Tobin's Q is the most preferred market-based ratio to measure the long run effects of certain investments.

II. Share price

A share price measures the value of the business (Kurniaty et al., 2018). It is a crucial firm performance metric assessed by investors before they can invest in a business. A higher share price implies that the concerned firm is highly valued by the market.

6.10.2 Independent variable/s (Environmental Sustainability Commitment)

The independent variables of the study were components of environmental sustainability. These were: energy efficiency, water efficiency, waste reduction, carbon emission reduction, environmental compliance, materials efficiency, stakeholder engagement, as well as green products and services innovation. The environmental sustainability variables used in this study were derived from the GRI guidelines (EN category). The GRI indicators have been used widely as guidelines on measures of sustainability (Amacha & Dastane, 2017). Each of the environmental sustainability variable is presented below.

I. Energy efficiency

International Energy Agency (2015) defines energy efficiency as optimising energy consumption by adopting systems which eliminate overuse thereof. In this study, energy efficiency was defined as all strategic ways adopted by a firm to reduce energy consumption. It was measured using Giga Joules per tonne) (Gj/t). Through content analysis, energy efficiency was measured by assessing the extent to which the firm reduced its energy consumption, invested in renewable energy, saved fuel and evidence of electricity savings.

II. Water efficiency

Water efficiency is the minimisation of water usage achieved by maximising re-usage and recycling thereof (Zamfir et al., 2017). In this study, water efficiency was measured based on the firm's commitment to reduce water consumption. Additionally, it was measured based on the kilo litres saved for that year by the firm. Other water efficiency indicators used included: total volume of water recycled, total volume of water reused and reduction in water use.

III. Waste management

Waste management is defined as practices implemented by a firm to handle waste in a way that minimises environmental pollution (Bartolacci et al., 2015). This study adopted the GRI indicators of waste management. As such, waste management was measured based on the following indicators: amount of waste recycled, amount of waste reused, waste reduction initiatives and use of alternative raw materials with less waste.

IV. Carbon emission reduction

Carbon emission reduction is described as an act of cutting down activities and processes which emit hazardous gases into the atmosphere (Rokhmawati, 2015). In this study, carbon emission reduction was measured by assessing reductions in direct emissions (scope 1), reductions in indirect emissions (scope 2) and investments in technology to trap CO_2 and convert it into other economical uses. Carbon emission is measured using metric tonnes of CO_2 equivalent (mtCO2e).

V. Material efficiency

In this study, material efficiency was measured based on the firm's use of lesser material, light weight designs, easily recycled material, use of biodegradable material and improved raw material handling.

VI. Green products and services innovation

Green products and services innovation was measured using products innovation, green packaging, enhanced product quality, green labelling and eco design.

VII. Environmental compliance

Environmental compliance was measured based on factors such as obtaining environmental certification, investment in international standards such as ISO 14001, absence of fines and penalties and presence of internal environmental policies.

VIII. Stakeholder engagement

Stakeholder engagement was measured based on the factors such as: stakeholder identification by the firm, stakeholder communication on environmental issues, frequency of stakeholder engagements and collaboration with stakeholders such as customers and suppliers to improve environmental performance.

Variables

Dependent variable; Y: Financial performance measures

Dependent variable 1; Y: Return on equity (ROE)

Dependent variable 2; Y: Return on assets (ROA)

Dependent variable 3; Y: Earnings per share (EPS)

Dependent variable 4; Y: Share price

Dependent variable 5; Y: Tobin's Q

Independent variable; X: Environmental sustainability variables

Independent variable 1; X1: energy efficiency

Independent variable 2; X2: water efficiency

Independent variable 3; X3: waste management

Independent variable 4; X4: carbon emission reduction

Independent variable 5; X5: material efficiency

Independent variable 6; X6: green products/services innovation

Independent variable 7; X7: environmental compliance

Independent variable 8; X8: stakeholder engagement

Panel regression model

$$Y_{it}=\alpha+X_{1it}+X_{2it}+X_{3it}+X_{4it}+X_{5it}+X_{6it}+X_{7it}+X_{8it}+X_{9it}+X_{10it}+\varepsilon$$

Where y=financial performance; i denotes the firm; t denotes the time; x_1= energy efficiency (ef); x_2= water efficiency (we); x_3= waste management (wm); x_4= carbon emission reduction (cer); x_5= material efficiency; x_6=green products/services innovation; x_7=environmental compliance; x_8=stakeholder engagement; x_9=firm size; x_{10}=liquidity; + ε = error term; α= constant

Control variables

A control variable is defined as "extraneous variables manipulated (or included in a statistical model) so as to exclude their effect on the relationship between independent and dependent variables (for confounding variables) or to reduce the variability of the dependent variable" (Bacon-Shone, 2013:25). It is important to determine if other underlying factors have an influence on the dependent variable (Maleka et al., 2017). Hence, these factors should be tested prior to the independent variable to provide an alternate explanation for the findings. Control variables such as firm size and liquidity were used following similar studies (Jayeola, 2015; Horváthová, 2016).

I. Firm size

Considering firm size, Gallego-Álvarez et al. (2015) employed the natural log of firm assets. Other studies have used the number of employees to measure the size of the firm. In this study, market capitalisation was used to measure the size of the firm. The size of the firm has an effect on the profitability of a firm (Al Shahrani &Tu, 2016). It follows that large firms have slack resources which they can use to invest in environmental sustainability initiatives as compared to smaller firms (Boakye, 2018). Size influences the profitability of firms differently. For instance, Tarziján and Ramirez's (2011) findings indicated that large firms tend to be more profitable because of economies of scale. Hence, it is crucial to control the size of the firm before testing the relationship between environmental sustainability and financial performance.

II. Liquidity

Liquidity measures the ability of a business to pay its short-term liabilities when needed (Warra & Oqdeh, 2018). In this study, liquidity was measured by compiling values from the current ratio of firms which were evaluated. These were compiled for the 8-year period considered in the study. These were obtained in the firm's annual financial statements and from the IRESS database. Existing studies assert that liquidity should be controlled because it also has an effect on profitability (Marashdeh, 2014; Warra & Oqdeh, 2018). Failure to control this variable can bias the results.

Moderator variable

A moderator variable is defined as factor which may influence the strength of the relationship between two variables (Lu & Taylor, 2016; Jha & Rangarajan, 2020). It is curical to introduce a moderator variable on the link between environmental sustainability commitment and financial performance. This is pertinent to help researchers to uncover the underlying mechanisms which can influence this relationship (Endrik et al., 2014). On that account, industry sector was used as a moderator variable in this study.

I. Industry/sector

A plethora of scholars have submitted that industry context is among one of the key factors which may help to explain the circumstances through which the relationship between environmental sustainability commitment and financial performance can be stronger or weaker (Endrik et al., 2014; Lu & Taylor, 2016; Jha & Rangarajan, 2020). Gonenc and Scholtens (2019) emphasised the importance of understanding the industry context when trying to understand the effect of sustainability initiatives on corporate financial performance. The study found out that several studies use industry type either as a moderator or control variable which means it has significance in helping to understand the conditions which strengthens or weaken the environmental susainbaiility commitment and financial performance nexus. Other scholars are of the view that the effect of industry sector my differ across industries for example, between high polluting or energy intensive industries compared to less energy intensive industries (Albertini, 2013; Lu & Taylor, 2016; Rodrigo, Duran & Arenas, 2016). To help understand the mechanisms through which the environmental sustainability commitment and financial performance may vary, this study used industry type as a moderating variable. This approach was adopted following other studies such as Jha and Rangarajan (2020) for consistency. As indicated by Endrikat et al. (2014), incorporating such a mechanism in the environmental susainbaiility commitment and financial performance nexus nuanced the study from the rest of existing studies which followed a simplistic approach by testing only linear relationships.

Table 6.6: Definition and summary of variables

Variable	Description	Source
Environmental sustainability measure	- Measured using (energy efficiency, water efficiency, waste reduction, carbon emission reduction, environmental compliance, materials, stakeholder engagement	GRI indicators
Energy efficiency	-reduction in energy use -investments in renewable energy -fuel savings -electricity savings	GRI indicators
Water efficiency	-total volume of water recycled -total volume of water reused -reduction in water use	GRI indicators
Waste management	-amount of waste recycled -amount of waste reused -waste reduction initiatives -use of alternative raw materials with less waste	GRI indicators
Carbon emission reduction	-reductions in direct emissions (scope 1) -reductions in indirect emissions (scope 2) -investments in technology to trap CO2 and convert it to other economical uses	GRI indicators
Materials efficiency	-use of lesser material -easily recycled material -use of biodegradable material -improved raw material handling	GRI indicators

Green products and services innovation	-eco design -green packaging -eco labelling	GRI indicators
Environmental compliance	-obtaining environmental certification -presence of ISO 14001 - absence of fines and penalties -internal environmental policies	GRI indicators
Stakeholder engagement	-stakeholder identification -stakeholder communication on environmental issues -collaboration with stakeholders such as customers and suppliers to improve environmental performance -collaboration with other firms or organisations	GRI indicators
Financial performance	-Measured using (ROE, ROA, ROS, Tobin's Q, Share price	Integrated annual reports
Accounting Based Measures		
ROE	Return on equity is well understood as profits divided by the shareholders' equity	Ong et al., 2014; Kennon, 2017)
ROA	measures the overall effectiveness of management in generating profits with their available assets"	Ong et al., 2014
EPS	EPS shows the amount of earnings allocated to shareholders.	Madugba & Okafor, 2016
Market Based Measures		

Tobin's Q	"The Q ratio is defined as the market value of a firm divided by the replacement cost of the firm's assets".	Fu, Singhal and Parkash (2016:1).
Share price	A share price measures the market value of the firm.	Kurniaty et al. (2018).
Control variables		
Firm size	Firm size was measured based on capitalisation of the firm	JSE,2019
Liquidity	Liquidity was measured using the values of current ratio of the firm	Annual reports of comapnies

Source: Author own compilation (2019)

6.11 RELIABILITY AND VALIDITY

Reliability and validity aspects determine the rigour of all quantitative research (Struwig & Stead, 2013). Care should be taken to ensure that reliability and validity criteria are adhered to. Considering studies that use secondary data obtained from sustainability reports, the GRI has put six principles as guidelines to improve the quality of information obtained from these reports. These six principles include: balance, comparability, accuracy, timeliness, clarity and reliability (Diouf & Boiral, 2017). Reliability and validity are key aspects that enhance the quality of research findings.

6.11.1 Reliability

Reliability is a measure of consistency of data collection instruments. Financial performance information is obtainable from financial statements published on integrated sustainability reports (Didin, 2017). Based on the Financial Reporting Standards (FRS's), information provided in financial statements should be accurate and free from bias to allow stakeholders to make informed decisions (Masa'deh et al., 2015). Similarly, Aliabadi et al. (2013) assert that information contained in financial statements should be reliable. When such is achieved, the information contained therein becomes a crucial tool both managers and other key stakeholders rely on for decision making (Aliabadi et al., 2013). For consistency in financial statements, the Financial Reporting Standards (FRS's) guidelines encourage listed firms to prepare their financial statements by capturing the following aspects; chairman's statement; directors' report; profit and loss account; balance sheet; cash flow statement; notes to the accounts; and auditors' report.

To ensure reliability in this study, the researcher used the standard steps and protocol of the case study research design presented under Figure 6.3 (Teegavarapu et al., 2008). This ensures consistency in terms of whether or not other researchers can replicate the study to other settings. Inconsistencies in findings regarding studies which have investigated environmental sustainability and financial performance can be attributed to failure to adopt the case study research design protocol. Furthermore, to ensure reliability, the researcher used data specifically from the sustainability reports as they are carefully prepared to provide reliable information. Furthermore, the data used was obtained from the annual reports of the firms. The annual reports of all publicly listed firms are audited by independent external auditors (Amacha & Dastane, 2017). This is one of the requirements by the GRI that annual reports must be independently and externally audited (Diouf & Boiral, 2017). Another crucial element of sustainability reports is that they are prepared in line with the GRI standards, hence, guaranteeing that the information obtained will generate reliable results. Adherence to the GRI standards of reporting enhances the reliability of results (Diouf & Boiral, 2017). More so, a plethora of firms make use of independent assurance services which enhance the reliability of data provided by sustainability reports (Junior, Best & Cotter, 2014).

6.11.2 Validity

To ensure validity of the study, the researcher used a multiple case study where sufficient evidence was gathered to strengthen the constructs being measured (Teegavarapu et al., 2008). Moreover, the researcher evaluated if the data in the sustainability reports was in line with the research problem and aim of the study. The GRI principle of accuracy improves the validity of information provided by sustainability reports (Diouf & Boiral, 2017). This is because the guidelines and principles are made clear and readily available for all firms to use and benchmark when they prepare their sustainability reports. Hence, this ensured validity of the study. Attainment of construct validity is very crucial in quantitative studies (Zikmund, Babin, Carr & Griffin, 2010). As such researchers are recommended to ensure that the measures developed to measure each construct measure it accurately and sufficiently. In this study, construct validity was ensured by using environmental sustainability measures from GRI. These are adopted globally, entailing that they are accurate measures of the environmental sustainability construct. On the other hand, standardised financial data was used to measure financial performance. The information was obtained from audited financial statements which are prepared according to the generally acceptable accounting principles. Altogether, this meant that the measures of financial performance derived from these statements stood as valid measures of the financial construct.

6.12 ETHICAL CONSIDERATIONS

Ethics are very crucial especially when the study involves human beings and living organisms (Wilson, 2014). Considerations should be made to avoid causing both physical and psychological harm during data collection in situations where the subjects take the form of human beings. However, the population of this study consisted of firms listed on the JSE. Based on that, a distinction should be made between ethical considerations when conducting research with primary data and when secondary data is considered.

This study used secondary data, including sustainability reports obtainable on company websites. The potential ethical problem associated with secondary data is ending up using the data for the purpose it was not intended (Morrow, Boddy & Lamb, 2014). Such an ethical problem was minimised in this study since sustainability reports are on the public domain for the public to use. The data used in this research was obtained from the company websites.

Furthermore, the researcher ensured that there was no re-identification of firms considered and sensitive information generated from study findings was treated as highly confidential and could not be used against any firm. In this case, where lack of environmental sustainability commitment was identified, it was not used to expose the concerned firm but to encourage all laggards in terms of adopting environmental sustainability initiatives to enhance their financial performance.

Another ethical issue in research is related to how to use other existing scholars work and ideas. As such, there are guidelines to help researchers on how to use and reference other people's work. This is intended to avoid issues related to plagiarism (Yip, Han & Sng, 2016; Roka, 2017). In this study, the researcher followed all the guidelines related to using other scholars' work. To that effect, all the materials read and used in this study were properly referenced using both in text and a list of references. This was intended to acknowledge the authors from whom some of the ideas were read and applied. Furthermore, the whole document was run on Turnitin and a report was generated and is attached in Appendix 8 of this dissertation.

6.13 DEALING WITH OUTLIERS

Outliers can negatively affect the quality of results if not eliminated. Outliers are factors that are not part of the trend or factors being investigated. Therefore, it is crucial to eliminate outliers to obtain quality findings that are reflective of what exactly is being investigated. Outliers can be detected using standardised residuals (Field, 2013). The mean of standardised residuals should be 0 with a standard deviation of 1. According to Field (2013), any standardised residual above 3 shows the influence of an outlier. In this study, the standardised residuals were used to detect and eliminate outliers.

6.14 MULTICOLLINEARITY

Multicollinearity exists when two or more variables of the predictors in a regression model are positively or negatively correlated (Boakye, 2018:176). Hence, it is crucial to detect multicollinearity in order to eliminate it before further analysis. The presence of multicollinearity may reduce the quality of results (Field, 2013). However, a multicollinearity below 0.8 or 0.9 is acceptable as it does not affect the quality of results. Existing studies using panel data have used variance inflation factors (VIF) to detect and eliminate multicollinearity. The VIF estimates the amount of variance that has been inflated by multicollinearity (Boakye, 2018).

6.13 SUMMARY

This chapter discussed the research methodology adopted in this study. The methodology was guided by the honeycomb of research methodology designed by Wilson (2010). As such, the steps in the honeycomb of research methodology were each contextualised to this study. It emerged from the existing literature that the methodology to be followed by the researcher is shaped by different assumptions such as epistemology, ontology and axiology. These then inform the research philosophies which a researcher can adopt. This study adopted the positivist research philosophy with a deductive approach. The study, therefore, adopted the quantitative research methodology since it intended to collect and analyse numerical data. The case study research design was adopted, and the longitudinal research design was considered appropriate in this study since the researcher intended to collect panel data over 8 years. Secondary data was collected from sustainability reports of listed firms. Content analysis was used to collect environmental sustainability data. Data was analysed using descriptive statistics. The Hausman test was used to select the appropriate model between the fixed effect and the random effect models. The following chapter will present the findings of the study.

CHAPTER 7

PRESENTATION OF FINDINGS

7.1 INTRODUCTION

Broadly, this study aimed at examining the relationship between environmental sustainability commitment and financial performance of firms listed on the JSE. Specifically, the researcher aimed to establish whether environmental sustainability activities such as waste management, energy efficiency, water efficiency, carbon emission reduction, environmental compliance, material efficiency, stakeholder engagement and green products and services innovation affect financial performance. The study also intended to conduct an industry comparison to determine if the effect of environmental sustainability commitment on financial performance differed based on industry type. Lastly, the study intended to test the moderation effect of industry type on the relationship between environmental sustainability commitment and financial performance. Hence, this chapter aims to present the results of the study. The chapter is divided into two major parts. The first part presents the research findings of the study. The chapter will present descriptive statistics and correlation results first after which the ordinary least squares regression results will be presented. This will be followed by a section on diagnostic tests such as normality, heteroscedascity, multicollinearity and autocorrelation. These tests are crucial to ensure that all the assumptions of panel data are addressed. Inferential statistics will be run to test the hypothesised relationships. The second part will discuss the results. This will be based on the comparison of the findings of this study with existing empirical findings on the relationship between environmental sustainability commitment and financial performance. The next section will present the descriptive statistics of the findings.

7.2 DESCRIPTIVE STATISTICS

7.2.1 Descriptive Statistics for Environmental Sustainability Variables

Table 7.1: Descriptive Statistics for Environmental Sustainability Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Energy efficiency	256	2.945313	1.399208	0	4
Water efficiency	256	2.15625	1.217116	0	3
Waste management	256	3.382813	1.092729	0	4
Carbon emission reduction	256	2.253906	0.942454	0	3
Material efficiency	256	2.773438	1.228516	0	4
Green products and services	256	1.144531	1.457438	0	3
Environmental compliance	256	2.785156	0.411518	0	3
Stakeholder engagement	256	4.000000	0	0	4

Table 7.1 presents the findings from descriptive statistics for environmental sustainability commitment among JSE listed firms. The total number of observations was 256 derived from 32 firms observed for 8 years. The mean for energy efficiency was 2.945313 and the standard deviation was 1.399208, with a minimum value of 0 and a maximum value of 4. In terms of reporting, this variable was well reported by majority of the firms except only one firm. In terms of water efficiency, the mean was 2.15625 and the standard deviation was 1.217116, with a minimum value of 0 and a maximum value of 3. In terms of reporting, this variable was well reported by majority of the firms except only one firm. Considering waste management, the mean was 3.382813 and the standard deviation was 1.092729, with a minimum value of 0 and a maximum value of 4. It was discovered that it was only one firm which did report on this variable on the period considered. Carbon emission reduction had a mean of 2.253906 and a standard deviation of 0.942454, with a minimum value of 0 and a maximum value of 3. Interestingly, this variable was well reported by all firms considered. The mean for material efficiency was 2.773438 with a standard deviation of 1.228516, with a minimum value of 0 and a maximum value of 4. In terms of material efficiency, it is only two firms which did not consistently report on this

variable. Considering green products and services innovation, a mean of 1.144531 was observed with a standard deviation of 1.457438, with a minimum value of 0 and a maximum value of 3. It was observed that this variable was not consistently reported by at least 16 firms. This was expected as some industries such as mining, services and telecommunications may not be directly dealing with selling physical products, but this is more suited for the retail sector where this variable was well reported. In terms of environmental compliance, the mean score was 2.785156 and the standard deviation was 0.411518, with a minimum value of 0 and a maximum value of 3. This variable was well reported by all firms considered. In terms of stakeholder engagement, the mean score was 4 and the standard deviation was 0, with a minimum value of 0 and a maximum value of 3.

Overall, the descriptive statistics on environmental sustainability commitment variables show that the surveyed firms are actively committed to sustainability issues and reporting. The high mean (4) on stakeholder engagement shows that the observed firms actively engage their key stakeholders on environmental sustainability issues. Considering the standard deviation as a measure of central tendency and dispersion, the findings above show that the scores from each environmental sustainability was distributed around the norm, hence, they did not vary much from each other.

7.2.2 Descriptive Statistics for Financial Performance Variables

Table 7.2: Descriptive Statistics for Financial Performance Variables

Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
ROA	256	10.46873	14.4762	-27.28	92.89
ROE	256	15.79004	34.4581	-422.65	107.64
EPS	256	1181.074	1385.127	-1764.32	12044.82
SharePrice	256	15695.86	14525.73	0	86734
TobinsQ	256	1.673086	1.341552	0.22	7.05

Table 7.2 presents results on the descriptive statistics for dependent variables. The results presented averages for the 8 years' data collected by the researcher. The number

of observations was 256. The mean for ROA was 10.46873 and the standard deviation was 14.4762. The values for ROA ranged from a minimum of -27.28 to a maximum value of 92.89. On the other hand, the mean score for ROE was 15.79004 with a standard deviation of 34.4581. The minimum and maximum values for ROE were -422.65 and 107.64 respectively. In terms of EPS, the mean score was 1181.074 and the standard deviation was 1385.127, while the minimum value was -1764.32 and the maximum was 12044.82. The results also show that share price had a mean value of 15695.86 and a standard deviation of 14525.73. It is also noted that share price ranged from a minimum value of 0 to a maximum of 86734. Considering the Tobin's Q, the mean was 1.673086 and the standard deviation was 1.341552. The minimum and maximum values for Tobin's Q were 0.22 and 7.05, respectively.

7.2.2 Descriptive Statistics for Control Variables

Table 7.3: Descriptive Statistics for Control Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Liquidity	256	1.425118	0.9830142	0	6.8176
Firm size	256	929723	47711.28	0	428668

Table 7.3 presents the descriptive statistics for control variables. The findings show that the mean for liquidity was 1.425118 and the standard deviation was 0.9830142. The minimum value for liquidity was 0 and the maximum value was 6.8176. Considering firm size, the mean score was 929723 and the standard deviation was 47711.28. The minimum value was 0 and the maximum value was 428668.

7.3 CORRELATION ANALYSIS AMONG VARIABLES

Table 7.4: Correlation Analysis Among Variables

VARIABLES	ROA	ROE	EPS	ShareP	TobinsQ	Energy	Water	Waste	Emissions	Materials	GreenP	Compliance	stakeholder
ROA	1												
ROE	0,619	1											
EPS	0,3298	0,2417	1										
SharePrice	0,294	0,2328	0,7843	1									
TobinsQ	0,7565	0,4177	0,1913	0,2409	1								
Energy	0,0662	0,0693	-0,065	-0,0419	0,1114	1							
Water	-0,0323	0,0306	0,0834	0,164	-0,061	0,2422	1						
Waste	-0,0301	-0,0619	-0,0083	-0,0272	0,0245	0,2908	0,465	1					
Emissions	0,033	0,0586	0,149	0,1442	0,0353	0,3347	0,3379	0,3203	1				
Materials	0,0413	0,1033	-0,1904	-0,2111	0,1325	0,0589	0,2755	0,468	0,1413	1			
GreenP	-0,0285	0,0699	-0,2118	-0,3172	0,0609	0,0116	0,1044	0,2311	0,0902	0,6185	1		
Compliance	-0,1328	-0,1723	0,1955	0,2121	-0,3185	0,1157	0,2474	0,4016	0,1008	-0,0501	-0,2161	1	
Stakeholder	0,0741	0,0251	0,0338	-0,136	0,0516	-0,0164	-0,1261	-0,0908	-0,0613	-0,0018	0,1161	-0,095	1

Table 7.4 shows correlation analysis results among variables. The findings show that there is a postive relationship between energy efficiency and ROA (0.0662). Additionally, energy efficiency had a positive relationship with ROE (0.0693). Nevertheless, correlation between energy efficiency and EPS was negative (-0.065). Moreover, the correlation between energy efficiency and share price was negative (-0.0419). A positive correlation was also established between energy efficency and Tobin's Q (0.1114). Considering water efficiency and financial performance variables, a negative correlation was established between water efficiency and ROA (-0.0323) while it was discovered that water efficiency was positively correlated with ROE (0.0306).The results also show that water efficiency is positively correlated with EPS (0.0834) and share price (0.164), respectively. Nevertheless water efficiency is negatively correlated with Tobin's Q (-0.061). In terms of waste management, the findings show that waste management is negatively correlated with ROA (-0.0301); ROE (-0.06619); EPS (-0.0083) and share price (-0.0272). However, waste management was positively correlated with Tobin's Q

(0.0245). The results showed that carbon emission reduction was positively correlated with ROA (0.033); ROE (0.0586); EPS (0.149); share price (0.1442) and Tobin's Q (0.0353). A positive correlation was observed on material efficiency with ROA (0.0413) and ROE (0.1033) respectively. Nevertheless, there was a negative correlation between material efifciency and EPS (-0.1904) as well as with share price (-0.2111). A positive correlation was found between material efficiency and Tobin's Q (0.1325). Green products and services innovation was negatively correlated with ROA (-0.0285) but positively correlated with ROE (0.0699). The findings also showed that green products and services innovation was negatively correlated with EPS (-0.2118) as well as with share price (-0.3172). Nevertheless, a positive correlation was found between green products and services innovation with Tobin's Q (0.0609). The findings also indicated that environmental compliance was negatively correlated with ROA (-0.1328) and ROE (-0.1723) respectively. Conversely, a positive correlation was established between environmental compliance and EPS (0.1955) as well as with share price (0.2121). A negative correlation was found between green products and services innovation and Tobin's Q (-0.3185). A positive correlation was established between stakeholder engagement and ROA (0.0741); ROE (0.0251); EPS (0.0338) and Tobin's Q (0.0516). On the other hand, stakeholder engagement was negatively correlated with share price (-0.136).

7.3 ORDINARY LEAST SQUARES REGRESSION RESULTS

Table 7.5: Ordinary Least Squares Regression Results

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
VARIABLES	**ROE**	**ROA**	**EPS**	**Share Price**	**Tobin's Q**
Energy Efficiency	1.28 (0.44)	0.23 (0.73)	-162.66 (0.01)	-1411.58 (0.03)	0.77 (0.21)
Water Efficiency	3.36	0.64	112.63	2453.08	-0.01

	(0.11)	(0.44)	(0.17)	(0.00)	(0.87)
Waste Management	-5.13 (0.06)	-0.79 (0.47)	-72.04 (0.49)	-1578.76 (0.01)	0.13 (0.18)
Carbon Emission Reduction	2.89 (0.25)	1.16 (0.25)	304.15 (0.00)	2752.19 (0.00)	0.60 (0.48)
Materials Efficiency	2.92 (0.24)	0.61 (0.54)	-179.07 (0.06	-1062.53 (0.28)	0.09 (0.31)
Gren Products and services Innovation	0.39 (0.84)	-7.77 (0.33)	-89.99 (0.23)	-2255.00 (0.00)	-0.08 (0.26)
Environmental Compliance	-13.36 (0.02)	-5.58 (0.02)	539.73 (0.02)	4981.81 (0.04)	-1.33 (0.00)
Stakeholder Engagement	1.03 (0.88)	3.33 (0.25)	459.16 (0.07)	-3537.60 (0.21)	0.14 (0.58)

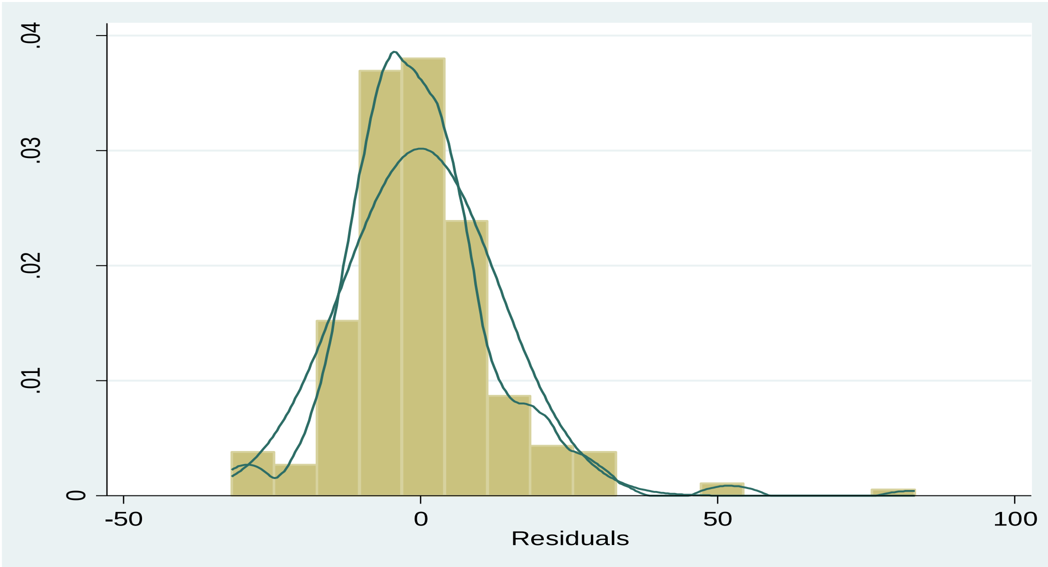
Table 7.5 shows Ordinary Least Squares Regression (OLS) results. The results of OLS were presented to provide a general outlook of the findings of the study. Nevertheless, the findings based on the OLS are not to be relied on because there are still some diagnostic tests to be conducted. These may influence the final results. The next section will present the different diagnostic tests conducted on the panel data.

7.4 DIAGNOSTIC TESTS

7.4.1 Normality

It is crucial to test for normality in panel data. Data which assumes a normal distribution curve increases the likelihood of getting quality results. In this study, the data passed the normality test and generally all the variables were normally distributed as shown in Figure 7.1.

Figure 7.1: Test for normality



7.4.2 Multicollinearity

Multicollinearity is another element which should be verified when using panel data. Multicollinearity exists when two or more variables of the predictors in a regression model are positively or negatively correlated (Boakye, 2018:176). Multicollinearity is tested using variance inflation factors (VIF). As shown by VIF values in Figure 7.2, there was no multicollinearity within the data. This is because all the VIF values on the variables are less than 10.

Figure 7.2: Test for Multicollinearity

. vif

Variable	VIF	1/VIF
Materials	2.11	0.474123
Waste	2.02	0.494081
GreenP	1.83	0.547291
Water	1.49	0.671468
Compliance	1.40	0.715940
Emissions	1.27	0.785214
Energy	1.22	0.816757
Firmsize	1.17	0.855648
Stakeholder	1.04	0.959053
Liquidity	1.02	0.976330
Mean VIF	1.46	

7.4.3 Serial autocorrelation

It is crucial to test for serial autocorrelation in panel data. This is because serial autocorrelation can bias the findings of the study (Masadeh, 2014). Serial autocorrelation tends to vary with each dependent variable used. In this study, serial autocorrelation was present on the model where environmental variables were regressed on share price as well as on Tobin's Q. More of the serial autocorrelation figures can be found on **Appendix 4 tables**.

7.4.4 Heteroscedasticity

The Breusch and Pagan test was used to assess the presence of heteroscedasticity. According to Field (2013), the presence of heteroscedasticity in panel data may weaken the analysis. Hence, it is crucial to test it and find ways to eliminate or suppress it. Values less than 0.05 show that there is heteroscedasticity in the panel data. As shown in Table 7.6, the panel data has heteroscedasticity as the model for ROE, share price and Tobin's Q have a value less than 0.05. More information about the Breusch and Pagan test can be found on **Appendix 4 tables**.

Table 7.6: Test for Heteroscedasticity

	ROE	**ROA**	**EPS**	**Share price**	**Tobin's Q**
Breusch-Pagan/ Cook-Weisberg test for heteroskedasticity	335.10 (0.00)	0.74 (0.39)	0.74 (0.39)	82.10 (0.00)	8.91 (0.00)

7.5 FEASIBLE GENERALISED LEAST SQUARES RESULTS

The Feasible Generalised Least Squares was finally adopted as the specific model to analyse data. This is because it suppresses heteroscedasticity which was identified in the data. Using the Feasible Generalised Least Squares, each of the eight environmental sustainability variables such as energy efficiency, water efficiency, waste management, carbon emission reduction, materials efficiency, green products and services innovation, environmental compliance and stakeholder engagement were regressed against each of the dependent variables. This produced 5 models based on ROE, ROA, EPS, share price and Tobin’s Q which had 8 independent variables regressed against each with firm size and liquidity as control variables. Hence, the values in Table 7.7 were extracted from different tables attached on **Appendix 5**. The interpretation of results presented in table 7.7 will be based on the objectives of the study and hypothesised relationships proposed in the study.

Table 7.7: Feasible Generalised Least Squares Results

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
VARIABLES	**ROE**	**ROA**	**EPS**	**Share Price**	**Tobin’s Q**
Energy Efficiency	-0.49 (-0.52)	-0.19 (-0.36)	-157.53* (-2.77)	-1421.89** (-2.28)	0.05 (0.94)
Water Efficiency	-0.18 (-0.15)	0.91 (1.30)	144.29** (2.00)	2654.83*** (3.37)	0.01 (0.16)
Waste Management	0.89 (0.57)	0.45 (0.50)	-97.62 (-1.02)	-1866.01* (-1.79)	0.15 (1.68)
Carbon Emission Reduction	1.13 (0.76)	1.07 (1.26)	284.07*** (3.32)	2807.73*** (2.99)	0.08 (0.91)
Material Efficiency	-0.76 (-0.51)	-0.58 (-0.66)	-192.86** (-2.20)	-1319.45 (-1.38)	0.04 (0.50)

Gren Products and services Innovation	1.16 (1.02)	0.05 (0.09)	-109.06 (-1.62)	-2235.51*** (-3.05)	-0.05 (-0.80)
Environmental Compliance	-11.83*** (-3.42)	-.4.73 (-2.38)	545.76*** (2.67)	1593.07*** (2.45)	-1.25* (-6.23)
Stakeholder Engagement	0.22 (0.06)	1.74 (0.86)	459.76* (1.80)	-2364.11 (-0.84)	0.08 (0.35)
Firm size	0.00*** (5.05)	0.00*** (0.00)	0.00 (1.01)	0.02 (0.31)	6.43*** (4.11)
Liquidity	1.33 (0.31)	3.34*** (4.80)	234.46*** (3.26)	1281.39 (1.61)	0.26*** (3.52)

Source: *, **, *** denotes significance at 10%, 5% and 1% respectively

Table 7.7 present Feasible Generalised Least Squares results based on the hypothesised relationships. The number presented inside brackets is the z value while the number on above it is the coefficient of that variable. The findings presented in Table 7.7 are interpreted separately in the next section. This decision was made to create a logical presentation of the results based on the objectives and hypotheses of the study.

7.5.1 Relationship Between Energy Efficiency and Financial Performance of Firms Listed on the JSE

Table 7.8: Relationship Between Energy Efficiency and Financial Performance of Firms Listed on the JSE

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
VARIABLES	**ROE**	**ROA**	**EPS**	**Share Price**	**Tobin's Q**
Energy Efficiency	-0.49 (-0.52)	-0.19 (-0.36)	-157.53* (-2.77)	-1421.89** (-2.28)	0.05 (0.94)

Source: *, **, *** denotes significance at 10%, 5% and 1% respectively

Table 7.8 presents results on the relationship between energy efficiency and financial performance of firms listed on the JSE. The findings show a negative but insignificant relationship between energy efficiency and ROE. A negative and insignificant relationship was also established between energy efficiency and ROA. Nevertheless, a negative and significant relationship was also established on the relationship between energy efficiency and EPS (-157.53; $p<0.1$) as well as between energy efficiency and share price (-1421.89; $p<0.05$). On the other hand, a positive but insignificant relationship was established between energy efficiency and Tobin's Q. Overall, the findings suggest that energy efficiency does not have a significant effect on financial performance in terms of ROE, ROA and Tobin's Q. Conversely, it can be inferred that attaining energy efficiency may have a negative effect on the financial performance of firms when EPS and share price are considered as measures of financial performance. The negative effect of energy efficiency on financial performance may be attributed to the cost of investing in energy efficiency technology. It was noted during data collection that the evaluated firms were actively involved in investing in green technology as a strategy to address the energy conundrum in South Africa. Hence, such huge investments may reduce the profitability of a business as measured by ROE, ROA, EPS and share price in the short run. Other investors may not take news on energy efficiency by firms seriously. Rather, they may perceive such news as green washing by the firm. This may lead to a negative valuation of the firm's shares, hence, a negative relationship between energy efficiency and share price.

7.5.2 Relationship Between Water Efficiency and Financial Performance of Firms Listed on the JSE

Table 7.9: Relationship Between Water Efficiency and the Financial Performance of Firms Listed on the JSE

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
VARIABLES	**ROE**	**ROA**	**EPS**	**Share Price**	**Tobin's Q**
Water Efficiency	-0.18 (-0.15)	0.91 (1.30)	144.29** (2.00)	2654.83*** (3.37)	0.01 (0.16)

Source: *, **, *** denotes significance at 10%, 5% and 1% respectively

Table 7.9 depicts the findings on the relationship between water efficiency and financial performance of firms listed on the JSE. The findings show that water efficiency and ROE are negatively related. However, the relationship is insignificant. The findings also show a positive but insignificant relationship between water efficiency and ROA. On the other hand, a positive and significant relationship (1.44.29; $p<0.05$) was established between water efficiency and EPS. A positive and significant relationship (2654.83; $p<0.01$) was also established between water efficiency and share price. A positive relationship between water efficiency and share price implies that investors value firms which are actively involved in solving the water challenge in South Africa. Another probable explanation may be that investors tend to value shares of firms which have water sustainability strategies in their business. This gives investors assurance that the business may not be affected by water shortage risks which makes it continue as a going concern. Nevertheless, a weak and positive relationship was established between water efficiency and Tobin's Q. The relationship was nevertheless insignificant because the p value is above the recommended significance level thresholds. In this case, a positive but insignificant relationship between water efficiency and Tobin's Q may mean that the market does not really value water efficiency by firms. For instance, investors might have their own evaluation criteria when making investment decisions. Overall, the findings suggest that being water efficient may not have an effect on financial performance when ROE, ROA and Tobin's Q are used as measures of financial performance. On the contrary, the findings also show that firms may enhance their financial performance when measures such as EPS and share price are used by attaining water efficiency.

7.5.3 Relationship Between Waste Management and Financial Performance of Firms Listed on the JSE

Table 7.10: Relationship Between Waste Management and Financial Performance of Firms Listed on the JSE

	(1)	(2)	(3)	(4)	(5)
VARIABLES	**ROE**	**ROA**	**EPS**	**Share Price**	**Tobin's Q**
Waste Management	0.89 (0.57)	0.45 (0.50)	-97.62 (-1.02)	-1866.01* (-1.79)	0.15 (1.68)

Source: *, **, *** denotes significance at 10%, 5% and 1% respectively

Table 7.10 shows findings on the relationship between waste management and financial performance of firms listed on the JSE. The findings show that there is a positive but insignificant relationship between waste management and ROE. Additionally, the findings also show that there is a positive but insignificant relationship between waste management and ROA. This may mean that the evaluated firms in South Africa are still investing in waste management initiatives minimally to comply with environmental legislation. Hence, they may be lacking creativity and innovation to transform their waste management initiatives to a point where it starts to significantly influence their financial performance in a positive manner. A negative but insignificant relationship was also established between waste management and EPS. The relationship between waste management and share price was also found to be negative and significant (-1866.01; $p<0.1$). On the other hand, the relationship between waste management and Tobin's Q was found to be positive but insignificant. The implication of this relationship is that waste management may positively influence Tobin's Q but given the context of a stock market in a developing country, it may take time for investors to positively value firms which are actively involved in waste management initiatives. Overall, the results suggest that waste management has no significant effect on the financial performance of listed firms considering both accounting and market-based measures of financial performance.

7.5.4 Relationship Between Carbon Emission Reduction and Financial Performance of Firms Listed on the JSE

Table 7.11: Relationship Between Carbon Emission Reduction and Financial Performance of Firms Listed on the JSE

	(1)	(2)	(3)	(4)	(5)
VARIABLES	**ROE**	**ROA**	**EPS**	**Share Price**	**Tobin's Q**
Carbon Emission Reduction	1.13 (0.76)	1.07 (1.26)	284.07*** (3.32)	2807.73*** (2.99)	0.08 (0.91)

Source: *, **, *** denotes significance at 10%, 5% and 1% respectively

Table 7.11 presents findings on the relationship between carbon emission reduction and the financial performance of firms listed on the JSE. As indicated by the findings on Table 7.6, a positive but insignificant relationship was established between carbon emission reduction and ROE. Additionally, a positive but insignificant relationship was established between carbon emission reduction and ROA. However, the effect of carbon emission reduction was different for EPS and share price. A positive and significant relationship (284.07; p<0.01) was established between carbon emission reduction and EPS. Furthermore, a significant positive relationship (2807.73; p<0.01) was established between carbon emission reduction and share price. On the other hand, the relationship between carbon emission reduction and Tobin's Q was positive but insignificant.

7.5.5 The Relationship Between Material Efficiency and Financial Performance of Firms Listed on the JSE

Table 7.12: The Relationship Between Material Efficiency and Financial Performance of Firms Listed on the JSE

	(1)	(2)	(3)	(4)	(5)
VARIABLES	**ROE**	**ROA**	**EPS**	**Share Price**	**Tobin's Q**
Material Efficiency	-0.76 (-0.51)	-0.58 (-0.66)	-192.86** (-2.20)	-1319.45 (-1.38)	0.04 (0.50)

Source: *, **, *** denotes significance at 10%, 5% and 1% respectively

Table 7.12 presents findings on the link between material efficiency and the financial performance of firms listed on the JSE. The findings show that the nexus between material efficiency and ROE is negative but insignificant. The material efficiency and ROA nexus was also found to be negative and insignificant. Nevertheless, material efficiency and EPS were found to be negatively related and the relationship was significant (-192.86; sig $p<0.05$). This implies that attaining material efficiency may negatively impact on the EPS. On the other hand, a negative but insignificant relationship was established between material efficiency and share price. Additionally, it was also found that material efficiency and Tobin's Q are positively related. However, the relationship was found to be weak and insignificant. Overall, the findings indicate that material efficiency has an insignificant effect on most measures of financial performance such as ROE, ROA, share price and Tobin's Q.

7.5.6 Relationship Between Green Products and Services and Financial Performance of Firms Listed on the JSE

Table 7.13: Relationship Between Green Products and Services and Financial Performance of Firms Listed on the JSE

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
VARIABLES	**ROE**	**ROA**	**EPS**	**Share Price**	**Tobin's Q**
Gren Products and services Innovation	1.16 (1.02)	0.05 (0.09)	-109.06 (-1.62)	-2235.51*** (-3.05)	-0.05 (-0.80)

Source: *, **, *** denotes significance at 10%, 5% and 1% respectively

Table 7.13 presents findings on the link between green products and services and the financial performance of firms listed on the JSE. The results show that the relationship between green products and services innovation and ROE is positive but insignificant. Also, it was discovered that green products and services innovation and ROA are positively related. However, the relationship is weak and insignificant. The study also found green products and services innovation to be negatively related to EPS. Nevertheless, the relationship was also found to be insignificant. On the other hand, a negative and significant relationship (-2235.51; p<0.01) was found between green products and services innovation and share price. The negative valuation of a business' green products and services by the market may be because the market does not value green products and services that much. This is usually the case in most developing countries, especially in Africa where the green revolution is relatively new as compared to developing countries. When considering the relationship between green products and services innovation and the Tobin's Q, a weak, negative and insignificant relationship was established.

7.5.7 Relationship Between Environmental Compliance and Financial Performance of Firms Listed on the JSE

Table 7.14: Relationship Between Environmental Compliance and Financial Performance of Firms Listed on the JSE

	(1)	(2)	(3)	(4)	(5)
VARIABLES	**ROE**	**ROA**	**EPS**	**Share Price**	**Tobin's Q**
Environmental Compliance	-11.83*** (-3.42)	-.4.73** (-2.38)	545.76*** (2.67)	1593.07*** (2.45)	-1.25* (-6.23)

Source: *, **, *** denotes significance at 10%, 5% and 1% respectively

Table 7.14 presents findings on the relationship between environmental compliance and the financial performance of firms listed on the JSE. The findings show that there is a negative and significant relationship (-11.83; p<0.01) between environmental compliance and ROE. This suggests that environmental compliance may negatively affect the returns attributable to shareholders. Conversely, a positive and significant relationship (545.76; p<0.01) was established between environmental compliance and EPS. This suggests that being a compliant business in terms of environmental requirements such as ISO 14001 and internal environmental policies may increase the profitability of the business as measured by EPS. Additionally, a positive and significant relationship (1593.07; p<0.01) was established between environmental compliance and share price. The implication of the positive and significant relationship between environmental compliance and share price is that investors value companies which comply with environmental regulations. This gives them assurance that the business will continue to have a positive image which protects their stake in the firm. Share price is highly sensitive to bad publicity of the business, which may emerge because of lack of compliance. Also, an insignificant negative relationship was established between environmental compliance and ROA. Considering the relationship between environmental compliance and the Tobin's Q, a negative and significant relationship was established (-1.25; p<0.1). This suffice to say that investors do not rely on compliance to determine the future value of the firm. Another explanation might be due to a weak environmental legislation in South Africa. This makes investors not see the value of compliance in determining the future value of the firm because other non-compliant firms still make profits without being apprehended.

7.5.8 Relationship Between Stakeholder Engagement and Financial Performance of Firms Listed on the JSE

Table 7.15: Relationship Between Stakeholder Engagement and Financial Performance of Firms Listed on the JSE

	(1)	(2)	(3)	(4)	(5)
VARIABLES	**ROE**	**ROA**	**EPS**	**Share Price**	**Tobin's Q**
Stakeholder Engagement	0.22 (0.06)	1.74 (0.86)	459.76* (1.80)	-2364.11 (-0.84)	0.08 (0.35)

Source: *, **, *** denotes significance at 10%, 5% and 1% respectively

Table 7.15 shows the findings from the regression model based on the relationship between stakeholder engagement and the financial performance of firms listed on the JSE. The findings show that stakeholder engagement is positively related to ROE. However, the relationship is insignificant. When stakeholder engagement is regressed against ROA, a positive but insignificant relationship is established. Coversely, stakeholder engagement was found to be a significant predictor of EPS (459.76; $p<0.1$). On the other hand, a negative but insignificant relationship (-2364.11; sig 0,40) was established between stakeholder engagement and share price. A weak, positive and insignificant relationship was also found between stakeholder engagement and the Tobin's Q. Overall, it was found that stakeholder engagement has a positive relationship with most of the financial performance measures such as ROE, ROA, EPS and Tobin's Q. Although the relationship is insignificant, it can be inferred that stakeholder engagement initiatives such as stakeholder communication and collaborating with stakeholders in environmental sustainability projects may positively influence financial performance as measured by EPS. One of the challenges confronting most firms is being driven by the profit maximisation goal that stakeholder engagement is not viewed as something that can help a business to generate profit. All in all, firms may unlock non-financial value for their business by actively engaging in stakeholder management. This is because the future of business longevity will depend more on the relationships that the business has with its key stakeholders. Considering the effect on Tobin's Q, it can be inferred that investors are still pessimistic about the importance of considering stakeholder engagement to determine the future value of a firm. Overall, it can be concluded that stakeholder engagement has an insignificant effect on financial performance.

7.4 COMPARISON BETWEEN ENVIRONMENTAL SENSITIVE INDUSTRIES AND LESS-ENVIRONMENTAL SENSITIVE INDUSTRIES

It was crucial to compare independent samples of firms in different industries to understand the financial implications emanating from environmental sustainability commitment variables such as energy efficiency, water efficiency, waste management, carbon emission reduction, material efficiency, green products and services innovation, environmental compliance and stakeholder management. On that account, it was crucial to understand how each of the environmental sustainability commitment variables influenced financial performance among firms in a particular industry. The next section will present the findings in form of tables. Henceforth, a critical comparison will be done based on the findings.

7.4.1 Environmental Sensitive Industries (ESI)

Table 7.16: Environmental Sensitive Industries (ESI)

	(1) ROA	(2) ROE	(3) EPS	(4) SharePrice	(5) TobinsQ
Energy	-2.835***	-0.709	-317.2***	-2534.9***	-0.166***
	(-2.68)	(-0.21)	(-3.91)	(-3.01)	(-2.96)
Water	0.181	6.931	237.6**	3842.3***	0.0217
	(0.12)	(1.49)	(2.14)	(3.32)	(0.28)
Waste	-5.204***	-9.095	-217.6	-3833.9***	-0.247***
	(-2.95)	(-1.61)	(-1.61)	(-2.73)	(-2.64)
Emissions	0.958	5.347	209.7*	335.8	-0.0319
	(0.66)	(1.15)	(1.89)	(0.29)	(-0.41)
Materials	-1.505	1.552	-457.1***	-3793.2***	-0.196***
	(-1.10)	(0.35)	(-4.35)	(-3.47)	(-2.69)
GreenP	1.325	2.375	166.2*	1256.0	-0.00245
	(1.10)	(0.62)	(1.79)	(1.30)	(-0.04)
Compliance	-19.81***	-36.84**	-37.27	995.4	-2.662***
	(-4.32)	(-2.51)	(-0.11)	(0.27)	(-10.92)
Stakeholder	3.321	6.106	696.9***	669.7	0.228
	(1.03)	(0.59)	(2.82)	(0.26)	(1.33)
Liquidity	0.688	4.633	559.5***	2812.2*	-0.297***
	(0.37)	(0.78)	(3.95)	(1.91)	(-3.03)
Firmsize	0.00298***	0.00284	0.483***	6.101***	0.0000159
	(3.23)	(0.96)	(6.83)	(8.30)	(0.32)
_cons	79.67***	83.03	-983.9	21628.6	10.75***
	(4.06)	(1.32)	(-0.65)	(1.38)	(10.31)
N	128	128	128	128	128

Source: *, **, *** denotes significance at 10%,5% and 1% respectively

Table 7.16 shows findings on the relationship between environmentally sustainability commitment and financial performance among firms in the Environmental Sensitive Industries (ESI) group. The findings in the above table will be outlined in section where key comparisons are made.

7.4.2 Less-Environmental Sensitive Industries (LESI)

Table 7.17: Less-Environmental Sensitive Industries (LESI)

LESI	(1) ROE	(2) ROA	(3) EPS	(4) SharePrice	(5) TobinsQ
Energy	0.645	1.069	-83.61	-1210.2	0.0868
	(0.65)	(1.54)	(-1.04)	(-1.60)	(1.16)
Water	0.939	0.978	-8.162	620.0	0.0630
	(0.79)	(1.18)	(-0.08)	(0.69)	(0.70)
Waste	0.412	0.663	88.10	407.8	0.179
	(0.25)	(0.57)	(0.65)	(0.32)	(1.43)
Emissions	-1.206	-0.201	259.7**	3286.0***	0.115
	(-0.78)	(-0.19)	(2.07)	(2.79)	(0.99)
Material	3.932**	0.472	140.4	1496.1	0.287**
	(2.30)	(0.39)	(1.01)	(1.14)	(2.21)
GreenP	-5.096***	-1.993*	-480.7***	-5879.5***	-0.428***
	(-3.55)	(-1.97)	(-4.11)	(-5.36)	(-3.94)
Compliance	-4.121	-1.707	509.5*	4077.1*	-0.581**
	(-1.26)	(-0.74)	(1.92)	(1.63)	(-2.35)
Stakeholder	-13.81**	0.315	-624.6	-18054.7***	-0.456
	(-2.24)	(0.07)	(-1.24)	(-3.83)	(-0.98)
Liquidity	3.107***	5.590***	144.8	643.6	0.638***
	(2.63)	(6.72)	(1.50)	(0.71)	(7.12)
Firmsize	0.0000816***	0.0000667***	-0.00335*	-0.0232	0.00000405*
	(3.50)	(4.07)	(-1.77)	(-1.30)	(2.30)
_cons	76.28***	0.706	1973.9	74382.5***	3.066
	(2.86)	(0.04)	(0.91)	(3.65)	(1.52)
N	128	128	128	128	128

Source: *, **, *** denotes significance at 10%,5% and 1% respectively

Table 7.17 shows findings on the relationship between environmentally sustainability commitment and financial performance among firms in the Less Environmental Sensitive Industries (ESI) group. The findings in the above table will be outlined in section where key comparisons are made.

7.4.3 Critical analysis and comparison of the two groups

Comparing energy intensive versus less intensive industries, the results showed that attaining energy efficiency negatively affects financial performance of ESI industries as measured by ROA (-2.835; $p<0.01$), EPS (-317.2; $p<0.01$), share price (-2534.9; $p<0.01$) and the Tobin's Q (-0.166; $p<0.01$). As indicated in previous sections, these are firms in sectors such as mining, energy as well as manufacturing. On the other hand, it was discovered that attaining energy efficiency in LESI did not have a significant effect at all with all financial performance measures.

In terms of water efficiency, the comparison showed that environmentally sensitive industries (ESI) obtain value from being water efficient which significantly and positively influenced the EPS (237.6; $p<0.05$) and share price (3842.3; $p<0.01$). The effect was insignificant on other financial variables. Conversely, the results showed that water efificency strategies such as recycling, reusing and reduction in water use do not have a significant effect on financial performance in less environmentally sensitive industries.

Regarding waste management, it was found that waste reduction strategies significantly and negatively affects financial performance measures such as ROA (-5.204; $p<0.01$), share price (-3833.9; $p<0.01$) and the Tobin's Q (-0.247; $p<0.01$) in ESIs. Conversely, the effect of such waste management strategies was insignificant on all measures of financial performance in less environmentally sensitive industries.

When the two separate industries were further compared in terms of carbon emission reduction initiatives such as reductions in direct emissions, reductions in indirect emissions and investments in technology to trap co_2 and convert it to other economical uses, the findings showed that environmentally sensitive industries benefit financially from such investments as exhibited by a significant positive EPS (209.7; $p<0.1$). Nevertheless, the effect was insignificant on all other measures of financial performance. Conversely, it was found out that firms in less environmentally sensitive industries can enjoy enhanced financial performance as exhibited by significant and positive relationships between carbon emission reduction and EPS (259.7; $p<0.05$) as well as with share price (3286; $p<0.01$). The effect of carbon emission reduction was insignificant on the rest of other financial performance measures such as ROE, ROA and Tobin's Q.

Regarding the relationship between material efficiency and financial performance, it was found that material efficiency strategies significantly and negatively affect financial performance meausures such as EPS (-457.1; $p<0.01$), share price (-3793.2; $p<0.01$), and Tobin's Q (-0,196; $p<0.01$) respectively of environmentally sensitive industries.

Nevertheless, the effect was insignificant on ROE and ROA. On the other hand, it was found that reducing carbon emissions significantly and positively influence financial performance particularly ROE (3.932; $p<0.05$) and Tobin's Q (0.287; $p<0.05$) in LESI. The effect was insignificant on the remaining two financial performance measures such ROE and ROA.

When the the two industries groups were compared in terms of green products and services innovation, it was found that such green products strategies positively predict financial performance particularly EPS (166.2; $p<0.1$) in ESIs. Nevertheless, the effect of investing in the green products and services innovation strategy was found to be insignificant on other financial performance measures such as ROE, ROA, share price and Tobin's Q. Conversely, it was found that adopting a business model which revolves around green products and services innovation strategy negatively affect the financial performance measures ROE (-5.096; $p<0.01$), ROA (-1.993; $p<0.1$), EPS (-480.7; $p<0.01$), share price (-5879.5; $p<0.01$) and Tobin's Q (-0.428; $p<0.01$).

Comparing the two industries in terms of environmental compliance showed that being environmentally compliant negatively affect the financial performance of firms operating in ESI. This was exhibited through significantly negative relationships between environmental compliance and ROE (-36.84; $p<0.05$), ROA (-19.81; $p<0.01$) and Tobin's Q (-2.662; $p<0.01$) respectively. On the other hand, the findings indicated that being environmentally compliant enhances financial performance measures such as EPS (509.5; $p<0.1$) and share (4077.1; $p<0.1$) in LESI. Nevertheless, the effect of environmental compliance on the Tobin's Q was found to be significantly negative (-0.581; $p<0.05$) while in significant on ROE and ROA.

Regarding the nexus between stakeholder engagement and financial performance, the cross comparisons indicated that stakeholder engagement positively and significantly predict financial performance as measured by EPS (696.9; $p<0.01$). On the contrary, the findings showed that investing in stakeholder engagement initiatives negatively affect the financial performance of LESI firms. This was exhibited by the significant negative relationships between stakeholder engagement and financial performance indicators such as ROE and share price.

Overall, synthesising the industrial comparisons above, it was found that 5 significant positive relationshipss and 13 significant negative relationships were established between environemental sustainability commitment and financial performance in ESIs. The 5 significant positive relationships were mainly predicted by environmental sustainability commitment variables such as water efficiency, carbon emission reduction, green products and services innovation as well as stakeholder engagement. It was also noted that environmental sustainability investements such as water efficiency, carbon emission reduction, green products and services innovation as well as stakeholder engagement were mainly related to EPS which is an accounting measure of financial performance than market based measures as it was found that it was only water efficiency which positively predicted the share price of firms within the ESI. The significant and positive relationships were linked to either EPS or share price. On the other hand, it was found that 6 significant positive relationships and 8 significant negative relationships were established between environemental sustainability commitment and financial performance in LESI. The 6 significant positive relationships were mainly predicted by environmental sustainability commitment initiatives such as carbon emission reduction, material efficiency and environmental compliance. The significant and positive relationships were established on ROE, EPS, share price and Tobin's Q. Based on the findings above, once can infer that environmental sustainability commitment is relatively equally important across all sectors. This is exhibited by the almost similar findings on the effect of environmental sustainability commitment on financial performance in both ESI and LESI. This is because these different industries can still benefit from environmental sustainability commitment initiatives even though the benefits can come from different environmental investments which add value to unique financial performance indicators in that particular sector as determined by the different stakeholders of the business in that industry. Stakeholders in different industries may have diverse expectations from firms which have an impact on the financial performance in a unique manner.

7.5 MODERATING EFFECT OF INDUSTRY TYPE ON THE RELATIONSHIP BETWEEN ENVIRONMENTAL SUSTAINABILITY COMMITMENT AND FINANCIAL PERFORMANCE

This section presents the findings on the moderation effect of industry type on the environmental sustainability commitment and financial performance nexus. The main goal is to evaluate if industry type influences the strength of the relationship between environmental sustainability commitment and financial performance. Having established that is pertinent in helping to resolve the ongoing debate on the relationship between these two variables. To compound the moderation effect, the interation variable tab in stata was used. This enabled the researcher to add industry type as interation variable on the relationship between environmental sustainability and financial performance.

7.5.1 Environmentally Sensitive Industries (ESI)

Table 7.18: ROE Model

Variables	**(1) ROE**	**(2) ROE**	**(3) ROE**	**(4) ROE**	**(5) ROE**	**(6) ROE**	**(7) ROE**	**(8) ROE**
Energy	4.771 (1.44)							
IndustryType	-1.232 (-0.89)	-2.198 (-1.57)	-5.086 (-1.47)	-1.653 (-0.97)	-4.865 (-1.74)	-6.488*** (-6.12)	-4.423 (-1.27)	-22.93* (-2.29)
c.Energy#c~e	-0.660 (-1.53)							
Liquidity	-0.418 (-0.31)	0.0295 (0.02)	-0.945 (-0.62)	-0.318 (-0.23)	0.0232 (0.02)	1.865 (1.43)	-0.828 (-0.58)	0.139 (0.11)
Firmsize	0.000*** (5.35)	0.000*** (5.20)	0.000*** (5.46)	0.000*** (5.18)	0.000*** (5.20)	0.000*** (3.90)	0.000*** (5.49)	0.000*** (5.54)
Water		2.472 (0.66)						
c.Water#c.~e		-0.364 (-0.75)						
Waste			-5.066 (-0.69)					
c.Waste#c.~e			0.410 (0.48)					
Emissions				3.204 (0.63)				
c.Emissions#c.~e				-0.675 (-1.04)				
Materials					-4.843 (-0.76)			
c.Materials#c.~e					0.474 (0.61)			
GreenP						-15.58*** (-4.49)		
c.GreenP#c.~e						1.657*** (3.74)		
Compliance							-7.294 (-0.76)	
c.Compliance#c.~e							0.472 (0.37)	

Stakeholder								-43.55** (-2.81)
c.Stakeholder#c.~e								2.01 (0.00)
_cons	27.37* (2.39)	34.38** (2.82)	63.25* (2.06)	34.12* (2.40)	58.15* (2.52)	70.92*** 8.16)	61.73* (2.25)	211.4*** (3.45)
N	128	128	128	128	128	128	128	128

T statistics in parenetheses *** p<0.01, ** p<0.05, * p<0.1

Table 7.18 presents the moderating effect of industrial type on the link between environmental sustainability commitment and financial among firms within the ESI. The findings show that industry type was only a significant factor in strengthening the link between green products and services innovation and ROE (1.657; p<0.01). nevertheless, industry type failed to have an effect on the link between the rest of environmental sustainability commitment with ROE.

Table 7.19: ROA Model

Variables	**(1) ROA**	**(2) ROA**	**(3) ROA**	**(4) ROA**	**(5) ROA**	**(6) ROA**	**(7) ROA**	**(8) ROA**
Energy	3.434* (1.85)							
IndustryType	-2.443** (-3.16)	-3.928*** (-5.01)	-11.55**	-2.411** (-2.53)	- 9.852*** (-6.95)	-5.974*** (-10.48)	- 7.781*** (-4.04)	-4.776 (-0.82)
c.Energy#c~e	-0.422 (-1.75)							
Liquidity	1.503** (2.02)	1.355 (1.65)	-0.297 (-0.38)	1.670** (2.20)	2.497*** (3.57)	3.029*** (4.33)	0.941 (1.20)	1.602** (2.12)
Firmsize	0.000*** (6.49)	0.000*** (6.14)	0.000*** (7.23)	0.000*** (6.50)	0.000*** (6.50)	0.000*** (5.09)	0.000*** (6.79)	0.000*** (6.52)
Water		-1.041 (-0.49)						
c.Water#c.~e		0.0663 (0.24)						
Waste			-17.60*** (-4.67)					
c.Waste#c.~e			(1.886*** (4.29)					
Emissions				3.396 (1.20)				
c.Emissions#c.~e				-0.564 (-1.55)				
Materials					- 15.49*** (-4.78)			
c.Materials#c.~e					1.691*** (4.27)			
GreenP						-10.44*** (-5.60)		
c.GreenP#c.~e						1.119*** (4.69)		
Compliance							-12.76* (-2.40)	
c.Compliance#c.~e							15.15** (2.17)	
Stakeholder								-1.186 (-0.13)
c.Stakeholder#c.~e								0.285 (0.19)
_cons	22.47**	35.81**	106.0***	24.62**	87.30**	52.63***	67.89***	37.07

	(3.52)	(5.24)	(6.71)	(3.09)	(7.46)	(11.25)	(4.48)	(1.04)
N	128	128		128	128	128	128	128

t statistics in parenetheses *** p<0.01, ** p<0.05, * p<0.1

Table 7.19 outlines the findings on the moderating effect of industrial type on the link between environmental sustainability commitment variables and ROA among firms within the ESI. The findings indicate that industry type significantly strengthened the link between waste management and ROA (1.886; p<0.01), material efficiency and ROA (1.691; p<0.01) as well as environmental compliance and ROA (15.15; p<0.05). Nevertheless, it failed to have any effect on the rest of the remaining combinations.

Table 7.20: EPS MODEL

Variables	(1) EPS	(2) EPS	(3) EPS	(4) EPS	(5) EPS	(6) EPS	(7) EPS	(8) EPS-
Energy	-650.4** (-2.24)							
IndustryType	-396.5*** (-3.27)	-106.5 (-0.86)	228.2 (0.74)	28.12 (0.19)	-475.5** (-1.96)	-55.3*** (-6.39)	754.5** (2.56)	-938.2 (-1.03)
c.Energy#c~e	85.83** (2.28)							
Liquidity	-166.3 (-1.43)	-160.2 (-1.23)	-106.0 (-0.79)	-135.5 (-1.13)	-136.8 (-1.15)	56.67 (0.53)	-25.77 (-0.21)	-163.9 (-1.40)
Firmsize	-0.001 (-0.38)	-0.000 (-0.24)	-0.000 (-0.28)	-0.000 (-0.04)	-0.001 (-0.49)	-0.004 (-2.64)	-0.001 (-0.74)	-0.001 (-0.32)
Water		169.0 (0.51)						
c.Water#c.~e		-20.19 (-0.47)						
Waste			831.4 (1.28)					
c.Waste#c.~e			-97.79 (-1.29)					
Emissions				703.4 (1.58)				
c.Emissions#c.~e				-70.08 (-1.23)				
Materials					-849.6 (-1.54)			
c.Materials#c.~e					79.06 (1.17)			
GreenP						-1783*** (-6.28)		
c.GreenP#c.~e						188.6*** (5.19)		
Compliance							2941.5*** (3.62)	
c.Compliance#c.~e							-332.9*** (-3.11)	
Stakeholder								-2050.6 (-1.46)
c.Stakeholder#c.~e								199.2 (0.87)
_cons	4364.0*** (4.36)	2060.8 (1.91)	-852.2 (-0.31)	666.5 (0.53)	5635.8** (2.82)	6006.9*** (8.43)	-5695.3** (-2.46)	10554.9 (1.90)
N	128	128	128	128	128	128	128	128

t statistics in parenetheses *** p<0.01, ** p<0.05, * p<0.1

Table 7.20 presents the findings on the findings on the moderating effect of industrial type on the link between environmental sustainability commitment variables and EPS among firms within the ESI. It was established that industry type significantly made the link between energy efficiency and EPS stronger (85.83; p<0.05). Moreover, industry type significantly strengthened the nexus between green products and services innovation and EPS (188.6; p<0.01). It was also established that industry type weakened the link between environmental compliance and EPS (-332.9; p<0.01). Nevertheless, it failed to have any effect on the rest of the remaining combinations.

Table 7.21: Share Price MODEL

Variables	**(1) ShareP**	**(2) ShareP**	**(3) ShareP**	**(4) ShareP**	**(5) ShareP**	**(6) ShareP**	**(7) ShareP**	**(8) ShareP**
Energy	-4268.3 (-1.44)							
IndustryType	-4114.9 (-3.33)	-989.7 (-0.80)	-2398.3 (-0.77)	298.0 (0.20)	-9498*** (-4.12)	-1861*** (-13.37)	6540.2* (2.19)	-27436** (-3.24)
c.Energy#c~e	495.4 (1.29)							
Liquidity	-4208*** (-3.54)	-3579*** (-2.76	-4467** (-3.28)	-3673*** (-3.07)	-3298*** (-2.90)	-685 (-0.86)	-2859** (-2.34)	-3782*** (-3.24)
Firmsize	0.000 (0.10)	0.000 (0.24)	0.000 (0.17)	0.007 (0.38)	-0.006 (-0.33)	-0.051*** (-4.36)	-0.005 (-0.26	0.000 (0.08)
Water		5244.9 (1.57)						
c.Water#c.~e		-680 (-1.57)						
Waste			101.9 (0.02)					
c.Waste#c.~e			-153.1 (-0.20)					
Emissions				10444.3*** (2.34)				
c.Emissions#c.~e				-1167.8** (-2.04)				
Materials					-17739*** (-3.37)			
c.Materials#c.~e					1778*** (2.76)			
GreenP						-26806*** (-12.66)		
c.GreenP#c.~e						2879*** (10.63)		
Compliance							28334*** (3.43)	
c.Compliance#c.~e							-3373** (-3.10)	
Stakeholder								-56667*** (-4.33)
c.Stakeholder#c.~e								6311*** (2.96)
_cons	51289.5*** (5.03)	24724** (2.29)	39941** (1.46)	11850 (0.94)	10281*** (5.40)	90851*** (17.10)	-40080 (-1.70)	260912*** (5.04)
N	128	128	128	128	128	128	128	128

t statistics in parenetheses *** p<0.01, ** p<0.05, * p<0.1

Table 7.21 outlines findings on the findings on the moderating effect of industrial type on the link between environmental sustainability commitment variables and share price among firms within the ESI. It was noted that industry type significantly strengthened links between material efficiency and share price (1778; p<0.01). Moreover, industry type significantly strengthened the nexus between green products and services innovation and share price (2879; p<0.01). The relationship between stakeholder engagement and share price was also strengthened by the effect of industry type (6311; p<0.01). It was also established that industry type weakened the link between carbon emission reduction and share price (-1167.8; p<0.05). The relationship between environmental compliance and share price was also weakened by the effect on industry type. Nevertheless, it failed to have any effect on the rest of the remaining combinations.

Table 7.22: Tobin's Q MODEL

Variables	(1) Tobin's Q	(2) Tobin's Q	(3) Tobin's Q	(4) Tobin's Q	(5) Tobin's Q	(6) Tobin's Q	(7) Tobin's Q	(8) Tobin's Q
Energy	0.320 (1.49)							
IndustryType	-0.318*** (-3.55)	-0.441*** (-4.86)	-1.095*** (-5.03)	-0.185 (-1.70)	-0.914*** (-5.21)	-0.771*** (-12.60)	-1.215*** (-5.75)	-0.893 (-1.34)
c.Energy#c~e	-0.0372 (-1.34)							
Liquidity	0.192** (2.23)	0.192** (2.02)	0.052 (0.54)	0.244*** (2.81)	0.269*** (3.11)	0.405*** (5.39)	0.0663 (0.77)	0.214** (2.48)
Firmsize	0.000*** (4.31)	0.000*** (4.22)	0.000*** (4.50)	0.000*** (4.73)	0.000*** (4.12)	0.000*** (2.72)	0.000*** (5.09)	0.000*** (4.46)
Water		-0.0508 (-0.21)						
c.Water#c.~e		0.00498 (0.16)						
Waste			-1.460*** (-3.18)					
c.Waste#c.~e			0.164*** (3.07)					
Emissions				0.799** (2.47)				
c.Emissions#c.~e				-0.0991** (-2.39)				
Materials					-1.187*** (-2.96)			
c.Materials#c.~e					0.137*** (2.79)			
GreenP						-1.519*** (-7.59)		
c.GreenP#c.~e						0.170 (6.64)		
Compliance							-2.502*** (-4.29)	
c.Compliance#c.~e							0.288*** (3.75)	
Stakeholder								-1.167 (0.71)
c.Stakeholder#c.~e								0.119 (0.71)
_cons	3.562***	4.647***	10.52***	2.485**	8.663***	7.406***	11.48***	9.063*

	(4.82)	(5.88)	(5.46)	(2.73)	(5.98)	(14.75)	(6.91)	(2.22)
N	128	128	128	128	128	128	128	128

t statistics in parenetheses *** p<0.01, ** p<0.05, * p<0.1

Table 7.22 presents findings on the moderating effect of industrial type on the link between environmental sustainability commitment variables and Tobin's among firms within the ESI. It was noted that industry type significantly strengthened links between waste management and Tobin's Q (0.164; p<0.01). Moreover, industry type significantly strengthened the nexus between material efficiency and Tobin's (0.137; p<0.01). The relationship between environmental compliance and Tobin's Q was also strengthened by the effect of industry type (0.288; p<0.01). It was also established that industry type weakened the link between carbon emission reduction and Tobin's Q (-0.0991; p<0.05). Nevertheless, it failed to have any effect on the rest of the remaining combinations.

7.5.1 LESS Environmentally Sensitive Industries (LESI)

Table 7.23: ROE MODEL

Variables	(1) ROE	(2) ROE	(3) ROE	(4) ROE	(5) ROE	(6) ROE	(7) ROE	(8) ROE
Energy	-28.68*** (-4.43)							
IndustryType	-39.78*** (-4.71)	-4.433 (-0.54)	4.535 (0.35)	-16.08 (-1.94)	-15.05** (-2.02)	-0.697 (-0.16)	-4.438 (-1.07)	2.498 (0.65)
c.Energy#c~e	12.62*** (5.46)							
Liquidity	2.450 (0.38)	1.539 (0.21)	1.539 (0.21)	2.540 (0.37)	1.163 (0.16)	1.666 (0.23)	1.610 (0.23)	1.969 (0.27)
Firmsize	0.003 (1.16)	0.003 (1.07)	0.003 (1.05)	0.003 (1.09)	0.003 (0.98)	0.004 (1.16)	0.003 (1.04)	0.003 (1.07)
Water		-5.181 (-0.45)						
c.Water#c.~e		3.580 (1.22)						
Waste			-5.381 (-0.43)					
c.Waste#c.~e			-0.674 (-0.20)					
Emissions				-14.99 (-1.46)				
c.Emissions#c.~e				8.296** (2.56)				
Materials					-13.79* (-1.78)			
c.Materials#c.~e					6.945** (2.80)			
GreenP						-7.116 (-0.92)		
c.GreenP#c.~e						4.583** (1.93)		
Compliance							-54.46*** (-3.60)	
c.Compliance#c.~e							0.000 (0.00)	
Stakeholder								6.913

								(0.64)
c.Stakeholder#c.~e								0.000 (0.00)
_cons	91.13** (3.26)	7.066 (0.19)	18.84 (0.35)	29.80 (0.96)	33.04 (1.07)	2.515 (0.11)	174.9** (3.28)	-29.57 (-0.64)
N	128	128	128	128	128	128	128	128

t statistics in parenetheses *** p<0.01, ** p<0.05, * p<0.1

Table 7.23 presents the findings on the moderating effect of industrial type on the link between environmental sustainability commitment variables and ROE among firms within the LESI. The findings indicate that industry type significantly strengthened the link between energy efficiency and ROA (12.62; p<0.01). The effect was also positive and significant on the link between carbon emission reduction and ROE (8.296; p<0.05). It was noted that industry type also strengthened the link between material efficiency and ROE (6.945; p<0.05) as well as between green products and services innovation and ROE (4.583; 0.05). Nevertheless, the effect of industry type was insignificant on the remaining combinations.

Table 7.24: ROA MODEL

Variables	**(1) ROA**	**(2) ROA**	**(3) ROA**	**(4) ROA**	**(5) ROA**	**(6) ROA**	**(7) ROA**	**(8) ROA**
Energy	-9.881*** (-4.41)							
IndustryType	-6.830** (-2.34)	4.342 (1.58)	4.893 (1.19)	-0.420 (-0.15)	1.019 (0.40)	3.095** (2.14)	0.877 (0.64)	3.276*** (2.59)
c.Energy#c~e	3.133*** (3.92)							
Liquidity	2.316 (1.04)	2.671 (1.10)	2.174 (0.94)	2.680 (1.13)	2.107 (0.85)	2.860 (1.16)	2.461 (1.09)	2.561 (1.08)
Firmsize	0.003*** (3.17)	0.003*** (2.69)	0.003*** (2.75)	0.003*** (2.76)	0.003*** (2.70)	0.003*** (2.79)	0.003*** (2.75)	0.003*** (2.70)
Water		0.504 (0.13)						
c.Water#c.~e		-0.479 (-0.49)						
Waste			-4.548 (-1.13)					
c.Waste#c.~e			-0.555 (-0.51)					
Emissions				-4.003 (-1.14)				
c.Emissions#c.~e				1.684 (1.51)				
Materials					-2.741 (-1.03)			
c.Materials#c.~e					0.912 (1.07)			
GreenP						-0.0791 (-0.03)		
c.GreenP#c.~e						0.525 (0.65)		
Compliance							-19.32*** (-3.85)	
c.Compliance#c.~e							0.000 (0.00)	
Stakeholder								4.235

								(1.18)
c.Stakeholder#c.~e								0.000 (0.00)
_cons	26.55*** (2.75)	-5.980 (-0.46)	13,48 (0.80)	3.825 (0.36)	2.788 (0.26)	-5.745 (-0.75)	57.99*** (3.28)	-21.31 (-1.40)
N	128	128	128	128	128	128	128	128

T statistics in parenetheses *** p<0.01, ** p<0.05, * p<0.1

Table 7.24 presents the findings on the moderating effect of industrial type on the link between environmental sustainability commitment variables and ROA among firms within the LESI. The findings indicate that industry type significantly strengthened the link between energy efficiency and ROA (3.133; p<0.01). Nevertheless, the effect of industry type was insignificant on the remaining combinations of environmental sustainability variables and ROA.

Table 7.25: EPS MODEL

Variables	**(1) EPS**	**(2) EPS**	**(3) EPS**	**(4) EPS**	**(5) EPS**	**(6) EPS**	**(7) EPS**	**(8) EPS**
Energy	-345.4 (-1.93)							
IndustryType	-475** (-2.03)	-367.8 (-1.76)	-1103*** (-3.55)	-148.2 (-0.68)	-831.9*** (-4.69)	-300.1*** (-2.72)	-289.2*** (-2.64)	-262.9*** (-2.80)
c.Energy#c~e	76.27 (1.19)							
Liquidity	472.8*** (2.64)	462.3** (2.50)	3.70.4** (2.13)	498*** (2.74)	253.3 (1.48)	445.7** (2.37)	492.2*** (2.71)	484.2*** (2.74)
Firmsize	0.3888*** (4.94)	0.379*** (4.74)	0.353*** (4.71)	0.357*** (4.40)	0.385*** (5.32)	0.353*** (4.32)	0.367*** (4.63)	0.368*** (4.76)
Water		-264.1 (-0.89)						
c.Water#c.~e		44.95 (0.60)						
Waste			-1158*** (-3.84)					
c.Waste#c.~e			228.4*** (2.81)					
Emissions				178 (0.66)				
c.Emissions#c.~e				-38.00 (-0.45)				
Materials					-932.5*** (-5.05)			
c.Materials#c.~e					218.7*** (3.70)			
GreenP						-223.5 (-1.11)		
c.GreenP#c.~e						70.62 (1.15)		
Compliance							-396.9 (-0.99)	
c.Compliance#c.~e							0.000 (0.00)	
Stakeholder								761.2*** (2.87)
c.Stakeholder#c.~e								0.000 (0.00)
_cons	1764.2*** (2.28)	1441.6 (1.47)	5215*** (4.09)	260.7 (0.32)	3544.9*** (4.84)	951.1 (1.63)	1973.5 (1.40)	-2220*** (-1.97)
N	128	128	128	128	128	128	128	128

t statistics in parenetheses *** p<0.01, ** p<0.05, * p<0.1

Table 7.25 presents the findings on the moderating effect of industrial type on the link between environmental sustainability commitment variables and ROE among firms within the LESI. The findings indicate that industry type significantly strengthened the link between waste management and EPS (228.4; p<0.01). It was noted that industry type also strengthened the link between material efficiency and EPS (2.18.7; p<0.01). Nevertheless, the effect of industry type was insignificant on the remaining combinations of environmental sustainability variables and EPS.

Table 7.26: Share Price MODEL

Variables	(1) ShareP	(2) ShareP	(3) ShareP	(4) ShareP	(5) ShareP	(6) ShareP	(7) ShareP	(8) ShareP
Energy	-2765.1 (-1.58)							
IndustryType	-5813.1** (-2.55)	-3329.9 (-1.64)	-16931*** (-6.05)	-4551** (-2.16)	-10273*** (-6.02)	-5288*** (-5.09)	-4509*** (-4.27)	-3864*** (-4.13)
c.Energy#c~e	638.1 (1.02)							
Liquidity	597 (0.34	880.7 (0.49)	-1020.3 (-0.65)	751.4 (0.43)	-1605 (-0.97)	-521.7 (-0.29)	724.2 (0.41)	744.5 (0.42)
Firmsize	4.901*** (6.40)	4.724*** (6.08)	4.532*** (6.72)	4.851*** (6.17)	4.892*** (7.04)	4.314*** (5.61)	4.732*** (6.18)	4.753*** (6.17)
Water		891.5 (0.31)						
c.Water#c.~e		-172.6) (-0.24)						
Waste			-16499*** (-6.07)					
c.Waste#c.~e			3484.9*** (4.75)					
Emissions				-1434.3 (-0.55)				
c.Emissions#c.~e				319.3 (0.39)				
Materials					-9558*** (-5.39)			
c.Materials#c.~e					2392.6*** (4.21)			
GreenP						-5503** (-2.90)		
c.GreenP#c.~e						1614*** (2.78)		
Compliance							-5329.7 (-1.38)	
c.Compliance#c.~e							0.000 (0.00)	
Stakeholder								1662 (0.63)
c.Stakeholder#c.~e								0.00 (0.00)
_cons	29802.4*** (3.95)	18517.4 (1.95)	85603*** (7.45)	24405** (3.09)	50229.9*** (7.14)	28014*** (5.09)	38498.9** (2.83)	14745.1 (1.31)
N	128	128	128	128	128	128	128	128

t statistics in parenetheses *** p<0.01, ** p<0.05, * p<0.1

Table 7.26 presents the findings on the moderating effect of industrial type on the link between environmental sustainability commitment variables and share price among firms within the LESI. The findings indicate that industry type significantly strengthened the links between waste management and share price (3484.9; p<0.01), material efficiency and share price (2392.6; p<0.01) and between green products and services innovation and share price (1614; p<0.01). Nevertheless, the effect of industry type was insignificant on the remaining combinations of environmental sustainability variables and share price.

Table 7.27: Tobin's Q MODEL

Variables	(1) Tobin's Q	(2) Tobin's Q	(3) Tobin's Q	(4) Tobin's Q	(5) Tobin's Q	(6) Tobin's Q	(7) Tobin's Q	(8) Tobin's Q
Energy	-0.490*** (-3.77)							
IndustryType	0.0951 (0.56)	0.659*** (4.18)	0.692*** (4.18)	0.332** (2.05)	0.239 (1.68)	0.525*** (6.50)	0.361*** (5.19)	0.597*** (8.25)
c.Energy#c~e	0.156*** ((3.35)							
Liquidity	0.103 (0.79)	0.126 (0.90)	0.00881 (0.68)	0.121 (0.90)	0.0364 (0.26)	0.0950 (0.69)	0.103 (0.89)	0.115 (0.85)
Firmsize	0.000 (1.47)	0.000 (1.13)	0.000 (1.15)	0.000 (1.32)	0.036 (1.20)	0.095 (1.14)	0.103 (1.20)	0.115 (1.15)
Water		0.0628 (0.28)						
c.Water#c.~e		-0.0244 (-0.43)						
Waste			-0.306 (-1.36)					
c.Waste#c.~e			-0.0338 (-0.56)					
Emissions				-0.310 (-1.55)				
c.Emissions#c.~e				0.119* (1.89)				
Materials					-0.425** (-2.87)			
c.Materials#c.~e					0.139*** (2.93)			
GreenP						-0.195 (-1.32)		
c.GreenP#c.~e						0.101** (2.23)		
Compliance							-1.849*** (-7.27)	
c.Compliance#c.~e							0.000 (0.00)	
Stakeholder								0.217 (1.06)
c.Stakeholder#c.~e								0.000 (0.00)
_cons	1.200** (2.14)	-0.534 (-0.72)	0.880 (0.93)	0.329 (0.54)	0.867 (1.48)	-0.186 (1.43)	5.672*** (6.33)	-1.203 (-1.38)
N	128	128	128	128	128	128	128	128

t statistics in parenetheses *** p<0.01, ** p<0.05, * p<0.1

Table 7.27 shows findings on the moderating effect of industrial type on the link between environmental sustainability commitment variables and Tobin's among firms within the LESI. It was noted that industry type significantly strengthened links between energy efficiency and Tobin's Q (0.156; p<0.01). Moreover, industry type significantly strengthened the nexus between carbon emission reduction and Tobin's (0.119; $p<0.05$). The relationship between green products and services innovation and Tobin's Q was also strengthened by the effect of industry type (0.101; $p<0.05$). Nevertheless, industry type failed to have any effect on the rest of the remaining combinations of environmental sustainability commitment variables and financial performance.

Overall, in ESI, industry type strengthened 13 combinations while only weakening 4 combinations of environmental sustainability commitment and financial performance. Interstingly, industry type significantly and positively moderated the relationship between environmental sustainability commitment and financial performance in LESI on 14 combinations. Based on the above analysis, one can infer that industry type significantly moderates the relationship between environmental sustainability commitment and financial performance.

7.4 DISCUSSION OF FINDINGS

This section is aimed at discussing the findings that emerged from data analysis. These findings will be discussed along existing similar findings. The idea is to synthesise the findings of this study into the mainstream of existing research. This is done to gauge the extent to which the findings of this study contribute towards the ongoing debate on the inconclusive relationship between environmental sustainability commitment and financial performance. As has been noted in the previous section, the findings showed a significant positive relationship, while others showed a significant negative relationship and the remainder exhibited an insignificant relationship. Hence, the findings will be discussed along the trend displayed by the findings (significant positive relationship, significant negative relationship and insignificant relationship) on each objective of the study. This section will also discuss findings related to industrial comparisons as well as the moderation effect of industry type on the relationship between environmental sustainability commitment and financial performance. Essentially, the conclusion drawn from this section should contribute immensely towards resolving the inconclusiveness of existing empirical studies.

7.5.1 Relationship Between Energy Efficiency and Financial Performance of Firms Listed on the JSE

Significant negative relationship

A negative and significant relationship was established between energy efficiency and EPS as well as between energy efficiency and share price. It can be inferred that attaining energy efficiency may have a negative effect on the financial performance of firms when EPS and share price are considered as measures of financial performance. The negative effect of energy efficiency on financial performance may be attributed to the cost of investing in energy efficiency technology. It was noted during data collection that the evaluated firms were actively involved in investing in green technology as a strategy to address the energy conundrum in South Africa. Hence, such huge investments may reduce the profitability of a business as measured by EPS and share price in the short run. Other investors may not take news on energy efficiency by firms seriously. Rather, they may perceive such news as green washing by the firm. This may lead to a negative valuation of the firm’s shares, hence, a negative relationship between energy efficiency and share price

The findings of this study are supported by similar empirical findings. Qian (2012) investigated the relationship between environmental sustainability performance and financial performance. The study was conducted among Australian firms. The study found a negative relationship between energy efficiency and financial performance. The study found that some firms still benefit from unsustainable use of energy. For instance, the study rather found that publicly listed firms which do not have environmental sustainability as one of their strategic goals reported higher financial performance.

The above findings are also supported by the Tradeoff hypothesis which advances the argument that environmental protection may reduce the profitability of a business. According to Friedman (1984), a firm only exists to make profit and to enhance value for its shareholders. Hence, any other obligation such as environmental sustainability commitment comes with extra cost that erodes the profits of the firm and reduces the returns for shareholders. To that effect, environmental considerations are a burden to the firm and should be considered in the firm's strategy. Rather, managers may only consider it after the profitability goals of the firm have been attained and only if the owners of the firm give managers permission to use the firm's resources to participate in environmental protection initiatives. The most compelling argument advanced by the Tradeoff hypothesis is that other obligations such as environment protection uses up the resources of the firm which are supposed to be used for more value creation within the firm. Nevertheless, this view may expose a firm to lawsuits and penalties from the government and other environmental pressure groups due to the rising concerns over environmental damage by firms.

Insignificant relationship

The findings showed a negative but insignificant relationship between energy efficiency and ROE. A negative and insignificant relationship was also established between energy efficiency and ROA. On the other hand, a positive but insignificant relationship was established between energy efficiency and Tobin's Q. Although it is positive, the weak relationship between energy efficiency and Tobin's Q implies that investors are not convinced by the energy efficiency strategies of firms. Some investors may perceive it as a marketing tool by firms. Hence, this may result in the green efficiency efforts of firms not getting the desired future market valuation by investors. Overall, the findings suggest that energy efficiency does not have a significant effect on financial performance in terms of ROE, ROA and Tobin's Q. The findings above are supported by similar existing findings.

For instance, Pons, Bikfalvi, Llach and Palcic (2013) investigated the effect of energy efficiency on the financial performance. The study used investment in new technology to measure energy efficiency. The results indicated that although new technology was crucial to attain energy efficiency, its effect on financial performance was insignificant. Another study by Boakye (2018) investigated the environmental sustainability and financial performance of small and medium enterprises listed on the Alternative Investment Market (AIM) in the UK. The study found no significant relationship between energy efficiency and financial performance as measured by Tobin's Q. The study concluded that the insignificant relationship established could be a result of information asymmetry. On that note, investing in energy efficiency only may be insufficient to convince investors to invest in the business based on the future value of the firm. Rather, investors can be convinced if a firm goes above just energy efficiency and acquire environmental certification such as ISO 4001 (Pavlinovic, 2013).

7.5.2 Relationship Between Water Efficiency and Financial Performance of Firms Listed on the JSE

Significant positive relationship

A positive and significant relationship was established between water efficiency and EPS. A positive and significant relationship was also established between water efficiency and share price. A positive relationship between water efficiency and share price implies that investors value firms which are actively involved in solving the water challenge in South Africa. Another probable explanation may be that investors tend to value shares of firms which have water sustainability strategies in their business. This gives investors assurance that the business may not be affected by water shortage risks which makes it continue as a going concern. With the rate of water shortages in South Africa, investors may consider seriously the issue of water sustainability before investing in the shares of a firm. All in all, the findings show that firms may enhance their financial performance when measures such as EPS and share price are used by attaining water efficiency.

Tasneem et al. (2016) posited that water efficiency improves the green image of the firm. This improves the value of the firm by investors and other stakeholders which boosts demand for the firms shares and its products. Existing literature links improved firm's value to superior financial performance. A firm which invests intensively in water efficiency can earn green trust from its customers and investors. Recently, green customers highly regard firms which are environmentally sensitive. As such, they are willing to become loyal customers to such firms and pay a premium price to its products. This significantly contributes to enhanced financial performance. Ong et al. (2014) further underscore that water efficiency has momentous costs benefits which directly boost the financial performance of a firm. When firms embark on water saving initiatives such as recycling, reduction in water consumption and formulating water sustainability policies, the firm is likely to experience superior firm financial performance (Ong et al., 2014).

Firms should invest beyond their own water consumption needs but also help their supply chain members to eliminate wasteful ways of water consumption. Most manufacturing firms have already started risking the flow of their production processes due to water inefficiencies. Inefficient water management can expose a firm to unnecessary costs which can affect the firm's profitability negatively. For instance, Coca Cola was forced to close its plant in India due to water shortages. This costed the firm a lot of revenue in terms of lost sales and stranded assets (Linneman, Hoekstra & Berkhout, 2015; Whelan & Fink, 2016; Askham & Van der Poll, 2017).

On their study on European firms, Zamfir, Mocanu and Grigorescu (2017) reported that firms located in the United Kingdom, Hungary and Slovakia which came up with ways to minimise water usage while concurrently maximising re-usage recorded an increase in firm financial performance. From that it is clear that water efficiency unlocks momentous financial benefits to firms (Zokaei, 2013). The author of this study believes that water efficiency can assist firms to cut cost in terms of reducing water bills which results in improved financial performance.

Insignificant relationship

The findings showed that water efficiency and ROE are negatively related. However, the relationship is insignificant. The findings also show a positive but insignificant relationship between water efficiency and ROA. Nevertheless, a weak and positive relationship was established between water efficiency and Tobin's Q. The relationship was nevertheless insignificant. In this case, a positive but insignificant relationship between water efficiency and Tobin's Q may mean that the market does not really value water efficiency by firms. For instance, investors might have their own evaluation criteria when making investment decisions. Another possible explanation is that the firms concerned are not actively sending positive signals to investors regarding their water sustainability commitment initiatives. Investors need to be convinced that the reported water efficiency measures are not just for compliance but are genuinely meant to enhance the value of the firm which can add value to shareholder returns. Overall, the findings suggest that being water efficient may not have an effect on financial performance when ROE, ROA and Tobin's Q are used as measures of financial performance.

The above results are in agreement with other existing studies. For instance, Nyirenda et al. (2014) investigated the effect of environmental sustainability on financial performance of a mining firm listed on the JSE. The study used carbon reduction, energy efficiency and water usage as measures of environmental sustainability while return on equity was used to measure financial performance. The results showed an insignificant relationship between water efficiency and financial performance. Nyirenda et al. (2014) argued that the insignificant relationship established could have been because the concerned mining firm was only investing in water efficiency for complying with regulations in the mining industry without much innovation.

7.5.3 Relationship Between Waste Management and Financial Performance of Firms Listed on the JSE

Insignificant relationship

The findings show that there is a positive but insignificant relationship between waste management and ROE. Additionally, the findings also show that there is a positive but insignificant relationship between waste management and ROA. This may mean that the evaluated firms in South Africa are still investing in waste management initiatives minimally to comply with environmental legislation. Additionally, the evaluated firms might also be targeting law hanging fruits waste management initiatives such as recycling without investing in real strategies which promote a circular flow economy. Attaining this level means that firms can harvest more profits from waste elimination, savings on raw materials and revenue from sales of recovered waste material. Hence, the author of this study is of the view that the evaluated firms may be lacking creativity and innovation required to transform their waste management initiatives to a point where it starts to significantly influence their financial performance in a positive manner. A negative but insignificant relationship was also established between waste management and EPS. The relationship between waste management and share price was also found to be negative and insignificant. On the other hand, the relationship between waste management and Tobin’s Q was found to be positive but insignificant. The implication of this relationship is that waste management may positively influence Tobin’s Q but given the context of a stock market in a developing country, it may take time for investors to positively value firms which are actively involved in waste management initiatives. Overall, the results suggest that waste management has no significant effect on the financial performance of listed firms considering both accounting and market-based measures of financial performance.

Ong et al. (2014) assessed the impact of environmental improvements on the financial performance of leading companies listed in Bursa Malaysia. The study used materials consumption, energy consumption, water consumption, biodiversity, GHG reduction and waste reduction to measure environmental performance. Ratios such as ROA and ROE were used to measure financial performance. The study found no significant relationship between waste reduction initiatives and firm financial performance.

Neeveditah et al. (2017) studied the link between environmental management systems and firm financial performance. The study used listed firms from Mauritius. The findings revealed that there is no significant relationship between waste reduction and firm financial performance. Neeveditah et al. (2017) also found that most firms including the surveyed firms were using reactive waste management strategies for compliance's sake as opposed to proactive measures where they voluntarily invest in innovative technologies which can cut down waste while at the same time giving them a competitive edge as well as improved financial performance.

Jo et al. (2015) argue that the insignificant relationship between waste management and firm financial performance might be caused by insufficient investment in environmental performance. Consequently, this might fail to boost the profitability figure as intended by most managers. Trumpp and Guenther (2017) explain this phenomenon using the "theoretical framework of a 'too-little-of-a-good-thing' (TLGT) effect." According to this theoretical underpinning, the strength between the environmental sustainability commitment and financial performance is determined by the level of environmental performance. This entails that high environmental performance also amounts to positive financial performance and vice-versa.

7.5.4 Relationship Between Carbon Emission Reduction and Financial Performance of Firms Listed on the JSE

Significant positive relationship

The effect of carbon emission reduction was different for EPS and share price. A positive and significant relationship was established between carbon emission reduction and EPS. Furthermore, a significant and positive relationship was established between carbon emission reduction and share price. The above results suggest that, with the emergence of green investors, it has become imminent for firms to consider carbon emission reduction seriously. The results provide enough evidence that carbon emission reduction does not only affect EPS, but it also positively influences the share price. Hence, firms which actively invest in initiatives aimed at reducing carbon emissions are likely to experience superior financial performance. This is because different stakeholders globally are pushing for a significant reduction in green house gas emissions. The implication of this is that firms which excel in carbon emissions reduction are likely to receive positive valuation from the market which increases value of their shares. Ideally, such firms can even trade their shares at a premium as the market is prepared to purchase them for an anticipated appreciation in the shares. Moreover, reducing carbon emissions by adopting cleaner sources of energy can help the business to be sustainable and attract external funding from green oriented investors. The findings of this study are in agreement with existing similar studies.

A study by Fujii et al. (2013) examined the association between carbon emission reduction and firm financial performance using firms in the manufacturing sector of Japan. The study established that improved environmental performance leads to an improved financial performance measured using return on assets (ROA). Similarly, Charlo, Moya and Muñoz (2015) also discovered that firms with a positive environmental performance report improved financial performance. Cucchiella et al. (2017) also assessed carbon emission reduction and its effect on financial performance. The study used large Italian firms. The results indicated that cutting down carbon emissions has beneficial effects on the financial performance of a firm. Yu and Tsai (2018) concur and allude that efforts by a firm to cut down its carbon emissions improve the longevity and sustainability of the firm. This is because it is now crucial than ever to excel in environmental performance. For instance, in South Africa it is now mandatory for firms listed on the JSE to disclose their environmental impact and different measures employed to mitigate such. To show the seriousness of environmental responsible behaviour, the FTSE/JSE responsible investment index have been established to continuously evaluate firms on their ESG performance.

Lewandowski (2017) assessed the carbon emission reduction and financial performance nexus using 1640 international firms between 2003 to 2015. The study found a significant positive relationship between carbon emission reduction and financial performance using return on sales. The results further indicated that the relationship between carbon emission reduction and financial performance was stronger for companies which excelled in carbon emission reduction initiatives compared to the laggards. Similarly, Capece et al. (2017) scrutinised the link between reduction in emissions and financial performance of Italian firms. The results indicated that firms actively involved in initiatives to cut down emissions showed positive financial performance. Low levels of carbon emissions are associated with higher firm financial performance (Busch & Hoffmann, 2011). The positive financial benefits accrue from a positive image gained by a firm due to being environmentally responsible. Additionally, low levels of carbon emissions might also mean that the firm's operations are efficient which cut costs in all areas within the firm leading to superior financial performance.

Gallego-Álvarez et al. (2015) studied the effect of carbon emission reduction on firm financial performance. The study utilised a sample size of 89 companies and data was gathered for a 3-year period. The results showed a significant and positive relationship between carbon emission reduction and firm financial performance. This entails that a firm can maximise profits when they cut down their emissions. The cost savings can be because the firm can now operate without environmental penalties and lawsuits by environmental pressure groups.

Insignificant relationship

A positive but insignificant relationship was established between carbon emission reduction and ROE. Additionally, a positive but insignificant relationship was established between carbon emission reduction and ROA. The relationship between carbon emission reduction and Tobin's Q was found to be positive but insignificant. The findings show that examined firms have a huge potential to benefit from their environmental investments as indicated by a positive but insignificant ROE, ROA and Tobin's Q. The implication of this is that firms should identify innovative technological investments which can significantly unlock value for their carbon emission reduction initiatives. Failure to do this may mean that their carbon emission reduction iniatives may fail to offset the costs associated with putting such in place which may frustrate managers who are evaluated in terms of key performance indicators biased towards profitability of the business. The findings of this study are in agreement with several existing empirical studies. For instance, Neeveditah et al. (2017) investigated the association between environmental practices and firm financial performance of firms listed on the Mauritius Stock Exchange. The study established an insignificant relationship between carbon emission reduction and financial performance. Neeveditah et al. (2017) attributed this insignificant relationship to the fact that most firms only participate in carbon emission initiatives to the extent only required by the legislation. As such, this limits their potential to find innovative ways to cut emissions while simultaneously boosting their profits. However, a study by Wong, Lai, Shang, Lu and Leung (2012) argues that such a result can be because carbon emission reduction is difficult to measure and quantify so are the benefits.

Another view was expressed by Trumpp and Guenther (2017) who analysed the relationship between environmental sustainability commitment and firm financial performance. The study established a u-shaped. Trumpp and Guenther (2017) make an important remark that the type of relationship established between environmental sustainability and firm financial performance is determined by the level of environmental sustainability investment. This entails that a negative relationship is likely to be established on firms with low environmental performance while those with a high environmental performance are likely to show a positive relationship.

Misani and Pogutz (2015) assessed the effect of environmental performance on the financial performance of carbon intensive firms. The sample of the study was carbon intensive firms which voluntarily disclosed their emissions on the Carbon Disclosure Project data base between 2007 and 2013. Carbon emission reduction was used to measure environmental sustainability while the Tobin's Q was used to measure financial performance. The results showed an insignificant relationship between carbon emission reduction and firm financial performance. This suggests that investors will be indifferent on whether to invest in future or not. The study also noted that a firm is likely to record enhanced financial performance when carbon emission reduction is moderate as compared to when it is low or high.

7.5.5 The Relationship Between Material Efficiency and Financial Performance of Firms Listed on the JSE

Significant negative relationship

Material efficiency and EPS were found to be negatively related and the relationship was significant. This implies that attaining material efficiency may negatively impact on the EPS. This is because attaining material efficiency may mean adopting completely new methods of production, product designs and probably specific material which does not strain the environment. This may be costly in the short run as the business is still trying to adjust its production process or its operations. These findings are sufficiently supported by other existing studies. For example, other scholars argue that attaining material efficiency can be costly to a firm. Material efficiency requires huge investments in technology and new product designs (Rexhäuser & Rammer, 2014). These can come up with exorbitant costs which negatively impact the financial performance of a firm. Additionally, there is scarcity of engineers worldwide. Hence, the few who are there are highly priced in the labour market making it difficult for a firm to secure their services for a long period of time.

Insignificant relationship

The findings show that the nexus between material efficiency and ROE is negative but insignificant. The materials efficiency and ROA nexus was also found to be negative and insignificant. On the other hand, a negative but insignificant relationship was established between material efficiency and share price. Additionally, it was also found that material efficiency and Tobin's Q are positively related. However, the relationship was found to be weak and insignificant. Overall, the findings indicate that material efficiency has an insignificant effect on most measures of financial performance such as ROE, ROA, share price and Tobin's Q. The implication of these findings is that material efficiency is not taken seriously by a significant number of firms. This was evident during data collection as several firms scored 0 on most material efficiency measures such as using light weight designs, using biodegradable material and using less materials. Several firms have only been focusing on either water efficiency, energy efficiency, waste management and carbon emission while neglecting other environmental sustainability variables such as material efficiency (International Resource Panel, 2018). One of advantages of material efficiency is the creation of a circular material flows where economic activities are conducted while at the same time accounting for the environment. This is aimed at addressing the short falls of the linear economy where there is no consideration for sustainability. The circular flow focuses on environmental protection, optimisation of resource use by emphasising the need for material reuse and elimination of processes, which creates negative externalities to the environment. Furthermore, the circular flow economy uses a variety of methods to attain material efficiency. Ideally, the circular flow economy is based on the idea to eliminate waste before production begins and the attachment of value to waste in the event that it was generated (Indo-German Expert Group, 2014; European Commission, 2015; UNEP, 2015; Milios, 2016; Mendoza, Sharmina, Gallego-Schmid, Heyes & Azapagic, 2017). Firms can benefit financially from material efficiency as approximately one third of materials can be saved by implementing lightweight designs (Carruth, Allwood & Moynihan, 2011). Re-using components is one of the most effective strategies to attain material efficiency. This is in line with the reverse logistics strategy, which has gained momentum recently. This strategy is both economically and environmentally viable (Cooper & Allwood, 2012). All in all, re-using components remains one of the lowly hanging fruit strategies that firms can use to eliminate excessive demands for new raw materials.

7.5.6 Relationship Between Green Products and Services Innovation and Financial Performance of Firms Listed on the JSE

Significant and negative relationship

A negative and significant relationship was found between green products and services innovation and share price. The negative valuation of a business' green products and services by the market may be because the market does not value green products and services that much. This is usually the case in most developing countries, especially in Africa where the green revolution is relatively new as compared to developed countries (Nekmahmud & Fekete-Farkas, 2020). Hence, customers may still consider other factors such as the affordability of the product or service other than its green features (Nekmahmud & Fekete-Farkas, 2020). Without much information about the importance of green products/services, firms which invest fully in green products/services may incur loses in the short run. The short run can be a period less than a year where the production cannot be expanded. Some studies cite that green products/services innovation can negatively affect the firm's profitability (Rexhäuser & Rammer, 2014). A significant amount of investment is required in new technology and process before implementing the design and production of green products and services. This may lead to significant cash outflows which might take long to recover. Other studies are of the view that green products and services innovation strategies such as green packaging and eco-labelling can make the final price of the product unreasonably high. For instance, Orzan, Cruceru, Bălăceanu and Chivu (2018) analysed the effect of behaviour and attitudes of Romanian consumers towards green packaging. The study found that consumers may be discouraged from buying highly priced green products and continue buying less priced environmentally unfriendly products. This negatively impacts on the financial performance of the firm. Similarly, Seo, Ahn, Jeong and Moon (2016) assessed the attitudes of customers towards green products. The findings showed that green products increase the cost of production which are later passed on to customers in the form of higher prices. This may drive away customers leading the business to run losses.

Insignificant relationship

The results show that the relationship between green products and services innovation and ROE is positive but insignificant. Also, it was discovered that green products and services innovation and ROA are positively related. However, the relationship is weak and insignificant. The study also found green products and services innovation to be negatively related to EPS. Nevertheless, the relationship was also found to be insignificant. When considering the relationship between green products and services innovation and the Tobin’s Q, a weak, negative and insignificant relationship was established. An insignificant relationship between green products/services innovation and financial performance can be attributed to factors such as a negative perception by stakeholders such as investors and customers among others. Due to rising concerns over green washing, it remains difficult to predict if the green iniatives by firms are genuine or not. Hence, this may weaken the potential of green initiatives to bring significant financial returns to the firm.

Firms can unlock value from their green initiaves by educating the market especially in developing countries through eco-labelling. Eco-labelling is defined as initiatives put together by a firm to communicate its environmental responsibility. This is done by putting information related to green practices on the firm’s products. Such information is intended to educate customers on the benefits of green behaviour as well as organic ingredients contained in the product. As such, eco-labelling has become one of the crucial tools of green marketing (Hornibrook, May & Fearne, 2015; Testa, Iraldo, Vaccari & Ferrari, 2015). Eco-labels are meant to guide customers on their purchase decision making. It follows that customers perceive firms that effectively label their products transparent as compared to those that do not. On that note, customers usually trust green products with international green certification. This assures them that the information provided on eco labels is authentic. Eco-labelling backed by international environmental certification assures customers that the firm is not into greenwashing, a concept that has led most green customers not to be easily convinced by eco labels. Fears are that marketers preach what they do not practise in reality. As such, firms should ensure that the information provided on eco labels is legitimate to gain legitimacy and positive publicity which can translate into significant positive financial performance (Blengini & Shields, 2010; Testa et al., 2015; Hameed et al., 2016; Prieto-Sandoval et al., 2016; Delmas & Lessem, 2017; Hameed & Waris, 2018; Lee et al., 2018).

For the green product and services innovation strategy to work, the entire internal processes should be transformed to support the new strategy. Trying to implement the green product and services innovation strategy without aligning it to internal processes can lead to nonsignificant effect on the financial performance. To that effect, green processes should be in place to help eliminate any inefficiency from inputs to the outputs. Moreover, the firm's buildings, warehouses and its logistics should signal to customers that the firm is seriously involved in green revolution not green washing. When all the above are in order, it becomes a well-coordinated system that guarantees the firm success from its green investments (Eneizan & Wahab, 2016).

7.5.7 Relationship Between Environmental Compliance and Financial Performance of Firms Listed on the JSE

Significant positive relationship

A positive and significant relationship was established between environmental compliance and EPS. This suggests that being a compliant business in terms of environmental requirements such as ISO 14001 and internal environmental policies may increase the profitability of the business as measured by EPS. Additionally, a positive and significant relationship was established between environmental compliance and share price. The implication of the positive and significant relationship between environmental compliance and share price is that investors value companies which comply with environmental regulations. This gives them assurance that the business will continue to have a positive image which protects their stake in the firm. Share price is highly sensitive to bad publicity of the business which may emerge because of lack of compliance. The findings above are supported by a plethora of other similar existing studies.

For instance, Porter (1995) argues that strong and stringent environmental policies force firms to fully commit towards environmental protection. To that effect, a well-structured environmental legislation makes it possible for firms to be profitable while at the same time being environmentally responsible. The Porter hypothesis takes a “revisionist” approach which opposes the widely held views by the traditionalist approach which argues that environmental legislation can weaken the financial performance of a firm. To that effect, Porter (1995) is of the view that environmental legislation can force firms to innovate which translates into environmental sustainability commitment. In that case, a firm can benefit from new product innovations and systems innovation which helps the firm to be a market leader, hence, motivates it to invest in environmental sustainability initiatives. New innovations can also help a firm meet and surpass its financial goals by cutting costs.

Another strand of literature submits that a firm is likely to avoid costs which come with fines and penalties emanating from non-compliance. Even though the cost of maintaining an environmentally compliant status might be relatively high, fines and penalties emanating from environmentally irresponsible behaviour can be unbearable (Clark, Feiner & Viehs, 2015). For instance, BP is still haunted by a case emanating from the 2010 oil spill in the Gulf. In 2018, it was estimated that the total cost for the penalty might be approximately US$144.89 billion as compared to the US$62.59 billion reported in BP’s financial statements (Gyo Lee, Garza-Gomez & Lee, 2018). Such a penalty can leave a firm with serious cash flow problems.

Furthermore, a firm is likely to avoid penalties and fines if they comply with environmental policies and standards such as ISO 4001 standards (Sorooshian & Ting, 2018). Environmental compliance enables firms to attain operational efficiency in terms of meeting quality requirements and product specifications, which improve the firm’s competitive advantage in the entire industry (Boakye, 2018). Recently, the supply chain has been greatly transformed where environmental compliance is the first consideration that suppliers check if they are to consider you as their supply chain partner or customer. This entails that firms which do not comply are likely to have outdated business models which augment chances of business failure.

A study by De Jong, Paulraj and Blome (2014) unpacked the inconclusiveness of studies linking ISO 14001 certification and financial performance in both the short and long run. The study found that ISO 14001 certification improves the financial performance of a firm in both the short and long run. More importantly, the increase in financial performance was well pronounced in the long run than in the short run. When comparing firms with and without ISO 14001 certification, the study found that firms with ISO 14001 certification report positive financial performance than their counterparts.

Firms that proactively invest in environmental systems get a chance to innovate and harvest financial returns from such investments (Neeveditah et al., 2017). Additionally, attaining excellence in environmental compliance is linked to positive corporate image and favourable brand reviews (Murphy, 2002), which leads to enhanced financial performance. When a firm is viewed as environmentally sensitive, it gains legitimacy from the perspective of its customers and society at large. This enables the firm to sell its shares at a premium, which increases its profitability (Jabbour, Santos & Nagano, 2008).

Afagachie (2013) weighed on the nexus between environmental sustainability and financial performance. The study used employed a mixed methodology where both the quantitative and qualitative research methodology were adopted. The findings of the study revealed a positive relationship between environmental policy and financial performance.

Significant negative relationship

The findings show that there is a negative and significant relationship between environmental compliance and ROE. This suggests that environmental compliance may negatively affect the returns attributable to shareholders. Considering the relationship between environmental compliance and the Tobin's Q, a negative and significant relationship between was established. Suffice to say that investors do not rely on compliance to determine the future value of the firm. Another explanation might be due to a weak environmental legislation in South Africa. This makes investors not to see the value of compliance in determining the future value of the firm because other noncompliant firms still make profits without being apprehended. This view is supported by Riaz et al. (2019) who noted that environmental policies in emerging markets are still weak and rarely enforced which disadvantages compliant firms as most non-compliant counterparts continue doing well and unpunished.

The adoption of international environmental standards such as ISO 4001 negatively affects financial performance (Miroshnychenko et al., 2017). Environmental compliance is costly to a firm as investments in technology and environmental compliance certificates drain the cash flows of a firm in the short run. Boakye (2018) investigated the relationship between environmental sustainability of firms listed on the AIM in UK. The study utilised SMEs the sample. The results of the study revealed a negative relationship between environmental compliance and financial performance as measured by Tobin's Q.

Insignificant relationship

When environmental compliance is tested against ROA, a negative but insignificant relationship is established (-4.73; sig 0.39). Another line of thought argues that attaining environmental certification especially in the context of developing countries does not really add value to the firm (Riaz et al., 2019). The argument is that most investors are still driven by the profit maximisation goal that the issue of environmental compliance is treated as secondary. On the other end of the of the spectrum, stakeholders such as customers react negatively to environmental certification as they still perceive it as one of the marketing gimmicks used by firms to increase sales without necessarily adding value towards environmental protection (Riaz et al., 2019). The few firms which comply does so based on mimetic and isomorphic pressure in the market. Consequently, firms end up not attaining superior performance because they do not innovate beyond the level deemed as compliant.

Other studies note that most firms adopt ISO 14001 certification as a strategy to gain legitimacy from the society (Boiral & Henri, 2012). In fact, these firms do not implement the efficiency driven strategies as stipulated by the ISO 4001. "In return, as firms fail to execute these standards over time, their projected efficient advantages based on the implementation reduce, and the response of the investors consequently deteriorates" (Riaz et al., 2019:4). The symbolic approach to the ISO 4001 adoption can negatively affect the image of the firm as it is usually treated as deception and malpractice by stakeholders (MacLean, Litzky & Holderness, 2015). Hence, ISO 4001 certification does not bring any tangible financial benefits if it is adopted for wrong reasons other than its efficiency enhancing purpose.

Naila (2012) analysed the relationship between environmental compliance and financial performance of firms listed on the Dar Es Salaam Stock Exchange. The study used capital expenditure on pollution control technology and ISO 14001 certification to measure environmental compliance. Financial performance was measured using return on investment (ROI). The findings of this study established no relationship between environmental compliance and financial performance. This means that firms neither make losses nor profits by complying with environmental regulations (Naila, 2012). He, Liu, Lu and Cao (2015) also assessed the effect of ISO 14001 adoption on the performance of Chinese firms. The nexus between ISO 14001 adoption and financial performance was found to be insignificant. Nevertheless, the study established that a firm can still enjoy some other non-financial benefits which come with a full environmental compliance status.

7.5.8 Relationship Between Stakeholder Engagement and Financial Performance of Firms Listed on the JSE

Significant positive relationship

Stakeholder engagement was found to be a significant predictor of EPS. The implication of this is that listed firms can enhance their financial performance by engaging stakeholders on their commitment towards the environment. This is supported by other existing studies. For example, Golicic and Smith (2013) conducted a study over a 20-year period. The aim was to evaluate the nexus between GSCM and financial performance. The study established a significant positive relationship between the GSCM and financial performance. It was deduced that stakeholder engagement through GSCM enhances the firm's market valuation by investors. Geng, Mansouri and Aktas (2017) investigated the effect of GSCM and performance using Asian firms. The study was meta-analytic and assessed 50 articles on GSCM. The findings revealed that GSCM positively influence financial performance. "Intangibles like trusting relationships with suppliers, employee learning and growth, reputation and goodwill are key drivers of corporate competitiveness and profitability" (Ramakrishnan, 2008:4).

Stakeholder engagement enhances the longevity and financial performance of a firm (Haninun et al., 2018). Stakeholders possess the resources required by a firm to execute its environmental sustainability initiatives (Laughland & Bansal, 2011). The Resource Based View (RBV) theory submits that having access to key resources gives a firm a competitive advantage over others. For instance, a firm requires new technology from suppliers while at the same time it is its employees who will ensure that the new technology is accepted. Hence, when stakeholders are continuously engaged on environmental related issues and projects which the firm plans to execute, they are likely to support the firm. This unlocks value and sustainable synergies which translates into superior financial performance. This view is supported by the Signaling theory which explains that management should share relevant information with its stakeholders to eliminate information asymmetry. When such is achieved, the firm is likely to enjoy momentus benefits in terms of financial performance which spans into the long run (Haninun et al., 2018).

Insignificant relationship

Overall, it was found that stakeholder engagement has an insignificant effect on financial performance. The findings showed that stakeholder engagement is positively related to ROE. However, the relationship is insignificant (0.22; 0.95). When stakeholder engagement is regressed against ROA, a positive but insignificant relationship is established (1.74; sig 0.39). On the other hand, a negative but insignificant relationship (-2364.11; sig 0,40) was established between stakeholder engagement and share price. A weak, positive and insignificant relationship was also found between stakeholder engagement and the Tobin's Q. Overall, it was found that stakeholder engagement has a positive relationship with most of the financial performance measures such as ROE, ROA, EPS and Tobin's Q. Although the relationship is insignificant, it can be inferred that stakeholder engagement initiatives such as stakeholder communication and collaborating with stakeholders in environmental sustainability projects may positively influence financial performance. Nevertheless, the effect is minimal and does not determine the profitability of the firm. One of the challenges confronting most firms is being driven by the profit maximisation goal that stakeholder engagement is not viewed as something that can help a business to generate profit. All in all, firms may unlock non-financial value for their business by actively engaging in stakeholder management. This is because the future of business longevity will depend more on the relationships that the business has with its key stakeholders. Considering the effect on Tobin's Q, it can be inferred that investors are still pessimistic on the importance of considering stakeholder engagement to determine the future value of a firm. Among the few studies which reported an insignificant relationship is a study by Zaccheaus, Oluwagbemiga and Olugbenga (2014). The study analysed the relationship between stakeholder engagement and financial performance using Nigerian listed firms. The study established an insignificant relationship between stakeholder engagement on environmental issues and financial performance as measured by share price.

7.6 COMPARISON BETWEEN ENVIRONMENTAL SENSITIVE INDUSTRIES AND LESS-ENVIRONMENTAL SENSITIVE INDUSTRIES

Comparing energy intensive versus less intensive industries, the results showed that attaining energy efficiency negatively affects financial performance of such industries as measured by ROA, EPS, share price and the Tobin's Q. The negative relationship can be attributed to the fact that energy forms a key resource in these sectors such as mining, oil and gas and manufacturing. This means a substantial amount of their costs is accounted for by energy. One can also reason that these firms in ESI may be investing in energy efficiency initiatives for compliance purposes only other than being proactive and innovative. This stifles the probability of earning financial benefits from such investments. This view is supported by Endrikat et al. (2014) who expressed that firms may start to unlock positive financial gains from environmental sustainability commitment if they can proactively participate in such issues. On the other hand, it was discovered that attaining energy efficiency in LESI did not have a significant effect at all with all financial performance measures.

In terms of water efficiency, the comparison showed that environmentally sensitive industries (ESI) obtains value from being water effieinct which significantly and positively influenced the share price only with other variables being insignificant. The implication of this finding is that water is an important resource within mining and manufacturing sectors. Attaining water efficiency ensures that the business operations of these firms run smoothly without water shortages. This means the business can perform optimally which enhances the value its shares as perceived by potential investors. Conversely, the results showed that water efificency strategies such as recycling, reusing and reduction in water use do not have a significant effect on financial performance in less environmentally sensitive industries. This is because water is not a pressing issue in sectors such as banking, telecommunications and services. Instead these firms may consider investing intensively in areas which enhances their business models and disregard huge water investments as several listed firms perceive environmental investments as costly (Robaina & Madaleno, 2020).

Regarding waste management, it was found that waste reduction strategies significantly and negatively affects all financial performance measures such as ROE, ROA, EPS, share price and the Tobin's Q in ESI. Conversely, the effect of such strategies was insignificant on all measures of financial performance in less environmentally sensitive industries. The above findings could be that the concerned firms are not investing in cutting edge technology to eliminate waste while remaining profitable. This means adopting this strategy may negatively affect the listed firms' financial performance.

When the two separate industries were further compared in terms of carbon emission reduction initiatives such as reductions in direct emissions, reductions in indirect emissions and investments in technology to trap co_2 and convert it to other economical uses, the findings showed that environmentally sensitive industries could benefit financially from such investments as exhibited by a significant positive EPS. Nevertheless, the effect was insignificant on all other measures of financial performance. Conversely, it was found out that firms in less environmentally sensitive industries can enjoy enhanced financial performance as exhibited by significant and positive relationships between carbon emission reduction and EPS as well as with share price. The current findings corroborate the findings by Trinks, Mulder and Scholtens (2020) who reported that firms can directly unlock positive financial performance from carbon emission reduction. This is because attaining this level of efficiency means the business is performing well in all its processes which eliminate costs and lead to superior performance. The effect of carbon emission reduction was insignificant on the rest of other financial performance measures such as ROE, ROA and Tobin's Q.

Regarding the relationship between material efficiency and financial performance, it was found that material efficiency strategies significantly and negatively affect financial performance (EPS, share price, and Tobin's Q) of environmentally sensitive industries. Nevertheless, the effect was insignificant on ROE and ROA. On the other hand, it was found that material efficiency significantly and positively influences financial performance particularly ROE and Tobin's Q in LESI.

When the the two industries groups were compared in terms of green products and services innovation, it was found that green products strategies positively predict financial performance particularly ROA, EPS and share price in ESIs. Conversely, it was found that adopting a business model which revolves around green products and services innovation negatively affect the financial performance of a business in LESI. The implication of this is that green products may not be significantly valued in sectors such such as banking, telecommunications and services.

Comparing the two industries in terms of environmental compliance showed that being environmentally compliant negatively affect the financial performance of firms operating in ESI. This was exhibited through significantly negative relationships between environmental compliance and EPS, share price and Tobin's Q respectively. This may be because firms operating ESI such as mining, health and pharmaceuticals and manufacturing are strictly coerced to comply with quality standards and other operating compliance requirements which come at a relatively high cost. On the other hand, the findings indicated that being environmentally compliant enhances financial performance measures such as EPS and share in LESI. Nevertheless, the effect of environmental compliance on the Tobin's Q was found to be significantly negative.

Regarding the nexus between stakeholder engagement and financial performance, the cross comparisons indicated that stakeholder engagement is key determinant of financial performance especially when EPS is used. On the contrary, the findings showed that investing in stakeholder engagement initiatives negatively affect the financial performance of LESI firms. This was exhibited by the significant negative relationships between stakeholder engagement and financial performance indicators such as ROE and share price. This implies that stakeholders in sectors such as banking, services and telecommunications may not perceive communication by firms about sustainability as newsworthy.

Overall, synthesising the discussion above, it was found that 6 significant positive relationshipss and 15 significant negative relationships were established between environemental sustainability commitment and financial performance in ESIs. The 6 significant positive relationships were mainly from environmental investements such as water efficiency, carbon emission reduction, green products and services innovation as well as stakeholder engagement. The significant and positive relationships were linked to ROA, EPS, and share price. On the other hand, it was found that 6 significant positive relationships and 8 significant negative relationships were established between environemental sustainability commitment and financial performance in LESIs. The 6 significant positive relationships were mainly from environmental investements such as carbon emission reduction, material efficiency and environmental compliance. The significant and positive relationships were established on ROE, EPS, share price and Tobin’s Q. The implication of these results is that environmental sustainability commitment is equally important across all sectors. This is because these different industries can still benefit from environmental sustainability commitment initiatives even though the benefits can come from different environmental investments which add value to unique financial performance indicators in that particular sector as determined by the different stakeholders of the business. Another glaring observation made by the author of this study is that firms listed on the FTSE/JSE are likely to experience comparatively similar financial results from environemental investments regardless of industry type because these firms are mandated to actively report on environmental sustainability initiatives (JSE, 2020). Additionally, with the growing emphasis towards responsible investment, all listed firms are realising the pertinent role of excelling in environmental sustainability initiatives (Zhang, 2016). The findings of this study are also supported by Jha and Rangarajan (2020) who also found that the effect of environmental sustainability commitment on financial performance did not differ in the context of Indian firms which the study divided into ESI and LESI.

7.5 MODERATING EFFECT OF INDUSTRY TYPE ON THE RELATIONSHIP BETWEEN ENVIRONMENTAL SUSTAINABILITY COMMITMENT AND FINANCIAL PERFORMANCE

In ESI, industry type strengthened 13 combinations while only weakening 4 combinations of environmental sustainability commitment and financial performance. Interstingly, industry type significantly and positively moderated the relationship between environmental sustainability commitment and financial performance on 14 counts in LESI. Based on the above analysis, one can infer that industry type significantly moderates the relationship between environmental sustainability commitment and financial performance. It was noted that in this study, the effect of industry type mostly made the environmental sustainability commitment and financial performance nexus stronger in LESI than in ESI.

The findings of this study corroborate the existing findings of other scholars regarding the influence of industry type in either strengthening or weaking the nexus between environmental sustainanbility commitment and financial performance. According to Endrikat et al. (2014), industry type is one of the crucial mechanisms through which the relationship between environmental sustainanbility commitment and financial performance can be understood. This view is also widely supported by other scholars who reported that industry type helps to explain the boundary conditions through which the environmental sustainanbility commitment and financial performance nexus is either strengthened or weakened (Albertini, 2013; Lu & Taylor, 2016; Jha & Rangarajan, 2020).

7.6 DECISION ON TESTED HYPOTHESES

Table 7.28: Decision on Tested Hypotheses

Hypotheses	**Decision**
Energy efficiency and financial performance	
***H1a*$_1$**: *There is a significant positive relationship between energy efficiency and ROE of firms listed on the JSE*	Rejected X
***H1b*$_1$**: *There is a significant positive relationship between energy efficiency and ROA of firms listed on the JSE.*	Rejected X
***H1c*$_1$**: *There is a significant positive relationship between energy efficiency and EPS of firms listed on the JSE.*	Rejected X
***H1d*$_1$**: *There is a significant positive relationship between energy efficiency and Tobin's Q of firms listed on the JSE.*	Rejected X
***H1e*$_1$**: *There is a significant positive relationship between energy efficiency and share price of firms listed on the JSE*	Rejected X
Water efficiency and financial performance	
***H2a*$_1$**: *There is a significant positive relationship between water efficiency and the ROE of firms listed on the JSE.*	Rejected X
***H2b*$_1$**: *There is a significant positive relationship between water efficiency and the ROA of firms listed on the JSE.*	Rejected X
***H2c*$_1$**: *There is a significant positive relationship between water efficiency and the EPS of firms listed on the JSE.*	Accepted ✓
***H2d*$_1$**: *There is a significant positive relationship between water efficiency and the Tobin's Q of firms listed on the JSE.*	Rejected X
***H2e*$_1$**: *There is a significant positive relationship between water efficiency and the share price of firms listed on the JSE.*	Accepted ✓
Waste management and financial performance	
***H3a*$_1$**: *There is a significant positive relationship between waste management and the ROE of firms listed on the JSE*	Rejected X
***H3b*$_1$**: *There is a significant positive relationship between waste management and the ROA of firms listed on the JSE.*	Rejected X
***H3c*$_1$**: *There is a significant positive relationship between waste management and the EPS of firms listed on the JSE*	Rejected X
***H3d*$_1$**: *There is a significant positive relationship between waste management and the Tobin's Q of firms listed on the JSE.*	Rejected X

***H3e$_1$**: There is a significant positive relationship between waste management and the share price of firms listed on the JSE.*	Rejected X
Carbon emission reduction and financial performance	
***H4a$_1$:** There is a significant positive relationship between carbon emission reduction and the ROE of firms listed on the JSE.*	Rejected X
***H4b$_1$:** There is a significant positive relationship between carbon emission reduction and the ROA of firms listed on the JSE.*	Rejected X
***H4c$_1$:** There is a significant positive relationship between carbon emission reduction and the EPS of firms listed on the JSE.*	Accepted ✓
***H4d$_1$:** There is a significant positive relationship between carbon emission reduction and the Tobin's Q of firms listed on the JSE*	Rejected X
***H4e$_1$:** There is a significant positive relationship between carbon emission reduction and the share price of firms listed on the JSE.*	Accepted ✓
Material efficiency and financial performance	
***H5a$_1$:** There is a significant positive relationship between materials efficiency and ROE of firms listed on the JSE.*	Rejected X
***H5b$_1$:** There is a significant positive relationship between materials efficiency and ROA of firms listed on the JSE.*	Rejected X
***H5c$_1$:** There is a significant positive relationship between materials efficiency and EPS of firms listed on the JSE.*	Rejected X
***H5d$_1$:** There is a significant positive relationship between materials efficiency and Tobin's Q of firms listed on the JSE.*	Rejected X
***H5e$_1$:** There is a significant positive relationship between materials efficiency and share price of firms listed on the JSE.*	Rejected X
Green Products and Services Innovation and financial performance	
***H6a$_1$:** There is a significant positive relationship between green products and services and ROE of firms listed on the JSE.*	Rejected X
***H6b$_1$:** There is a significant positive relationship between green products and services and ROA of firms listed on the JSE.*	Rejected X
***H6c$_1$:** There is a significant positive relationship between green products and services and EPS of firms listed on the JSE.*	Rejected X

H6d*$_1$*: *There is a significant positive relationship between green products and services and Tobin's Q of firms listed on the JSE.*	Rejected X
H6e*$_1$*: *There is a significant positive relationship between green products and services and share price of firms listed on the JSE.*	Rejected X
Environmental compliance and financial performance	
H7a*$_1$*: *There is a significant positive relationship between environmental compliance and ROE of firms listed on the JSE.*	Rejected X
H7b*$_1$*: *There is a significant positive relationship between environmental compliance and ROA of firms listed on the JSE.*	Rejected X
H7c*$_1$*: *There is a significant positive relationship between environmental compliance and EPS of firms listed on the JSE.*	Accepted ✓
H7d*$_1$*: *There is a significant positive relationship between environmental compliance and Tobin's Q of firms listed on the JSE.*	Rejected X
H7e*$_1$*: *There is a significant positive relationship between environmental compliance and share price of firms listed on the JSE.*	Accepted ✓
Stakeholder engagement and financial performance	
H8a*$_1$*: *There is a significant positive relationship between stakeholder engagement and ROE of firms listed on the JSE.*	Rejected X
H8b*$_1$*: *There is a significant positive relationship between stakeholder engagement and ROA of firms listed on the JSE.*	Rejected X
H8c*$_1$*: *There is a significant positive relationship between stakeholder engagement and EPS of firms listed on the JSE.*	Accepted
H8d*$_1$*: *There is a significant positive relationship between stakeholder engagement and Tobin's Q of firms listed on the JSE.*	Rejected X
H8e*$_1$*: *There is a significant positive relationship between stakeholder engagement and share price of firms listed on the JSE.*	Rejected X
H9a: *Industry/sector significantly moderates the relationship between environmental sustainability commitment and financial performance among firms listed on the JSE.*	Accepted

7.6 SUMMARY

This chapter presented the findings of the study. The chapter also discussed the findings by comparing them to previous similar findings. The chapter started by presenting descriptive statistics of all variables of the study. It also presented correlations of the key variables of the study. OLS regression was also presented. Since this study used panel data, it was crucial to perform some diagnostic tests on the data. According to the diagnostic tests, the data did not have any problem with normality and multicollinearity. Nevertheless, the diagnostic tests showed that the data had heteroscedasticity and autocorrelation. Based on that, it led to the decision to choose the Feasible Generalised Least Squares as the compatible regression model for the data. The advantage of using the feasible generalised least squares was that it suppresses both heteroscedascity and autocorrelation which enhances the findings of the study. Using the feasible generalised least squares, five models were developed where the eight independent variables such as energy efficiency, water efficiency, waste management, carbon emission reduction, material efficiency, green products and services innovation, environmental compliance and stakeholder engagement were regressed against each dependent variable such as ROE, ROA, EPS, share price and Tobin's Q. Mixed findings emerged from the analysis. On the other variables the results were positive and significant, while others were negative and significant. The remainder were insignificant. It was discovered that environmental sustainability variables such as water efficiency, carbon emission reduction, environmental compliance and stakeholder engagement were significantly and positively related to financial performance measures such as EPS and share price. A positive and significant relationship was established between water efficiency and EPS. A positive and significant relationship was also established between water efficiency and share price. A positive and significant relationship was also established between carbon emission reduction and EPS. Furthermore, a significant and positive relationship was established between carbon emission reduction and share price. A positive and significant relationship was established between environmental compliance and EPS. This suggests that being a compliant business in terms of environmental requirements such as ISO 14001 and internal environmental policies may increase the profitability of the business as measured by EPS. Additionally, a positive and significant relationship was established between environmental compliance and share price. The relationship between stakeholder engagement and EPS was also found to be positive and significant. This means that firms can enhance their financial performance from environmental investment.

On the other hand, other variables showed a significant negative relationship. For instance, a negative and significant relationship was established on the relationship between energy efficiency and EPS as well as between energy efficiency and share price. The relationship between waste management and share price was also found to be negative and significant. Material efficiency and EPS were also found to be negatively related and the relationship was significant. A negative and significant relationship was also found between green products and services innovation and share price. The findings also showed that there is a negative and significant relationship between environmental compliance and ROE. Considering the relationship between environmental compliance and the Tobin's Q, a negative and significant relationship between was established.

The remainder of the results exhibited an insignificant relationship between different environmental variables and financial performance. For example, the findings showed a negative but insignificant relationship between energy efficiency and ROE. A negative and insignificant relationship was also established between energy efficiency and ROA. On the other hand, a positive but insignificant relationship was established between energy efficiency and Tobin's Q. The findings showed that water efficiency and ROE are negatively related. However, the relationship is insignificant. The findings also show a positive but insignificant relationship between water efficiency and ROA. Nevertheless, a weak and positive relationship was established between water efficiency and Tobin's Q. The relationship was nevertheless insignificant. The findings showed that there is a positive but insignificant relationship between waste management and ROE. Additionally, the findings showed that there is a positive but insignificant relationship between waste management and ROA. A negative but insignificant relationship was also established between waste management and EPS. On the other hand, the relationship between waste management and Tobin's Q was found to be positive but insignificant. A positive but insignificant relationship was established between carbon emission reduction and ROE. Additionally, a positive but insignificant relationship was established between carbon emission reduction and ROA. The relationship between carbon emission reduction and Tobin's Q was found to be positive but insignificant. The findings showed that the nexus between material efficiency and ROE is negative but insignificant. The material efficiency and ROA nexus was also found to be negative and insignificant. On the other hand, a negative but insignificant relationship was established between materials efficiency and share price. Additionally, it was also found that materials efficiency and Tobin's Q are positively related. However, the relationship was found to be weak and insignificant. Overall, the findings indicated that material efficiency had an insignificant effect on most measures of financial performance such as ROE, ROA, share price and Tobin's Q. The results also showed that the relationship between green products and services innovation and ROE is positive but insignificant. It was also discovered that green products and services innovation and ROA are positively related. However, the relationship was weak and insignificant. The study also found green products and services innovation to be negatively related to EPS. Nevertheless, the relationship was also found to be insignificant. When considering the relationship between green products and services innovation and the Tobin's Q, a weak, negative and insignificant relationship was established. When environmental compliance was regressed against ROA, a negative but insignificant relationship is established. Lastly, the findings showed that stakeholder engagement was positively related to ROE. However, the relationship was insignificant. When stakeholder engagement was regressed against ROA, a positive but insignificant relationship was established. On the other hand, a negative but insignificant relationship was established between stakeholder engagement and share price. A weak, positive and insignificant relationship was also found between stakeholder engagement and the Tobin's Q. Overall, it can be concluded that stakeholder engagement has an insignificant effect on financial performance. Regarding comparisons between ESI and LESI, the findings showed that the effect of environmental sustainability commitment on financial performance did not differ based on the industry type. The results were relatively the same. The findings rather showed that firms within each industry had specific environmental sustainability commitment and financial performance combinations which were unique to that industry. After testing for moderation, it was found that industry type significantly moderates the relationship between environmental sustainability commitment and financial performance. It was noted that the effect of industry type mostly made the environmental sustainability commitment and financial performance nexus stronger in LESI than in ESI.

CHAPTER 8

CONCLUSIONS AND RECOMMENDATIONS

8.1 INTRODUCTION

The current chapter is aimed at presenting summaries of the entire study. The major goal is to present the primary findings which emerged from the empirical tests conducted towards contributing to the ongoing debate among scholars on the relationship between environmental sustainability commitment and financial performance. The chapter is organised in the following manner. Section 8.2 will present the summary of findings. This will be based on the key findings from the objectives of the study. Henceforth, section 8.3 will provide key contributions of the study. These key contributions are divided into; theoretical, empirical, methodological practical and policy contributions. Section 8.4 will present the proposed framework developed by the researcher as a tool to link environmental sustainability commitment and financial performance. The rest of the chapter will outline key recommendations, limitations of the study and suggested areas for future research.

8.2 SUMMARY OF FINDINGS

Objective 1: To examine the relationship between energy efficiency and financial performance of firms listed on the JSE

Significant negative relationship

A negative and significant relationship was established between energy efficiency and EPS as well as between energy efficiency and share price. It can be inferred that attaining energy efficiency may have a negative effect on the financial performance of firms when EPS and share price are considered as measures of financial performance. The negative effect of energy efficiency on financial performance may be attributed to the cost of investing in energy efficiency technology. It was noted during data collection that the evaluated firms were actively involved in investing in green technology as a strategy to address the energy conundrum in South Africa. Hence, such huge investments may reduce the profitability of a business as measured by EPS and share price in the short run. Other investors may not take news on energy efficiency by firms seriously. Rather, they may perceive such news as green washing by the firm. This may lead to a negative valuation of the firm's shares, hence a negative relationship between energy efficiency and share price.

Insignificant relationship

The findings showed a negative but insignificant relationship between energy efficiency and ROE. A negative and insignificant relationship was also established between energy efficiency and ROA. On the other hand, a positive but insignificant relationship was established between energy efficiency and Tobin's Q. Although positive, the weak relationship between energy efficiency and Tobin's Q implies that investors are not convinced by the energy efficiency strategies of firms. Some other investors may perceive that it has a marketing tool by firms. Hence, this may result in the green efficiency efforts of firms not getting the desired future market valuation by investors. Overall, the findings suggest that energy efficiency does not have a significant effect on financial performance in terms of ROE, ROA and Tobin's Q. The findings above are supported by similar existing findings.

Objective 2: To analyse the relationship between water efficiency and financial performance of firms listed on the JSE

Significant positive relationship

A positive and significant relationship was established between water efficiency and EPS. A positive and significant relationship was also established between water efficiency and share price. A positive relationship between water efficiency and share price implies that investors value firms which are actively involved in solving the water challenge in South Africa. Another probable explanation may be that investors tend to value shares of firms which have water sustainability strategies in their business. This gives investors assurance that the business may not be affected by water shortage risks which makes it continue as a going concern. All in all, the findings show that firms may enhance their financial performance when measures such as EPS and share price are used by attaining water efficiency.

Insignificant relationship

The findings showed that water efficiency and ROE are negatively related. However, the relationship is insignificant. The findings also show a positive but insignificant relationship between water efficiency and ROA. Nevertheless, a weak and positive relationship was established between water efficiency and Tobin's Q. The relationship was nevertheless insignificant. In this case, a positive but insignificant relationship between water efficiency and Tobin's Q may mean that the market does not really value water efficiency by firms. For instance, investors might have their own evaluation criteria when making investment decisions. Overall, the findings suggest that being water efficient may not have an effect on financial performance when ROE, ROA and Tobin's Q are used as measures of financial performance.

Objective 3: To evaluate the relationship between waste management and the financial performance of firms listed on the JSE.

The relationship between waste management and share price was also found to be negative and significant. On the other hand, the findings showed that there is a positive but insignificant relationship between waste management and ROE. Additionally, the findings also show that there is a positive but insignificant relationship between waste management and ROA. This may mean that the evaluated firms in South Africa are still investing in waste management initiatives minimally to comply with environmental legislation. Hence, they may be lacking creativity and innovation required to transform their waste management initiatives to a point where it starts to significantly influence their financial performance in a positive manner. A negative but insignificant relationship was also established between waste management and EPS. The relationship between waste management and share price was also found to be negative and insignificant. On the other hand, the relationship between waste management and Tobin's Q was found to be positive but insignificant. The implication of this relationship is that waste management may positively influence Tobin's Q but given the context of a stock market in a developing country, it may take time for investors to positively value firms which are actively involved in waste management initiatives. Overall, the results suggest that waste management has no significant effect on financial performance of listed firms considering both accounting and market-based measures of financial performance.

Objective 4: To investigate the relationship between carbon emission reduction and financial performance of firms listed on the JSE

Significant positive relationship

The effect of carbon emission reduction was different for EPS and share price. A positive and significant relationship was established between carbon emission reduction and EPS. Furthermore, a significant and positive relationship was established between carbon emission reduction and share price. The above results suggest that, with the emergence of green investors, it has become imminent for firms to consider carbon emission reduction seriously. The results provide enough evidence that carbon emission reduction does not only affect EPS, but it also positively influences the share price. Hence, firms which actively invest in initiatives aimed at reducing carbon emissions are likely to experience superior financial performance. The findings of this study are in agreement with similar studies.

Insignificant relationship

A positive but insignificant relationship was established between carbon emission reduction and ROE. Additionally, a positive but insignificant relationship was established between carbon emission reduction and ROA. The relationship between carbon emission reduction and Tobin's Q was found to be positive but insignificant.

Objective 5: To assess the relationship between material efficiency and financial performance of firms listed on the JSE

Significant negative relationship

Material efficiency and EPS were found to be negatively related and the relationship was significant. This implies that attaining material efficiency may negatively impact on the EPS.

Insignificant relationship

The findings showed that the nexus between material efficiency and ROE was negative but insignificant. The material efficiency and ROA nexus was also found to be negative and insignificant. On the other hand, a negative but insignificant relationship was established between material efficiency and share price. Additionally, it was also found that material efficiency and Tobin's Q were positively related. However, the relationship was found to be weak and insignificant. Overall, the findings indicate that material efficiency has an insignificant effect on most measures of financial performance such as ROE, ROA, share price and Tobin's Q.

Objective 6: To establish the relationship between green products and services and financial performance of firms listed on the JSE

Significant and negative relationship

A negative and significant relationship was found between green products and services innovation and share price. The negative valuation of a business' green products and services by the market may be because the market does not value green products and services that much. This is usually the case in most developing countries, especially in Africa where the green revolution is relatively new as compared to developing countries.

Insignificant relationship

The results showed that the relationship between green products and services innovation and ROE is positive but insignificant. Also, it was discovered that green products and services innovation and ROA are positively related. However, the relationship is weak and insignificant. The study also found green products and services innovation to be negatively related to EPS. Nevertheless, the relationship was also found to be insignificant. When considering the relationship between green products and services innovation and the Tobin's Q, a weak, negative and insignificant relationship was established.

Objective 7: To interrogate the relationship between environmental compliance and financial performance of firms listed on the JSE.

Significant positive relationship

A positive and significant relationship was established between environmental compliance and EPS. This suggests that being a compliant business in terms of environmental requirements such as ISO 14001 and internal environmental policies may increase the profitability of the business as measured by EPS. Additionally, a positive and significant relationship was established between environmental compliance and share price. The implication of the positive and significant relationship between environmental compliance and share price is that investors value companies which comply with environmental regulations. This gives them assurance that the business will continue to have a positive image which protects their stake in the firm. Share price is highly sensitive to bad publicity of the business which may emerge because of lack of compliance.

Significant negative relationship

The findings showed that there is a negative and significant relationship between environmental compliance and ROE. This suggests that environmental compliance may negatively affect the returns attributable to shareholders. Considering the relationship between environmental compliance and the Tobin's Q, a negative and significant relationship between was established. This suffice to say that investors do not rely on compliance to determine the future value of the firm. Another explanation might be due to a weak environmental legislation in South Africa. This makes investors not to see the value of compliance in determining the future value of the firm because other non-compliant firms still make profits without being apprehended.

Insignificant relationship

When environmental compliance was tested against ROA, a negative but insignificant relationship is established.

Objective 8: To determine the relationship between stakeholder engagement and financial performance of firms listed on the JSE

A positive and significant relationship was established between stakeholder engagement and EPS. This implies that listed firms may unlock financial value by actively communicating their environmental commitments to their key stakeholders such as customers, employees, shareholders, investors, supply chain partners, community members and the government.

Insignificant relationship

The findings showed that stakeholder engagement is positively related to ROE. However, the relationship is insignificant. When stakeholder engagement is regressed against ROA, a positive but insignificant relationship was established. On the other hand, a negative but insignificant relationship was established between stakeholder engagement and share price. A weak, positive and insignificant relationship was also found between stakeholder engagement and the Tobin's Q. Overall, it was found that stakeholder engagement has a positive relationship with most of the financial performance measures such as ROE, ROA, EPS and Tobin's Q. Although the relationship is insignificant, it can be inferred that stakeholder engagement initiatives such as stakeholder communication and collaborating with stakeholders in environmental sustainability projects may positively influence financial performance. Nevertheless, the effect is minimal and does not determine the profitability of the firm. One of the challenges confronting most firms is being driven by the profit maximisation goal that stakeholder engagement is not viewed as something that can help a business to generate profit. Considering the effect on

Tobin's Q, it can be inferred that investors are still pessimistic about the importance of considering stakeholder engagement to determine the future value of a firm. Overall, it can be concluded that stakeholder engagement has an insignificant effect on financial performance.

Objective 9: To determine if the effect of environmental sustainability commitment on financial performance differ based on the industry type

The findings showed that the effect of environmental sustainability commitment on financial performance did not differ based on the industry type. The results were relatively the same. The findings rather showed that firms within each industry had specific environmental sustainability commitment and financial performance combinations which were unique to that industry. The implication of these results is that environmental sustainability commitment is equally important across all sectors. This is because these different industries can still benefit from environmental sustainability commitment initiatives even though the benefits can come from different environmental investments which add value to unique financial performance indicators in that particular sector as determined by the different stakeholders of the business. The findings of this study were expected because firms listed on the FTSE/JSE are likely to experience comparatively similar financial results from environemental investments regardless of industry type because these firms are mandated to actively report on environmental sustainability initiatives twice a year.

Objective 10: To assess the moderating effect of industrial context on the relationship between environmental sustainability commitment and financial performance among firms listed on the Johannesburg Stock Exchange

In ESI, industry type strengthened 13 combinations while only weakening 4 combinations of environmental sustainability commitment and financial performance. Interstingly, industry type significantly and positively moderated the relationship between environmental sustainability commitment and financial performance on 14 counts in LESI. Based on the above, one can submit that industry type significantly moderates the relationship between environmental sustainability commitment and financial performance. It was noted that in this study, the effect of industry type mostly made the environmental sustainability commitment and financial performance nexus stronger in LESI.

8.3 CONTRIBUTIONS OF THE STUDY

8.3.1 Theoretical Contribution

The major weakness in studies was lack of a robust theoretical framework to measure environmental sustainability and financial performance (Trumpp et al., 2015; Galant & Cadez, 2017; Trumpp & Guenther, 2017; Bergmann et al., 2017). There was a tendency for studies to use few variables which lack the rigour of a theoretical framework. The author of this study has noted that environmental sustainability has been measured mostly using either waste management, energy efficiency or water management. This study contributed theoretically by adding new variables such as material efficiency, environmental compliance, green products and services innovation and stakeholder engagement to measure environmental sustainability. This enhances the explanatory power of the theoretical framework. The study also contributed theoretically by adopting a multi-dimensional measure of financial performance as recommended in existing literature (Maditinos et al., 2006; Chen et al., 2016; Boakye, 2018). This entailed adopting both accounting and market-based measures of financial performance in the financial model. This has been lacking in existing studies. Hence, this study was the first of its kind to develop such a model which enriched the theoretical model linking environmental sustainability and financial performance.

8.3.2 Empirical contribution

There is a discrepancy in existing empirical findings on the relationship between environmental sustainability commitment and financial performance. The mixed findings include studies which have reported a positive relationship, negative relationship and an insignificant relationship between environmental sustainability and financial performance (Jabbour, Da Silva, Paiva & Santos, 2012; Lu & Taylor, 2015; Miroshnychenko, Barontini & Testa, 2017; Boakye, 2018). This created a sufficient research gap for this study. For instance, in South Africa, Nyirenda (2014) examined environmental management practices of a JSE listed mining company. However, the study used only three environmental sustainability measures (energy efficiency, water management and carbon emission reduction) and return on assets as the only firm financial measure. The novelty of this study is that it produced new empirical findings on variables that have never been tested before in South Africa. New environmental sustainability variables such as materials efficiency, environmental compliance, green products and services innovation and stakeholder engagement were linked to the enhanced financial performance model which included both the accounting and market-based measures of financial performance. The relationships among each environmental sustainability variables (materials efficiency, environmental compliance, green products and services innovation and stakeholder engagement) have never been tested empirically in South Africa. The key empirical findings which emerged in this study were that environmental variables such as energy efficiency, water efficiency and environmental compliance positively and significantly enhance the financial performance of listed firms when both accounting (EPS) and market measures (share price) of financial performance are used. The study further contributed new empirical evidence by comparing comparing the effect of environmental sustainability commitment on financial performance on two groups of firms which were divided into environmentally sensitive industries and less environmentally sensitive industries. This has never been tested in South Africa. Essentially, the study went beyond testing linear relationships by testing the moderating effect of industry type on the environmental sustainability commitment and financial performance nexus which generated new empirical findings which were lacking in South Africa.

8.3.3 Methodological Contribution

Another contribution made in this study was to enrich the environmental sustainability construct by treating it as a multi-dimenisonal construct (Trumpp, Endrikat, Zopf & Guenther, 2015; Bergmann, Rotzek, Wetzel & Guenther, 2017). This is one of the ways to resolve the inconclusiveness in existing literature as most studies used only one or two factors to measure environmental sustainability which is insufficient (Putz, 2017; Trump & Guenther, 2017). As such, a concise measure of environmental sustainability was required to resolve the existing debate about the relationship between environmental sustainability and financial performance. Each of the environmental sustainability variables such as energy efficiency, water efficiency, waste management, carbon emission reduction, materials efficiency, stakeholder engagement as well as green products and services innovation influences each other and enhance the environmental sustainability construct unlike when one variable is used.

This study further contributed methodologically by acknowledging the importance of adopting the multi-dimensional measure of financial performance. The financial performance construct was not given much attention in existing studies linking environmental sustainability to financial performance. Most studies used either ROA or ROE which are all accounting measures of financial performance but failed to incorporate market-based measures of financial performance such as the Tobin's Q and share price. "Poorly chosen performance measures routinely create the wrong signals for managers, leading to poor decisions and undesirable results" (Maditinos et al., 2006:3). In this case, it might mean rejecting environmental sustainability initiatives citing that they weaken the financial performance, yet only basing on an underdeveloped financial performance measure. Hence, this study methodologically resolved this conundrum by adopting a multi-dimensional construct of financial performance which incorporated both the accounting and market-based measures of financial performance which have never been done in South Africa. More importantly, the financial performance model designed in this study was informed by the stakeholder theory. On that note, each financial ratio adopted in this study is linked to each key stakeholder of the firm. It is therefore, inferred that each set of financial ratios used on this model reflected different stakeholders' attitudes towards a firm's environmental sustainability behaviour. To that effect, financial performance should be defined in the confines of stakeholder satisfaction. Having done that, it becomes easy for researchers to construct effective financial performance measures that best reflect the stakeholder's perception of the firm and attain sustainable competitive advantage (Maditinos et al., 2006; Selvam et al., 2016; Fan, Pan, Liu & Zhou, 2017; Haninun et al., 2018).

8.3.4 Practical Contributions

There is currently slow participation by firms on environmental sustainability issues. One of the reasons is that managers do not see clear benefits of investing in environmental sustainability initiatives. Furthermore, several managers are driven by the profit maximisation motive which makes them reluctant to invest in projects which might reduce the profitability of the business. If it can be established that environmental sustainability commitment positively influences financial performance, it can go a long way in motivating more firms both listed and unlisted to consider environmental sustainability initiatives seriously. The findings of this study established that environmental responsible behaviour by firms can enhance their financial performance based on both accounting and market-based measures of financial performance. For instance, it was found that water efficiency, carbon emission reduction, material efficiency, green products and services innovation, environmental compliance and stakeholder engagement were positively and significantly related to measures of financial performance such as ROE, EPS, share price and Tobin's Q when the listed firms were tested in groups such as ESI and LESI. Specifically, this study made it clear that managers in ESI such as mining, health and pharmaceuticals and manufacturing can invest mostly in environmental investements such as water efficiency, carbon emission reduction, green products and services innovation as well as stakeholder engagement which significantly and positively predicted financial performance measures such as EPS, and share price. On the other hand, managers in LESI and in sectors such as services, telecommunications and banks can invest in environemental sustainability commitment strategies such as carbon emission reduction, material efficiency and environmental compliance which significantly and positively predicted financial performance measures such as ROE, EPS, share price and Tobin's Q.

Since this study focused on the top 32 FTSE/JSE listed firms, the findings of the study should encourage other laggards listed on the JSE main board that they can benefit immensely from being environmentally responsible firms. The findings of this study can also be of significance to small and medium enterprises listed on the AltX. Since these are high growth-oriented firms endeavouring to attract more capital and to be promoted into the JSE main board. Furthermore, the findings of this study can help AltX firms to identify the areas they can improve to attract green oriented investors, customers and suppliers to attain the desired growth. The findings of this study are also of utmost importance to investors, the government and other organisations interested in the environmentally friendly behaviour of listed firms. In the case of investors, the findings of this study can guide them in decision making on which firms to exactly invest in. With the emergence of responsible investing in South Africa and globally, it follows that both individual and institutional investors can derive much value from the findings of this study.

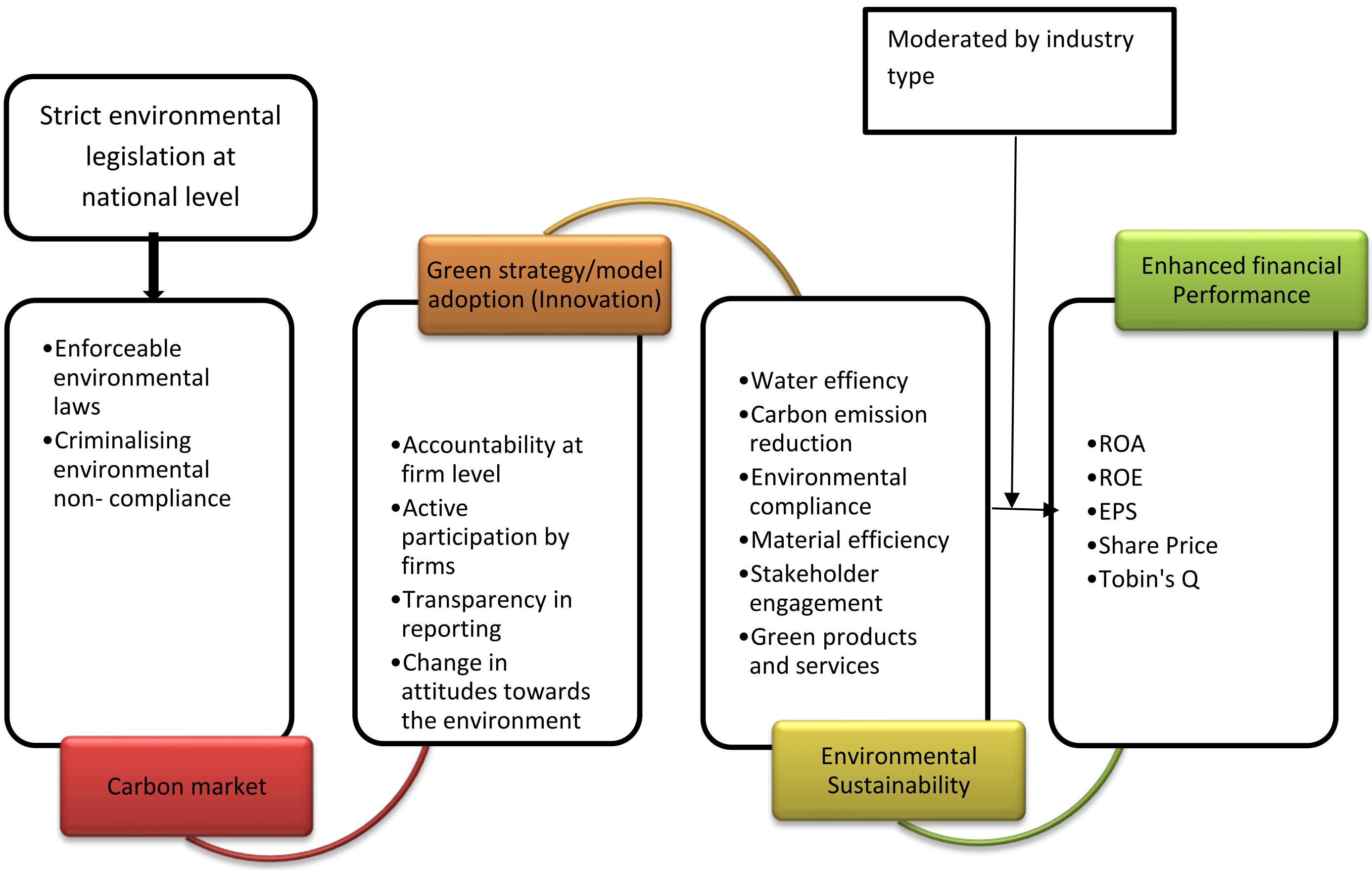
8.3.5 Policy Contribution

Environmental legislation should play a pertinent role towards ensuring that firms comply and become sustainable entities which proactively accounts for their environmental damage. Nevertheless, it was deduced from existing literature that environmental policies in developing countries are weak and suffer lack of implementation. South Africa is not immune to such shortfalls. In South Africa, a plethora of environmental policies have been developed since 1989 but the country remains one of the worst polluters in the world. This has caused the environmental sustainability challenge where firms continue to strain the environment through emissions and dumping of waste in undesignated areas. There is a paucity of studies which have investigated the relationship between environmental compliance and financial performance in South Africa. To that effect, the findings of this study could be useful in shaping the environmental policy framework in South Africa to mitigate the environmental sustainability conundrum. This could benefit parties such as; practitioners, consultants, corporate financial policy makers, industrial policy makers and the government.

One of the key contributions under policy development is the suggestion to treat environmental irresponsible behaviour as a criminal offence just like other cases which can lead to one being prosecuted. If firms become aware that environmental issues can lead one to jail, they are likely to change their behaviour and attitude towards environmental sustainability. One of the reasons why other firms are not seriously involved in environmental sustainability initiatives is that the laggards keep on making profits while polluting the environment without being taken to task. Consequently, this discourages other firms to actively get involved in environmental protection. Since this study established a positive relationship between compliance and financial performance, this should encourage policy makers to tighten the legislation and force firms to comply. The implementation of various environmental legislations in South is also key if environmental sustainability is to be attained.

8.4 PROPOSED MODEL LINKING ENVIRONMENTAL SUSTAINABILITY COMMITMENT TO FINANCIAL PERFORMANCE

Figure 8.1: Proposed Model Linking Environmental Sustainability Commitment to Financial Performance



Source: Author own compilation (2020)

Figure 8.1 depicts the proposed model linking environmental sustainability commitment to financial performance. The argument forwarded by the model is that strict environmental legislation at national level can force firms to take environmental sustainability commitment seriously. A perfectly structured legal environment can ignite innovation among firms which can enable them to attain environmental sustainability yet profitable. It is pertinent to note that firms need to account for their environmental damage by changing their attitude towards the environment which can enable them to adopt proactive environmental sustainability strategies. Based on the feasible generalised least squares results and then with a comparison between ESI and LESI, it was found that listed firms can benefit immensely from environmental sustainability commitment initiatives. For instance, it was found that water efficiency, carbon emission reduction, material efficiency, green products and services innovation, environmental compliance and stakeholder engagement were positively and significantly related to measures of financial performance such as ROE, EPS, share price and Tobin's Q when the listed firms were tested in groups such as ESI and LESI. Specifically, the model in Figure 8.1 clearly shows that managers in ESI such as mining, health and pharmaceuticals and manufacturing can invest mostly in environmental investements such as water efficiency, carbon emission reduction, green products and services innovation as well as stakeholder engagement which significantly and positively predicted financial performance measures such as EPS, and share price. On the other hand, managers in LESI and in sectors such as services, telecommunications and banks can invest in environemental sustainability commitment strategies such as carbon emission reduction, material efficiency and environmental compliance which significantly and positively predicted financial performance measures such as ROE, EPS, share price and Tobin's Q. Interestingly, the model outlines that the link between environmental sustainability commitment and financial performance can be moderated by industry type. This means managers of listed firms may need to consider their industry type to determine the best combination of environmental sustainability commitment initiatives and financial performance as each industry may have unique regulations and stakeholders which influence financial performance differently. Nevertheless, for firms to optimise their gains from environmental sustainability commitment, the author of this study suggests that they should adopt a multi-dimensional measure of both the environmental sustainability dimension and the financial performance dimension as depicted in the model in Figure 8.1. Having done that, listed firms are encouraged to invest beyond just compliance and find different innovative combinations which can reward their investments positively. Additionally, listed firms should send strong signals to stakeholders which show that they are genuinely committed towards environmental issues. This can help them to convert their environmental sustainability investments into positive financial performance as shown in the last pillar of the model. Another crucial point is that environmental sustainability commitment should not be treated as a once off event but should be viewed as a continuous process which requires listed firms to become learning organisations. This can help them to position their organisations for opportunities brought by the green revolution which can positively influence their financial performance.

8.5 LIMITATIONS OF THE STUDY

Even though the study was successful in achieving its objectives, it had a few limitations. The study used secondary data which might expose it to limitations associated with secondary data. The study could have been improved if it used primary data gathered specifically for the purpose of the problem at hand. Furthermore, the study could have been improved if the researcher used a qualitative research method. This could have generated in-depth insights behind the low participation by firms in environmental sustainability initiatives.

Another limitation of this study was that it focused only on financial performance. This could have been improved by including other performance measures such as innovation performance, growth in market share, customer satisfaction, employee satisfaction, corporate governance and social performance. This multi-dimensional measure of performance could have enhanced the findings of the study. All in all, the study managed to capture crucial insights which shed more light on the ongoing debate on the relationship between environmental sustainability commitment and financial performance.

8.6 AREAS FOR FUTURE RESEARCH

There are potential areas which future studies can explore to add to the ongoing debate on the relationship between environmental sustainability and performance of listed firms. Future studies can explore the relationship between a unidimensional measure of environmental sustainability and financial performance. This is based on the view that environmental sustainability measures can positively influence each other, hence, giving a favourable overall environmental sustainability construct. Another possible research avenue can be to assess the effect of slack resources such as financial resources on environmental sustainability commitment which is a view supported by the Resource Based View theory. Future studies should also endeavour to include broad and subjective measures of performance other than financial performance only. This can greatly enrich the findings on the relationship between environmental sustainability and performance of firms. It might be found that such subjective measures of performance can be positively related to environmental sustainability commitment. The effect of environmental sustainability practices on firms listed on the Alternative Stock Exchange (ALtX) of the Johannesburg Stock Exchange is also one of the pertinent areas future studies can investigate.

8.7 CONCLUSION

The importance of heeding the environmental sustainability commitment call cannot be underestimated. Laggards in terms of environmental sustainability commitment are likely to face fines and penalties as talks to tighten environmental legislation are now at an advanced stage. The weakness with existing studies was to use limited environmental variables and financial variables which weakened their findings. Furthermore, studies also had a tendency of focusing mainly on mining companies and a few on manufacturing companies leaving other sectors out. Hence, it was crucial to include all the sectors of firms listed on the JSE because each sector contributes to environmental pollution in several ways. Essentially, this study aimed at examining the relationship between environmental sustainability commitment and financial performance of firms listed on the JSE. Broadly, the researcher aimed to establish whether environmental sustainability activities such as waste management, energy efficiency, water efficiency, carbon emission reduction environmental compliance, material efficiency, stakeholder engagement and green products and services innovation do affect financial performance. The study also intended to conduct an industry comparison to determine if the effect of environmental sustainability commitment on financial performance differed based on industry type. Lastly, the study intended to test the moderation effect of industry type on the relationship between environmental sustainability commitment and financial performance. The objectives were empirically tested using the panel regression model. Mixed findings emerged from the analysis. The findings showed that environmental sustainability variables such as water efficiency, carbon emission reduction and environmental compliance were significantly and positively related to financial performance measures such as EPS and share price as indicated below. A positive and significant relationship was established between water efficiency and EPS. A positive and significant relationship was also established between water efficiency and share price. A positive and significant relationship was also established between carbon emission reduction and EPS. Furthermore, a significant and positive relationship was established between carbon emission reduction and share price. A significant and positive relationship was established between environmental compliance and EPS. This suggests that being a compliant business in terms of environmental requirements such as ISO 14001 and internal environmental policies may increase the profitability of the business as measured by EPS. Additionally, a positive and significant relationship was established between environmental compliance and share price. Moreover, a positive and significant relationship was established between stakeholder engagement and EPS. This means that firms can enhance their financial performance from environmental investment.

On the other hand, other variables showed a significant negative relationship. For instance, a negative and significant relationship was established on the relationship between energy efficiency and EPS as well as between energy efficiency and share price. Material efficiency and EPS were also found to be negatively related and the relationship was significant. A negative and significant relationship was also found between green products and services innovation and share price. The findings also showed that there is a negative and significant relationship between environmental compliance and ROE.

Considering the relationship between environmental compliance and the Tobin's Q, a negative and significant relationship between was established.

The remainder of the results exhibited an insignificant relationship between different environmental variables and financial performance. For example, the findings showed a negative but insignificant relationship between energy efficiency and ROE. A negative and insignificant relationship was also established between energy efficiency and ROA. On the other hand, a positive but insignificant relationship was established between energy efficiency and Tobin's Q. The findings showed that water efficiency and ROE are negatively related. However, the relationship is insignificant. The findings also show a positive but insignificant relationship between water efficiency and ROA. Nevertheless, a weak and positive relationship was established between water efficiency and Tobin's Q. The relationship was nevertheless insignificant. The findings showed that there is a positive but insignificant relationship between waste management and ROE. Additionally, the findings also showed that there is a positive but insignificant relationship between waste management and ROA. A negative but insignificant relationship was also established between waste management and EPS. The relationship between waste management and share price was also found to be negative and insignificant. On the other hand, the relationship between waste management and Tobin's Q was found to be positive but insignificant. A positive but insignificant relationship was established between carbon emission reduction and ROE. Additionally, a positive but insignificant relationship was established between carbon emission reduction and ROA. The relationship between carbon emission reduction and Tobin's Q was found to be positive but insignificant. The findings showed that the nexus between materials efficiency and ROE is negative but insignificant. The materials efficiency and ROA nexus was also found to be negative and insignificant. On the other hand, a negative but insignificant relationship was established between materials efficiency and share price. Additionally, it was also found that materials efficiency and Tobin's Q are positively related. However, the relationship was found to be weak and insignificant. Overall, the findings indicated that material efficiency had an insignificant effect on most measures of financial performance such as ROE, ROA, share price and Tobin's Q. The results also showed that the relationship between green products and services innovation and ROE is positive but insignificant. Also, it was discovered that green products and services innovation and ROA are positively related. However, the relationship was weak and insignificant. The study also found green products and services innovation to be negatively related to EPS. Nevertheless, the relationship was also found to be insignificant. When considering the relationship between green products and services innovation and the Tobin's Q, a weak, negative and insignificant relationship was established. When environmental compliance was regressed against ROA, a negative but insignificant relationship was established. Lastly, the findings showed that stakeholder engagement was positively related to ROE. However, the relationship was insignificant. When stakeholder engagement was regressed against ROA, a positive but insignificant relationship was established. Furthermore, the results showed that there was a positive and significant relationship between stakeholder engagement and EPS. On the other hand, a negative but insignificant relationship was established between stakeholder engagement and share price. A weak, positive and insignificant relationship was also found between stakeholder engagement and the Tobin's Q. Regarding comparisons between ESI and LESI, the findings showed that the effect of environmental sustainability commitment on financial performance did not differ based on the industry type. The results were relatively the same. The findings rather showed that firms within each industry had specific environmental sustainability commitment and financial performance combinations which were unique to that industry. After testing for moderation, it was found that industry type significantly moderates the relationship between environmental sustainability commitment and financial performance. It was noted that the effect of industry type mostly made the environmental sustainability commitment and financial performance nexus stronger in LESI than in ESI.

Overall, it was noted that listed firms can benefit immensely from environmental commitment initiatives such as water efficiency, carbon emission reduction, material efficiency, green products and services innovation, environmental compliance and stakeholder engagement. Essentially, environmental variables such as water efficiency and carbon emission reduction are at the core of the debate on sustainable development and climate change. This means by promoting water sustainability and reducing carbon emissions by being environmentally compliant, attaining material efficiency and actively communicating with stakeholders, listed firms will not only enjoy financial benefits but also help to mitigate climate change issues globally.

8.8 RECOMMENDATIONS

Environmental sustainability commitment remains one of the key areas firms should excel in to gain legitimacy from different stakeholders. Nevertheless, several firms still find it difficult to participate in environmental sustainability initiatives. This does not only tarnish their image in the face of green oriented stakeholders but also exposes them to possible lawsuits which negatively impact on the cash flows of the business. Besides, high pollution and high energy use shows that a firm is not efficient in its operations. Hence, environmental sustainability should not be treated as an alien in the strategy of the business but should be infused in the main strategy to enhance the efficiency and effectiveness of a firm in meeting all its goals. In this era and the future, good brands are going to be judged based on their environmental sensitiveness. To laggards, this might mean an end to their existence in the market as the growing number of green customers, investors, community and supply chain partners will not tolerate firms which do not prioritise the environment. To achieve the desired environmental sustainability commitment by firms, a holistic approach where all members in the business ecosystem participate is required. To that effect, this study proposes the following recommendations to different stakeholders of a business;

8.8.1 The government

The government plays a crucial role towards encouraging firms to adopt environmentally responsible behaviour. The government is the top decision maker through environmental regulation. Hence, in this case, the government is taken as the prime body responsible for introducing and implementing environmental legislation. As such, the government should take an active role towards providing a robust environmental legislation framework. Existing literature showed that South Africa has a rich environmental legislation but lacks implementation thereof. Hence, the government is encouraged to actively enforce the different legislations. This can be achieved by introducing punitive measures and make environmental irresponsible behaviour an offence which can lead to prosecution just like other issues regarded as a criminal offence by the state. Moreover, the government may also form a parliamentary task team which can work hand in hand with the Minister of Environmental Affairs. This may speed the action plans made to protect the environment since such initiatives can be directly debated in parliament. This can afford environmental protection the serious attention it requires since the effects of climate change have already been experienced globally.

The government should also minimise environmental incentives. From the analysis of environmental legislations in South Africa, it was discovered that a flood of incentives especially in the Carbon Tax Act of 2019 weaken it and does little to force firms to commit towards environmental protection initiatives. In as much as environmental incentives work as noted in other countries such as China where they have been implemented, giving firms too much incentives other than punitive measures may make the environmental sustainability call an elusive agenda and undermine the sustainable development revolution at large.

8.8.2 Corporate managers

Corporate managers are at the centre of the environmental sustainability commitment debate. This is because they are the face of their firms and in most instances tend to focus more on the profit maximisation goal at the expense of environmental protection. Most corporate managers also have a negative attitude towards environmental sustainability commitment. Therefore, recommendations are made for them to adopt a positive attitude towards environmental sustainability commitment. In this case, corporate managers are encouraged to look for ways to position their firms lest they risk losing legitimacy in the face of the society and other stakeholders.

Since environmental sustainability may seem to be a new area in most developing countries, the resistance to change by corporate managers may be attributed to a lack of knowledge about this phenomenon. Hence, corporate managers are encouraged to enrol for a certificate in environmental protection offered by several accredited institutions in South Africa. This can give them extensive knowledge required to pursue an environmental sustainability commitment strategy. Alternatively, corporate managers can set aside a budget and invite environmental protection consultants to teach them issues related to environmental compliance. This can take the form of a service contract where the consultants can train them on environmental issues such as energy efficiency, water efficiency, carbon emission reduction, waste management, material efficiency, stakeholder engagement, environmental compliance and the green products and services innovation among others. With this background, it may become easier for corporate managers to apply this knowledge in the implementation of proactive environmental sustainability initiatives.

8.8.3 Listed Firms

Firms are blamed for massive environmental damage. This is because of their significant number which makes the small amounts of environmental damage when put together. In every sector, there are activities which negatively affect the environment. Besides the primary activities of the firm, firms should also consider environmental damage caused by third parties who supply them with raw materials among which is electricity consumption. Listed firms need to actively participate in environmental sustainability initiatives. There are momentous benefits to be had by being environmentally proactive. Firms should invest fully in environmental sustainability initiatives if they are to enjoy the financial benefits that come with these initiatives. In this case, listed firms should invest beyond compliance. This can force them to innovate and eliminate inefficiencies leading to positive environmental performance which augments financial performance. Other key approaches are detailed below.

I. Adopting a holistic approach towards environmental sustainability

One glaring observation made from existing empirical findings is that firms fail to acknowledge the benefits associated with environmental sustainability commitment because they do not excel in all environmental sustainability variables. For instance, it was discovered that other firms only invest in initiatives such as energy efficiency or waste management leaving other variables unaddressed leading to poor environmental performance and hence, negative financial performance. Hence, firms are encouraged to excel in all environmental variables such as waste management, energy efficiency, water efficiency, carbon emission reduction environmental compliance, material efficiency, stakeholder engagement and green products and services innovation. This is because these environmental sustainability variables influence each other in some way leading to an overall positive environmental performance which translates into positive financial performance. For instance, attaining energy efficiency may positively reduce water consumption, carbon emissions and amount of waste generated. Hence, firms can benefit extensively if they can excel in all environmental variables.

II. Rethinking their strategy

Environmental sustainability is a strategic issue which requires a firm to come up with a profound environmental sustainability strategy. Globally, different organisations are being forced to rethink their strategy and integrate environmental sustainability in their core strategy. Integrating the environmental sustainability strategy in a firm’s operations can make it resilient in the dynamic business environment. The idea that a firm’s value depends on the success of the brand and sales made by the business has completely changed. In future, strong brands are going to be distinguished by green behaviour. Hence, firms should rethink their strategy and adopt proactive green business models driven by the green strategy. Green business models can allow firms to innovate beyond their competitors and enjoy competitive advantage.

Environmental sustainability should no longer be treated as an option but as a core element in the firm’s overall strategy. Firms should also view environmental sustainability commitment as a long-term phenomenon which requires continuous learning to attain. Being a learning organisation can allow firms to continuously identify new environmental trends and opportunities which they can exploit and remain competitive. This may require a strategic shift and alignment. Unaligned strategies tend to be detached from the entire organisation and usually fail to produce the intended results. The recommendations for a strategic shift and alignment are supported by the work of Kiron et al. (2017). Building on the work of Kiron et al. (2017), firms are recommended to embark on the following eight steps when trying to implement a green business strategy.

Figure 8.2: Strategic shift and alignment for environmental sustainability commitment

Step 1: **Set your sustainability vision and goals**

Step 2: **Focus on material issues**

Step 3: **Sustainability organization setup**

Step 4: **Explore business model innovation opportunities**

Step 5: **Develop a clear business case for sustainability**

Step 6: Get the board of directors on board

Step 7: **Collaborate with a variety of stakeholders to drive strategic change**

Source: Kiron et al. (2017)

Figure 8.1 shows some key steps that firms can take when trying to align a green strategy with their overall vision. As indicated in Figure 8.1, setting a sustainability vision is very crucial. This can set precedence to the build-up of a sustainable firm. Other crucial steps are bringing the board of directors on board and forming collaborations with other supply chain members on environmental sustainability issues. The author of this work believes that if firms can successfully follow and implement the above steps, the issue of environmental sustainability can become a success.

III. Environmental sustainability culture

The environmental sustainability strategy is only made a success when the firm adopts an environmental sustainability culture. Culture plays a crucial role in strategy implementation. As such, a misalignment between strategy and culture can result in resistance to change which consequently negates the efforts to adopt a green strategy. As such, firms are encouraged to incorporate environmental sustainability into their values, beliefs, norms and speeches. Furthermore, the firm's corporate physical evidence such as buildings and offices should communicate commitment towards environmental sustainability. This can enable the entire organisation to act and think in a positive manner towards environmental protection.

Nevertheless, firms are encouraged to introduce change towards adopting an environmental sustainability gradually. Rapid change may have negative effects to the firm. This include resistance to change and possible sabotage by organisational members. Hence, the move towards adopting an environmental sustainability culture should be incremental. This can allow all organisational members to buy-in the strategy and adopt the new beliefs, behaviour, attitude and values which can sustain a green strategy. Top management is very crucial in initiating a new culture within a business. Hence, adopting an environmental sustainability culture may become a success if it can cascade from top management to operational levels. This is because top management are responsible for building culture based on their behaviour, values and beliefs which can be observed by all organisational members as a new way of doing things within the firm.

8.8.4 Organisations Which Provide Environmental Reporting Guidelines

One outstanding challenge observed by the researcher during data collection was lack of standardised environmental sustainability measures. The operationalisation and measurement of environmental sustainability variables is still problematic. There is lack of standardisation of measurement of environmental sustainability variables such as material efficiency, stakeholder engagement, environmental compliance as well as green products and services innovation. There is variability in how these variables are reported in integrated reports of different firms, hence, lacking uniformity which leads to researchers reporting equivocal findings. This has resulted in inconsistency in reporting among firms. For instance, each firm reports environmental sustainability variables such as waste management, energy efficiency, water efficiency, carbon emission reduction environmental compliance, material efficiency, stakeholder engagement and green products and services innovation differently. This might be caused by lack of a uniform measure for these variables.

Hence, the author of this study recommends organisations such as Global Reporting Initiative, Carbon Disclosure Project and Sustainability Accounting Standards Board (SASB) among others to introduce standardised, numerical and objective measures especially on environmental variables. This may assist in clarifying the inconclusiveness among studies which investigated the relationship between environmental sustainability and financial performance. The suggestion is to use, kilo litres among others as used by scientists. For other environmental variables such as compliance, material efficiency, green products and services as well as stakeholder engagement, the suggestion is to use the total amount of money spend on these initiatives. These should be adopted uniformly as reporting standards. This can help the reporting firms, investors and researchers to easily utilise the data and have comparable findings.

The reporting guidelines should also reflect the context in which firms belong. For instance, most of the environmental sustainability reporting guidelines are authored by organisations in developed countries. These guidelines are made to cut across not differentiating between firms in developed and developing countries. There is a need for African tailored reporting guidelines. This can go a long way in simplifying these reporting standards. One of the reasons for the slow adoption of these reporting standards might be caused by lack of understanding by managers in a developing country such as South Africa due to the contextual issue.

8.9 SUMMARY OF THE CHAPTER

The purpose of this chapter was to provide summaries of findings of the study. The chapter summarised the findings based on each objective of the study. Mixed findings emerged from the statistical tests. The chapter also outlined the contributions made by this study. These included; theoretical, empirical practical and policy contributions. More importantly, the chapter presented a proposed model linking environmental sustainability commitment to financial performance. This stands as one of the crucial contributions of this study. This model can go a long way in assisting listed firms and South Africa at large to excel and benefit from the environmental sustainability commitment initiatives. The limitations of this study were also discussed in this chapter. Henceforth, areas for future research were suggested. These were meant to add value to the field of study linking environmental sustainability to performance of listed firms. Recommendations were also suggested to different stakeholders based on the findings of the study. The suggestions are key if the environmental sustainability agenda is to be realised. Overall, the study managed to achieve its objectives as each hypothesis was tested and evaluated. The glaring conclusions which emerged from the study were that firms can benefit immensely from environmental sustainability initiatives as shown by positive and significant relationships among water efficiency, carbon emission reduction, material efficiency, green products and services innovation, environmental compliance and stakeholder engagement with financial performance measures such as ROE, EPS, share price and Tobin's Q. Essentially, the researcher concluded that listed firms should send strong signals to their key stakeholders regarding their commitment towards environmental sustainability initiatives. This can be done through active stakeholder engagements, communication, eco-labelling their products and also letting physical infrastructure such as buildings to communicate the green strategy. This can positively influence the financial performance of listed firms and grow the returns for shareholders.

REFERENCES

Abosedra, S., Shahbaz, M. & Sbia, R. (2015). The links between energy consumption, financial development, and economic growth in Lebanon: evidence from cointegration with unknown structural breaks. *Journal of Energy*, *2015*(3):1-15.

Adams, K. A. & Lawrence, E. K. (2018). *Research methods, statistics, and applications*. Sage Publications.

Adnan, S. N. S. M. & Valliappan, R. (2019). Communicating shared vision and leadership styles towards enhancing performance. *International Journal of Productivity and Performance Management*, 68, 1042-1056.

Aerts, W. & Cormier, D. (2009). Media legitimacy and corporate environmental communication. *Accounting, Organizations and Society*, *34*(1): 1-27.

Afagachie, C. (2013). The relationship between corporate environmental performance and corporate financial performance: using the framework of corporate environmental policy implementation. (Doctoral dissertation, University of Bristol).

Agarwal, Y. (2013). Capital structure decisions: Evaluating risk and uncertainty. New York: Wiley.

Ahlén, J. & Ahlén, J. (2012). The Impact of CSR Ratings on Stock Prices. Bachelor Thesis, Stockholm School of Economics.

Aitken, J. & Harrison, A. (2013). Supply governance structures for reverse logistics systems. *International Journal of Operations & Production Management*, *33*(6): 745-764.

Akers, H. (2019). What Are the Disadvantages and Advantages of Performance Measures? [Online]. Available: https://bizfluent.com/info-8456358-disadvantages-advantages-performance-measures.html. Accessed on 24 May 2019.

Akinyemi, O., Alege, P., Ogundipe, A. & Osabuohien, E. (2016). Energy security and the green growth Agenda in Africa: Exploring trade-offs and synergies. *Mediterranean Journal of Social Sciences*, 7(1):375-382.

Akter, A. & Ahmed, S. (2015). Potentiality of rainwater harvesting for an urban community in Bangladesh. *Journal of Hydrology*, *528*, 84-93.

Al Shahrani, S. & Tu, Z. (2016). The impact of organisational factors on financial performance- Building a theoretical model. International journal of management science and business admin, 2(7): 51-52.

Albertini, E. (2013). Does environmental management improve financial performance? A meta-analytical review. *Organization & Environment*, *26*(4): 431-457.

Aleluia, J. & Ferrão, P. (2016). Characterization of urban waste management practices in developing Asian countries: A new analytical framework based on waste characteristics and urban dimension Waste Management. [Online]. Available: https://www.ncbi.nlm.nih.gov/pubmed/27220609. Accessed on 7 May 2018.

Alfalla-Luque, R., Marin-Garcia, J.A. & Medina-Lopez, C. (2015). 'An analysis of the direct and mediated effects of employee commitment and supply chain integration on organisational performance. *International Journal of Production Economics*, 162, 242–257.

Alhuraish, I., Robledo, C. & Kobi, A. (2016). Assessment of lean manufacturing and Six Sigma operation with decision making based on the analytic hierarchy process. *IFAC-PapersOnLine*, *49*(12): 59-64.

Aliabadi, S., Dorestani, A. & Balsara, N. (2013). The Most Value Relevant Accounting Performance Measure by Industry. *Journal of Accounting and Finance*, 13(1):22-34.

Allwood, J. M., Ashby, M. F., Gutowski, T. G. & Worrell, E. (2013). Material efficiency: providing material services with less material production. *Philosophical Transactions of the Royal Society a Mathematical, Physical and Engineering Sciences,* 371(1986): 15-28.

Al-Matari, E.M., Al-Swidi, A.K. & Fadzil, F.H.B. (2014). The Measurements of Firm Performance's Dimensions. *Asian Journal of Finance & Accounting,* 6(1):24-49.

Al-Qawasmi, J., Asif, M., El Fattah, A. A. & Babsail, M. O. (2019). Water Efficiency and Management in Sustainable Building Rating Systems: Examining Variation in Criteria Usage. *Sustainability,* 11(8):1-16.

Alshehhi, A., Nobanee, H., & Khare, N. (2018). The impact of sustainability practices on corporate financial performance: Literature trends and future research potential. *Sustainability*, *10*(2): 1-25.

Amacha, E. & Dastane, O. (2017). Sustainability Practices as Determinants of Financial Performance: A Case of Malaysian Corporations. *The Journal of Asian Finance, Economics and Business*, 4(2):55-68.

Amini, M. & Bienstock, C.C. (2014). Corporate sustainability: an integrative definition and framework to evaluate corporate practice and guide academic research. *Journal of Cleaner Production*, *76*, 12-19.

Amos, C. C., Rahman, A., Karim, F. & Gathenya, J. M. (2018). A scoping review of roof harvested rainwater usage in urban agriculture: Australia and Kenya in focus. *Journal of Cleaner Production*, *202*, 174-190.

Ansuategi, A; Greño, P; Houlden, V. (2015). The impact of climate change on the achievement of the post-2015 sustainable development goals. [Online]. Available: https://cdkn.org/wp-content/uploads/2015/05/Impact-of-climate-on-SDGs-technical-report-CDKN.pdf. Accessed on 26 February 2018.

Antwi, S. K. & Hamza, K. (2015). Qualitative and quantitative research paradigms in business research: A philosophical reflection. *European Journal of Business and Management*, *7*(3): 217-225.

Appiah, K., Du, J. & Boamah, K.B. (2017). The Effect of Environmental Performance on Firm's Performance–Evidence from Ghana. *British Journal of Interdisciplinary Research*, *8*(1): 340-348.

Ar, I.M. (2012). The impact of green product innovation on firm performance and competitive capability: the moderating role of managerial environmental concern. *Procedia-Social and Behavioral Sciences,* 62, 854-864.

Aras, G., Aybars, A. & Kutlu, O. (2010). Investigating the relationship between corporate social responsibility and financial performance in emerging markets. *Managing Corporate Performance*, 59, 229-254.

Araya, H.M.B., Mas, E.S. & Garrido, F.P. (2014). Sustainability reporting in European cooperative banks: an exploratory analysis. *Revesco,* 115, 30-56.

Arowoshegbe, A.O. & Emmanuel, U. (2016). Sustainability and triple bottom line: an overview of two interrelated concepts. *Igbinedion University Journal of Accounting*, 2, 88-126.

Arslan-Ayaydin, Ö. & Thewissen, J. (2015). The impact of environmental strengths and concerns on the accounting performance of firms in the energy sector. In *Energy Technology and Valuation Issues* (pp. 83-107). Springer, Cham.

Ashby, M.F. (2009). *Materials and the environment: eco-informed material choice.* 2nd edition. Burlington, MA: Butterworth-Heinemann

Ashforth, B.E. & Gibbs, B.W. (1990). The double-edge of organizational legitimation. *Organization Science*, *1*(2):177-194.

Askham, T.M. & Van der Poll, H.M. (2017). Water Sustainability of Selected Mining Companies in South Africa. *Sustainability*, *9*(6): 1-16.

Asongu, S. A., Le Roux, S. & Biekpe, N. (2017). Environmental degradation, ICT and inclusive development in Sub-Saharan Africa. *Energy Policy*, *111*, 353-361.

Asongu, S., El Montasser, G. & Toumi, H. (2016). Testing the relationships between energy consumption, CO2 emissions, and economic growth in 24 African countries: a panel ARDL approach. *Environmental Science and Pollution Research*, *23*(7):6563-6573.

Asongu, S.A., Le Roux, S. & Biekpe, N. (2018). Enhancing ICT for environmental sustainability in sub-Saharan Africa. *Technological Forecasting and Social Change*, *127*, 209-216.

Atasu, A., Sarvary, M. & Van Wassenhove, L. N. (2008). Remanufacturing as a marketing strategy. *Management Science*, *54*(10): 1731-1746.

Babbie, E. (2013). *The practice of social research. Thirteenth edition*. Belmont, MA: Wadsworth Cengage Learning.

Bacon-Shone, J.H. (2013). *Introduction to quantitative research methods*. Graduate School, The University of Hong Kong.

Bai, J., Choi, S. H. & Liao, Y. (2019). Feasible Generalized Least Squares for Panel Data with Cross-sectional and Serial Correlations. [Online]. Available: https://arxiv.org/pdf/1910.09004.pdf. Accessed on 19 April 2020.

Bailey, A. A., Mishra, A. & Tiamiyu, M. F. (2016). Green consumption values and Indian consumers' response to marketing communications. *Journal of Consumer Marketing,* 33(7): 562-573.

Bakari, H., Hunjra, A. I. & Niazi, G.S.K. (2017). How does authentic leadership influence planned organizational change? The role of employees' perceptions: Integration of theory of planned behavior and Lewin's three step model. *Journal of Change Management*, *17*(2): 155-187.

Barney, J.B. (2012). 'Purchasing, supply chain management and sustained competitive advantage: The relevance of resource-based theory. *Journal of Supply Chain Management,* 48(2):3–6.

Bartlett, A.A. (2012). The earning of sustainability. Teachers Clearinghouse for Science and Society. *Education Newsletter,* 31(1):1-17.

Bartolacci, F., Zigiotti, E. & Diem, T. H. (2015). Environmental and financial performance in Italian waste management firms. In *MIC 2015: Managing Sustainable Growth; Proceedings of the Joint International Conference, Portorož, Slovenia, 28–30 May 2015* (pp. 389-401). University of Primorska, Faculty of Management Koper.

Batchimeg, B. (2017). Financial Performance Determinants of Organizations:The Case of Mongolian Companies. *Journal of Competitiveness*, 9(3): 22-33.

Bawua, S.A. & Owusu, R. (2018). Analyzing the effect of Akoben programme on the environmental performance of mining in Ghana: a case study of a gold mining company. *Journal of Sustainable Mining*, *17*(1): 11-19.

Bell, A., Fairbrother, M. & Jones, K. (2019). Fixed and random effects models: making an informed choice. *Quality & Quantity*, *53*(2): 1051-1074.

Bell, E., Bryman, A. & Harley, B. (2018). *Business research methods*. Oxford university press.

Bell, R. G. (2017). Protecting the Environment during and after Resource Extraction. *Extractive Industries*, 3, 1-20.

Bergmann, A., Rotzek, J. N., Wetzel, M. & Guenther, E. (2017). Hang the low-hanging fruit even lower-Evidence that energy efficiency matters for corporate financial performance. *Journal of Cleaner Production*, *147*, 66-74.

Blaikie, N. & Priest, J. (2019). Designing social research: The logic of anticipation. John Wiley & Sons.

Blengini, G.A. & Shields, D.J. (2010). Green labels and sustainability reporting: Overview of the building products supply chain in Italy. *Management of Environmental Quality: An International Journal,* 21(4):477-493.

Bloom, N., Brynjolfsson, E., Foster, L., Jarmin, R., Patnaik, M., SaportaEksten, I. & Van Reenen, J. (2018). What Drives Differences in Management Practices? *American Economic Review*, 1-27.

Boakye, D.J. (2018). The Relationship between Environmental Management Quality and Financial Performance of AIM listed Firms. Doctoral thesis, Bournemouth University.

Bocken, N. M., De Pauw, I., Bakker, C. & van der Grinten, B. (2016). Product design and business model strategies for a circular economy. *Journal of Industrial and Production Engineering*, *33*(5): 308-320.

Bocken, N., Short, S., Rana, P. & Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. *Journal of Cleaner Production*, 65, 42- 56.

Boiral, O. & Henri, J.F. (2012). Modelling the impact of ISO 14001 on environmental performance: A comparative approach. *Journal of Environmental Management*, 99, 84-97.

Bose, I. & Pal, R. (2012). Do green supply chain management initiatives impact stock prices of firms? *Decision Support System*, 52, 624-634.

Bowen, F. & Aragon-Correa, J.A. (2014). Greenwashing in corporate environmentalism research and practice: The importance of what we say and do. *Organization and Environment,* 27, 107-12.

Bower, J. L. & Paine, L.S. (2017). The error at the heart of corporate leadership. [Online]. Available:https://hbr.org/2017/05/managing-for-the-long-term#the-error-at-the-heart-of-corporate-leadership. Accessed on 17 July 2019.

Bowie, N. (2007). Foreword. In A. J. Zakhem, D. E. Palmer & M. L. Stoll (Eds.), Stakeholder theory: Essential readings in ethical leadership and management (pp. 9-13). Amherst, N.Y.: Prometheus Books.

Bozovic-Stamenovic, R., Kishnani, N., Tan, B. K., Prasad, D. & Faizal, F. (2016). Assessment of awareness of Green Mark (GM) rating tool by occupants of GM buildings and general public. *Energy and Buildings*, *115*, 55-62.

Brigham, E.F. & Houston, J.F. (2012). *Fundamentals of financial management*. Cengage Learning. USA.

Brigham, E.F. & Houston, J.F. (2012). Fundamentals of financial management. Seventh edition. Mason, OH: South-Western Cengage Learning.

British Petroleum (BP), (2016a). Energy outlook. [Online]. Available: https://www.bp.com/content/dam/bp/pdf/energy-economics/statistical-review-

2016/bp-statistical-review-of-world-energy-2016-full-report.pdf. Accessed on 15 August 2018.

British Petroleum (BP), (2016b). BP Statistical Review of World Energy June 2016. [Online]. Available: http://oilproduction.net/files/especial-BP/bp-statistical-review-of-world-energy-2016-full-report.pdf. Accessed on 26 February 2018.

Brownlee, J. (2016). The differences between investing in companies listed on the JSE's main board and the AltX. [Online]. Available: https://fspinvest.co.za/articles/investing/the-differences-between-investing-in-companies-listed-on-the-jse-apstrphe-s-main-board-and-the-altx-6950.html. Accessed on 07 August 2019.

Burlea, A. S. & Popa, I. (2013). Legitimacy theory. In *Encyclopedia of Corporate Social Responsibility* (pp. 1579-1584). Springer Berlin Heidelberg.

Busch, T. & Hoffmann, V. H. (2011). How hot is your bottom line? Linking carbon and financial performance. *Business & Society*, 50(2): 233-265.

Businesstech, (2019). How South Africa’s top 40 companies performed in 2018. [Online]. Available:https://businesstech.co.za/news/finance/291816/how-south-africas-top-40-companies-performed-in-2018/. Accessed on 12 March 2018.

Canepari, B. (2017). Environmental performance management in multinational corporations.[Online].Available:https://tesi.luiss.it/19034/1/665581_CANEPARI_BARBARA.pdf. Accessed on 17 November 2019.

Canepari, B. (2017). Environmental performance management in multinational corporations.[Online].Available:https://www.semanticscholar.org/paper/EnvironmentalperformancemanagementinCanepari/c71539024b2428a7d675c45f41b341768f05038e. Accessed on 19 November 2019.

Caniëls, M. C., Cleophas, E. & Semeijn, J. (2016). Implementing green supply chain practices: an empirical investigation in the shipbuilding industry. *Maritime Policy & Management*, *43*(8): 1005-1020.

Cantore, N., Nussbaumer, P., Wei, M. & Kammen, D. M. (2017). Promoting renewable energy and energy efficiency in Africa: a framework to evaluate employment generation and cost effectiveness. *Environmental Research Letters*, *12*(3): 1-11.

Capece, G., Di Pillo, F., Gastaldi, M., Levialdi, N. & Miliacca, M. (2017). Examining the effect of managing GHG emissions on business performance. *Business Strategy and the Environment*, 26(8): 1041-1060.

Carabin, G., Wehrle, E. & Vidoni, R. (2017). A Review on Energy-Saving Optimization Methods for Robotic and Automatic Systems. *Robotics*, *6*(4):1-21.

Carbon Disclosure Project (2010). South Africa JSE 100. [Online]. Available: https://www.nbi.org.za/wp-content/uploads/2016/06/CDP-2010-South-Africa-JSE100.pdf. Accessed on 17 November 2019.

Carbon Disclosure Project (2014). Carbon Action Initiative Annual Report. [Online]. Available: https://www.gcx.co.za/carbon-disclosure-project-cdp/. Accessed on 16 April 2019.

Carruth, M. A., Allwood, J. M., & Moynihan, M. C. (2011). The technical potential for reducing metal requirements through lightweight product design. *Resources, Conservation and Recycling*, *57*, 48-60.

Castrillón, M.A. & Mares, A.I. (2014). Revisión Sobre la Sostenibilidad Empresarial. *Revista de Estudios Avanzados de Liderazgo*, 1, 52-77.

Cennamo, C., Berrone, P. & Gomez-Mejia, L.R. (2009). Does stakeholder management have a dark side? *Journal of Business Ethics*, 89(4): 491-507.

Charlo, M.J., Moya, I. & Muñoz, A.M. (2015). Sustainable development and corporate financial performance: a study based on the FTSE4Good IBEX Index. *Business Strategy and the Environment,* 24(4): 277-288.

Chartered Global Management Accountant, (2013). KPIs – financial and non-financial. [Online]. Available: https://www.cgma.org/resources/tools/essential-tools/kpis.html. Accessed on 18 May 2019.

Chashmi, N.A. & Fadaee, M. (2016). Impact of Financial Performance and Growth Opportunities on Success or Failure of Companies: Evidence from Tehran Stock Exchange. *Journal of Accounting & Marketing,* 5(2):1-4.

Chen, F., Ngniatedema, T. & Li, S. (2018). A cross-country comparison of green initiatives, green performance and financial performance. *Management Decision*, 56(5): 1008-1032.

Chen, l., Feldmann, A. & Tang, O. (2015). The relationship between disclosure of corporate social performance and financial performance: Evidence from GRI reports in manufacturing industry. *International Journal of Production Economics,* 170, 445-456.

Chen, P.H., Ong, C.F. & Hsu, S.C. (2016). Understanding the relationships between environmental management practices and financial performances of multinational construction firms. *Journal of cleaner production*, *139*, 750-760.

Cheng, B., Ioannou, I. & Serafeim, G. (2014). Corporate social responsibility and access to finance. *Strategic Management Journal*, *35*(1):1-23.

Cheng, C.C., Yang, C.L. & Sheu, C. (2014). The link between eco-innovation and business performance: A Taiwanese industry context. *Journal of Cleaner Production*, 64, 81–90.

Cherian, J., Umar, M., Thu, P. A., Nguyen-Trang, T., Sial, M. S. & Khuong, N. V. (2019). Does Corporate Social Responsibility Affect the Financial Performance of the Manufacturing Sector? Evidence from an Emerging Economy. *Sustainability*, 11(4):1-14.

Ching, H. Y. & Gerab, F. (2017). Sustainability reports in Brazil through the lens of signaling, legitimacy and stakeholder theories. *Social Responsibility Journal*, *13*(1):95-110.

Chiou, T. Y., Chan, H. K., Lettice, F. & Chung, S. H. (2011). The influence of greening the suppliers and green innovation on environmental performance and competitive advantage in Taiwan. Transportation Research Part E. *Logistics and Transportation Review,* 47(6), 822-836.

Chithambo, L. & Tauringana, V. (2014). Company specific determinants of greenhouse gases disclosures. *Journal of Applied Accounting Research*, 15(3): 323-338.

Chithambo, L. (2013). The Extent and Determinants of Greenhouse Gas Reporting in the United Kingdom. PhD thesis, Bournemouth University.

Chiu, T. K. & Wang, Y. H. (2015). Determinants of social disclosure quality in Taiwan: An application of stakeholder theory. *Journal of Business Ethics*, *129*(2): 379-398.

Cho, S. J., Chung, C. Y., & Young, J. (2019). Study on the Relationship between CSR and Financial Performance. *Sustainability*, *11*(2):1-26.

Choi, D., & Hwang, T. (2015). The impact of green supply chain management practices on firm performance: the role of collaborative capability. *Operations Management Research*, *8*(3-4): 69-83.

Cici, C. & D'Isanto, D. (2017). Integrating Sustainability into Core Business. *Symphonya. Emerging Issues in Management,* n (1): 50-65.

Clark, G. L., Feiner, A., & Viehs, M. (2015). From the stockholder to the stakeholder: How sustainability can drive financial outperformance. [Online]. Available: https://arabesque.com/research/From_the_stockholder_to_the_stakeholder_web .pdf. Accessed on 12 September 2019.

Climate Bonds Initiative, (2016). Bonds and Climate Change: The State of the Market in 2016. [Online]. Available: https://www. climatebonds.net. Accessed on 5 June 2018.

Cole, M. J., Bailey, R. M., Cullis, J. D. & New, M. G. (2018). Water for sustainable development in the Berg Water Management Area, South Africa. *South African Journal of Science*, *114*(3/4): 1-10.

Coleman, P.D. (2006). Evolution of stock pricing. [Online]. Available: http://www.numeraire.com/download/EvolutionStockPricing.pdf. Accessed on 24 July 2019.

Collins, H. (2010). Creative research: The theory and practice of research for the creative industries. Lausanne: AVA Publishing SA.

Conway, E. (2015). Engaging small and medium-sized enterprises (SMEs) in the low carbon agenda. *Energy, Sustainability and Society*, *5*(1): 32-41.

Cooke, T. E. (1989). Disclosure in the corporate annual reports of Swedish companies. *Accounting and Business Research*, 19(74): 113-124.

Cooper, D.C. & Allwood, J.M. (2012). Reusing steel and aluminium components at end of product life. *Environmental Science and Technology*, 46, 10334-10340.

Cooper, D.R. & Schindler, P.S. (2013). Business research methods (Twelfth edition). New York: McGraw-Hill.

Cortfield, A. (1998). The Stakeholder theory and its future in Australian corporate governance: Apreliminary analysis. *Bond Law Review,* 10(2): 213-240.

Costa-Campi, M. T., García-Quevedo, J. & Segarra, A. (2015). Energy efficiency determinants: An empirical analysis of Spanish innovative firms. *Energy Policy*, *83*, 229-239.

Cramer, J. (2013). Material efficiency: from top-down steering to tailor-made governance. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, *371*(1986): 201-217.

Crane, L.M. (2010). Measuring financial performance: A critical key to managing risk. [Online]. Available: https://msu.edu/~steind/financial_measures.pdf. Accessed on 01 August 2019.

Creswell, J.W. & Creswell, J.D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Cucchiella, F., Gastaldi, M. & Miliacca, M. (2017). The management of greenhouse gas emissions and its effects on firm performance. *Journal of Cleaner Production*, *167*, 1387-1400.

Cuerva, M. C., Triguero-Cano, Á. & Córcoles, D. (2014). Drivers of green and non-green innovation: empirical evidence in Low-Tech SMEs. *Journal of Cleaner Production*, *68*, 104-113.

Dam, L. & Petkova, B.N. (2014). The impact of environmental supply chain sustainability programs on shareholder wealth. *International Journal of Operations & Production Management*, 34(5):586-609.

Dangelico, R.M. & Pontrandolfo, P. (2015). Being “green and competitive”: the impact of environmental actions and collaborations on firm performance. *Business Strategy Environment*, 24, 413-430.

Danielson, M. G., Heck, J. L. & Shaffer, D. (2008). Shareholder theory–how opponents and proponents both get it wrong. *Journal of Applied Finance*, *18*(2): 62-66.

Dao, P. (2016). Performance evaluation based on financial ratios Case: Finnair and Scandinavian airlines. Degree thesis, Arcada University of Applied Sciences.

Das, S. & Bhattacharyya, B.K. (2015). Optimization of municipal solid waste collection and transportation routes. *Waste Management*, 43, 9-18.

De Boer, T.D. (2016). The influence of slack resources on the financial performance of ambidextrous firms. Masters dissertation, Utrecht University.

De Jong, P., Paulraj, A. & Blome, C. (2014). The financial impact of ISO 14001 certification: top-line, bottom-line, or both? *Journal of Business Ethics*, 119(1): 131-149.

De Pauw, I. C., Karana, E., Kandachar, P. & Poppelaars, F. (2014). Comparing Biomimicry and Cradle to Cradle with Ecodesign: a case study of student design projects. *Journal of Cleaner Production,* 78, 174-183.

De Pauw, I.C., Kandachar, P. & Karana, E. (2015). Assessing sustainability in nature-inspired design. *International Journal of Sustainable Engineering* 8(1): 5-13.

de Wet, J. (2014). Earnings Per Share as a Measure of Financial Performance: Do we interpret it appropriately? *Corporate Ownership & Control,* 10(4):265-275.

Debnath, S. (2014). Expanding environmental management accounting: An experimental construct to integrate material wastes and emission flows. *International Journal of Business Information Systems,* 16(2): 119-133.

Dechezleprêtre, A. & Sato, M. (2017). The impacts of environmental regulations on competitiveness. *Review of Environmental Economics and Policy*, 11(2): 183-206.

Delmas, M. A., Nairn-Birch, N. & Lim, J. (2015). Dynamics of environmental and financial performance: The case of greenhouse gas emissions. *Organization & Environment*, *28*(4): 374-393.

Delmas, M.A. & Lessem, N. (2017). Eco-premiumoreco-penalty? Eco-labels and quality in the organic wine market. *Business & Society*, 56(2):318-356.

Delmas, M.A. & Montes-Sancho, M.J. (2010). Voluntary agreements to improve environmental quality: Symbolic and substantive cooperation. *Strategic Management Journal*, *31*(6): 575-601.

Department of Environmental Affairs (DEA (2016). Report on the Determination of the Extent and Role of Waste Picking in South Africa; DEA: Pretoria, South Africa, 2016. [Online]. Available: http://sawic.environment.gov. za/documents/5413.pdf. Accessed on 21 June 2018.

Department of National Treasury, (2019). Publication of the 2019 Carbon Tax Act. [Online].Available:http://www.treasury.gov.za/comm_media/press/2019/2019052701%20Media%20statement%20-%20Carbon%20Tax%20Act.pdf. Accessed on 17 July 2019.

Derrida J. (2016). Of Grammatology. (40th Anniversary Edition). *Baltimore: Johns Hopkins University Press.*

Deutsch, N. & Pintér, É. (2016). The link between Corporate Social Performance and Corporate Financial Performance in the Banking Sector. In Proceedings of the 12th International Conference on Energy, Environment, Ecosystems and Sustainable Development (EEESD'16), Venice, Italy (pp. 29-31).

Di Pillo, F., Gastaldi, M., Levialdi, N. & Miliacca, M. (2017). Environmental Performance Versus Economic-financial Performance: Evidence from Italian Firms. *International Journal of Energy Economics and Policy*, 7(2): 98-108.

Dinç, D. T. & Akdoğan, E. C. (2019). Renewable Energy Production, Energy Consumption and Sustainable Economic Growth in Turkey: A VECM Approach. *Sustainability,* 11(5): 1-14.

Diouf, D. & Boiral, O. (2017). The quality of sustainability reports and impression management: A stakeholder perspective. *Accounting, Auditing & Accountability Journal,* 30(3): 643-667.

Dodson, M. S., de Azevedo, D. B., Mohiuddin, M., Defavari, G. H. & Abrahão, A.F. S. (2015). Natural Environment and Future Generations as Stakeholders, the path for Sustainability. *Desafio Online*, *3*(2): 55-74.

Dooley, K. (2015). The business case for environmental sustainability: embedding long-term strategies that enhance environmental and economic performance. *Sustainable Futures in a Changing Climate,* 12(2):1-15.

Dos Santos, M. A., Svensson, G. & Padin, C. (2013). Indicators of sustainable business practices: Woolworths in South Africa. *Supply Chain Management: An International Journal*, *18*(1): 104-108.

Dowling, J. & Pfeffer, J. (1975). Organizational legitimacy: Social values and organizational behavior. *Pacific Sociological Review*, *18*(1):122-136.

Du Plessis, W. (2015). Energy efficiency and the law: A multidisciplinary approach. *South African Journal of Science*, 111(1-2):01-08.

Dube, I. 2017. Assessment of waste management practices in the informal business sector in Olievenhoutbosch township, Pretoria. Masters dissertation, University of South Africa.

Duckworth, H. A. & Moore, R. A. (2010). *Social responsibility: Failure mode effects and analysis*. CRC Press.

Eccles, R.G. & Krzus, M.P. (2015). *The integrated reporting movement: Meaning, momentum, motives, and materiality*. John Wiley & Sons.

Elkington, J. (1997). Cannibals with forks: the triple bottom line of 21st century business. USA: New Society Publishers.

Elkington, J. (2004). Enter the Triple Bottom Line. in Henriques, A. & Richardson, J. (Eds.), The triple bottom line: does it all add up. London: EarthScan.

EL-Nwsany, R. I., Maarouf, I. & el-Aal, W.A. (2019). Water management as a vital factor for a sustainable school. *Alexandria Engineering Journal*, *58*(1):303-313.

Endrikat, J., Guenther, E. & Hoppe, H. (2014). Making sense of conflicting empirical findings: A meta-analytic review of the relationship between corporate environmental and financial performance. *European Management Journal,* 32(5):735–751.

Eneizan, B.M. & Wahab, K.A. (2016). Effects of green marketing strategy on the financial and non-financial performance of firms: A conceptual paper. *Arabian Journal of Business Management Review,* 6(5):1-7.

Environmental Performance Index (EPI), 2018. Global metrics for the environment: Ranking country performance on high-priority environmental issues. [Online]. Available:https://epi.envirocenter.yale.edu/downloads/epi2018policymakerssummaryv01.pdf. Accessed on 16 July 2019.

Epstein, M.J. & Buhovac, A.R. (2014). A new day for sustainability. *Strategic Finance*, *96*(1): 25-33.

Esty, D.C. & Cort, T. (2017). Corporate Sustainability Metrics: What Investors Need and Don't Get. *Journal of Environmental Investing,* 8(1):1-17.

Etikan, I., Musa, S. A. & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics*, *5*(1): 1-4.

Eunice. (2014). Corporate Social Responsibility as a Marketing Strategy for Enhanced Performance in the Nigerian Banking Industry: A Granger Causality Approach. *Procedia-Social and Behavioral Sciences*,164(31): 141-149.

European Commission, (2015). Closing the loop—An EU action plan for the circular economy. Communication from the commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2015) 614. Brussels: European Commission (EC). [Online]. Available: https://ec.europa.eu/transparency/regdoc/rep/1/2015/EN/1-2015-614-EN-F1-1.PDF. Accessed on 19 August 2019.

European Commission, (2017). Energy Efficiency. [Online]. Available: https://ec.europa.eu/energy/en/topics/energy-efficiency. Accessed on 6 July 2018.

European Commission, (2018). Life Cycle Inventories of Single Use Plastic Products and their Alternatives. [Online]. Available: http://ec.europa.eu/environment/enveco/economics_policy/pdf/studies/DG%20ENV%20Single%20Use%20Plastics%20LCA%20181213.pdf. Accessed on 16 July 2019.

European Environmental Bureau, (2015). Delivering resource-efficient products: How eco design can drive a circular economy in Europe. Brussels: European Environmental Bureau (EEB). [Online]. Available: https://eeb.org/work-areas/resource-efficiency/circular-economy/. Accessed on 19 August 2019.

EY Global, 2018. How an integrated sustainability strategy can help you stand out. [Online]. Available: https://www.ey.com/en_gl/assurance/how-an-integrated-sustainability-strategy-can-help-you-stand-out. Accessed on 20 February 2018.

Fadly, D. (2018). Greening industry in Vietnam: Environmental standards and resource efficiency in SMEs. [Online]. Available: http://www.greengrowthknowledge.org/sites/default/files/uploads/Dalia%20Fadly%20–%20Greening%20Industry%20in%20Vietnam_0.pdf. Accessed on 12 June 2019.

Fakoya, M. B. (2015). Adopting material flow cost accounting model for improved waste-reduction decisions in a micro-brewery. *Environment, Development and Sustainability*, 17(5): 1017-1030.

Falle, S., Rauter, R., Engert, S. & Baumgartner, R. J. (2016). Sustainability management with the sustainability balanced scorecard in Firms: Findings from an Austrian case study. *Sustainability*, *8*(6):1-16.

Fama, E.F. (1970). 'Efficient capital markets: A review of theory and empirical work. *The Journal of Finance,* 25(2): 383-417.

Fan, L. W., Pan, S. J., Liu, G. Q. & Zhou, P. (2017). Does energy efficiency affect financial performance? Evidence from Chinese energy-intensive firms. *Journal of Cleaner Production*, *151*, 53-59.

Farok, G.M. G. & Searcy, C. (2015). Analysis of ISO 14001: A balanced tool of environmental management system. *Research Journal of Agriculture and Environmental Management, 4*(11): 483-490.

Fethi, S. & Rahuma, A. (2020). The impact of eco-innovation on CO2 emission reductions: Evidence from selected petroleum companies. *Structural Change and Economic Dynamics*, *53*, 108-115.

Fischer, S. & O'Brien, M. (2012). Eco-innovation in Business: reducing cost and increasing profitability via Material Efficiency Measures. [Online]. Available: www.eco-innovation.eu/index.php/.../eco-innovation-briefs? Accessed on 23 May 2019.

Fischer, S. (2013). Material efficiency in companies of manufacturing industry: Classification of measures. 11th Global conference on sustainable manufacturing, 23rd -25th September, Berlin, Germany.

Flammer, C. (2013). Corporate social responsibility and shareholder reaction: The environmental awareness of investors. *Academy of Management Journal*, *56*(3): 758-781.

Food and Agriculture Organization of the United States (FAO) (2017). Water use efficiency.[Online].Available:http://www.fao.org/fileadmin/user_upload/agwa/docs/bari2017/Session2/Efficiency_introduction_I.pdf. Accessed on 05 September 2019.

Fraj, E., Matute, J. & Melero, I. (2015). Environmental strategies and organizational competitiveness in the hotel industry: The role of learning and innovation as determinants of environmental success. *Tourism Management*, *46*, 30-42.

Franklin Associates, (2014). Impact of Plastics Packaging on Life Cycle Energy Consumption & Greenhouse Gas Emissions in the United States and Canada – Substitution Analysis. Report prepared for the American Chemistry council (ACC) and the Canadian Plastics Industry Association (CPIA). [Online]. Available: https://plastics.americanchemistry.com/EducationResources/Publications/Impact-of-Plastics-Packaging.pdf. Accessed on 16 July 2019.

Freeman, R. E. 1984. Strategic management: A stakeholder approach. Boston:

Frenken, K. & Faber, A. (2009). Introduction: Evolutionary methodologies for analyzing environmental innovations and the implications for environmental policy. *Technological Forecasting and Social Change*, 76, 449-452

Fu, L., Singhal, R. & Parkash, M. (2018). Tobin's q Ratio and Firm Performance. *International Research Journal of Applied Finance,* VII(4):1-10.

Fujii H, Iwata K, Kaneko S. & Managi S. (2013). Corporate environmental and economic performance of Japanese manufacturing firms: empirical study for sustainable development. *Business Strategy and the Environment*, 22(3): 187–201.

Fullerton, R.R., Kennedy, F. A. & Widener, S.K. (2014). Lean manufacturing and firm performance: The incremental contribution of lean management accounting practices. *Journal of Operations Management*, *32*(7-8): 414-428.

Galant, A. & Cadez, S. (2017). Corporate social responsibility and financial performance relationship: a review of measurement approaches. *Economic research-Ekonomska istraživanja*, 30(1): 676-693.

Gallego-Álvarez, I., Segura, L. & Martínez-Ferrero, J. (2015). Carbon emission reduction: the impact on the financial and operational performance of international companies. *Journal of Cleaner Production*, 103, 149-159.

Ganda, F. & Milondzo, K. (2018). The Impact of Carbon Emissions on Corporate Financial Performance: Evidence from the South African Firms. *Sustainability*, *10*(7):1-22.

Ganda, F. & Ngwakwe, C.C. (2014). Role of energy efficiency on sustainable development. *Environmental Economics*, *5*(1):86-99.

Ganda, F. (2016). Determinants of corporate green investment practices in the Johannesburg Stock Exchange (JSE) listed firm. Doctoral thesis, University of Limpopo.

Ganda, F. (2018). The influence of carbon emissions disclosure on company financial value in an emerging economy. *Environment, Development and Sustainability*, *20*(4): 1723-1738.

Garcia-Castro, R., Ariño, M. A. & Canela, M. A. (2010). Does social performance really lead to financial performance? *Accounting for Endogeneity, Journal of Business Ethics,* 92, 107-126.

García-Sánchez, I. M. & Martínez-Ferrero, J. (2017). Independent directors and CSR disclosures: The moderating effects of proprietary costs. *Corporate Social Responsibility and Environmental Management*, *24*(1): 28-43.

Garcin, N. & Rodel, N. (2019). Carbon Tax Bill gift-wrapped for big emitters: At last, South Africa is getting a (weak) carbon tax. [Online]. Available: https://www.dailymaverick.co.za/article/2019-02-15-carbon-tax-bill-gift-wrapped-for-big-emitters-at-last-south-africa-is-getting-a-weak-carbon-tax/. Accessed on 17 July 2019.

Garg, P. (2015). Impact of sustainability reporting on firm performance of companies in India. *International Journal of Marketing and Business Communication*, *4*(3): 38-45.

Gautam, N. (2017). Sustainable tourism: A case study: Klaus K Hotel Helsinki. [Online].Available:https://www.theseus.fi/bitstream/handle/10024/128780/Sustainable%20Tourism%20a%20Case%20Study%20Klaus%20K%20Hotel.pdf?sequence=1&isAllowed=y. [Accessed on 12 February 2018].

Gawankar, S., Kamble, S.S. & Raut, R. (2015). Performance Measurement Using Balance Score Card and its Applications: A Review. *Journal of Supply Chain Management Systems*, 4(3):6-22.

Geissdoerfer, M., Bocken, N.M.P. & Hultink, E.J. (2016). Design thinking to enhance the sustainable business modelling process-A workshop based on a value mapping process. *Journal of Cleaner Production,* 135, 1218-1232.

Geissdoerfer, M., Vladimirova, D. & Evans, S. (2018). Sustainable business model innovation: A review. *Journal of Cleaner Production*, *198*, 401-416.

Geng, R., Mansouri, S.A. & Aktas, E. (2017). The relationship between green supply chain management and performance: A meta-analysis of empirical evidences in Asian emerging economies. *International Journal of Production Economics*, *183*, 245-258.

Gentry, R.J. & Shen, W. (2010). The Relationship between Accounting and Market Measures of Firm Financial Performance: How Strong Is It? *Journal of Managerial Issues,* XXII(4): 514-530.

Gherghina, S.C. & Simionescu, L.N. (2015). Does Entrepreneurship and Corporate Social Responsibility Act as Catalyst towards Firm Performance and Brand Value? *International Journal of Economics and Finance,* 7(4): 23-35.

Giddings, B., Hopwood, B. & O'brien, G. (2002). Environment, economy and society: fitting them together into sustainable development. *Sustainable Development,* 10(4): 187-196.

Girmay, M.E. & Chikobvu, D. (2017). Quantifying South Africa's sulphur dioxide emission efficiency in coal-powered electricity generation by fitting the three-parameter log-logistic distribution. *Journal of Energy in Southern Africa*, *28*(1):91-103.

Global Reporting Initiative (GRI) (2019). Sustainability reporting guidelines. [Online]. Available: https://www.globalreporting.org/Pages/default.aspx. Accessed on 14 June 2019

Global Reporting Initiative (GRI), (2015). G4 Guidelines-Reporting Principles and StandardDisclosures.[Online].Available:https://www.globalreporting.org/resourcelibrary/GRIG4-Part1-Reporting-Principles-and-Standard-Disclosures.pdf. Accessed on 17 November 2019.

Global Reporting Initiative (GRI), 2016. Making the case for SME sustainability reporting. [Online].Available:https://www.globalreporting.org/information/news-and-press-center/Pages/Small-Business,-Big-Impact-Making-the-case-for-SME-Sustainability-Reporting.aspx. [Accessed on 25 December 2017].

Godfrey, L. & Oelofse, S. (2017). Historical review of waste management and recycling in South Africa. *Resources*, *6*(4):1-11.

Godfrey, L. K. & Nahman, A. (2007). Are developing countries ready for first world waste policyinstruments?[Online].Available:http://researchspace.csir.co.za/dspace/handle/10204/846. Accessed on 20 July 2019.

Goi, C. L. (2017). The impact of technological innovation on building a sustainable city. *International Journal of Quality Innovation*, *3*(1):1-18.

Golicic, S.L. & Smith, C.D. (2013). A meta-analysis of environmentally sustainable supply chain management practices and firm performance. *Journal of Supply Chain Management*, 49, 78-95.

Gonenc, H. & Scholtens, B. (2017). Environmental and financial performance of fossil fuel firms: A closer inspection of their interaction. *Ecological Economics*, *132*, 307-328.

Gonenc, H. & Scholtens, B. (2019). Responsibility and performance relationship in the banking industry. *Sustainability*, *11*(12):1-49.

Goodland, R. & Daly, H. (1996). Environmental sustainability: universal and non-negotiable. *Ecological Applications*, *6*(4):1002-1017.

Government Gazette, (2019). Carbon Tax Act 15 of 2019 (English / Afrikaans). [Online]. Available:https://www.gov.za/documents/carbon-tax-act-15-2019-english-afrikaans-23-may-2019-0000. Accessed on 17 November 2019.

Government Gazette, (2019). Carbon Tax Act, 2019. [Online]. Available: https://www.gov.za/sites/default/files/gcis_document/201905/4248323-5act15of2019carbontaxact.pdf. Accessed on 17 July 2019.

Graham, S. & McAdam, R. (2016). The effects of pollution prevention on performance. *International Journal of Operations & Production Management,* 36(10): 1333-1358.

Gray, D.E. (2013). *Doing research in the real world*. Sage.

Greene, W.H. (2011). *Econometric Analysis*, 7th ed., Prentice Hall.

Greenovate, (2012). Guide to resource efficiency in manufacturing. [Online]. Available: https://www.greenovateeurope.eu/sites/default/files/publications/REMake_Greenovate!Europe%20%20Guide%20to%20resource%20efficient%20manufacturing%20(2012).pdf. Accessed on 23 May 2019.

Greyling, M. (2017). South Africa produces 108 million tons of waste per year. [Online]. Available: https://fourwaysreview.co.za/260625/sa-produces-108-million-tons-of-waste-per-year/. Accessed on 7 May 2018.

Griese, K. M., Werner, K. & Hogg, J. (2017). Avoiding Greenwashing in Event Marketing: An Exploration of Concepts, Literature and Methods. *Journal of Management and Sustainability*, 7(1):1-15.

Groenewald, D. & Powell, J. (2016). ‘Relationship between sustainable development initiatives and improved company financial performance: A South African perspective. *Acta Commercii,* 16(1):1-14.

Gurría, A. (2017). Putting water at the centre of the global agenda. *Lecture at the Centre for Foreign relations, New York City*, *24*.

Guthrie, J., Cuganesan, S. & Ward, L. (2007). Legitimacy theory: A story of reporting social and environmental matters within the Australian food and beverage industry. In *Asia Pacific Interdisciplinary Research in Accounting Conference (5th: 2007)* (pp. 1-35). APIRA 2007 Organising Committee.

Gutowski, T. G., Sahni, S., Allwood, J. M., Ashby, M. F. & Worrell, E. (2013). The energy required to produce materials: constraints on energy-intensity improvements, parameters of demand. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, *371*(1986): 21-33.

Gyo Lee, Y., Garza-Gomez, X. & Lee, R. M. (2018). Ultimate Costs of the Disaster: Seven Years After the Deepwater Horizon Oil Spill. *Journal of Corporate Accounting & Finance*, 29(1): 69-79.

Haanaes, K. (2016). Why all businesses should embrace sustainability. [Online]. Available: https://www.imd.org/research-knowledge/articles/why-all-businesses-should-embrace-sustainability/. Accessed on 25 February 2019.

Haber, J. & Schryver, C. (2019). How to Create Key Performance Indicators? *The CPA Journal*, *89*(4): 24-30.

Hack, N.B. (2017). Improving Stakeholder Engagement Increases Productivity, Profit and Sustainability. [Online]. Available: https://www.huffpost.com/entry/stakeholder-engagement_b_1556070. Accessed on 10 May 2019.

Hagberg, C., Johansson, S. & Karlsson, A. (2015). The relationship between CSR and financial performance: A quantitative study examining Swedish publicly traded companies. Bachelors Thesis, Linnaeus University.

Hagel, J., Brown, J.S., Samoylova, T., Lui, M., Damani, A. & Grames, C. (2013). Success or struggle: ROA as a true measure of business performance. [Online]. Available: https://www2.deloitte.com/content/dam/insights/us/articles/success-or-struggle-roa-as-a-true-measure-of-business-performance/DUP505_ROA_vFINAL2.pdf. Accessed on 18 November 2019.

Haleem, F., Farooq, S., Boer, H. & Gimenez, C. (2015). The moderating role of stakeholder pressure in the relationship between CSR practices and financial performance in a globalizing world. In Proceedings of the 22nd International EurOMA Conference on Operations Management for Sustainable Competitiveness (Vol. 22). Neuchâtel, Switzerland: The European Operations Management Association.

Hallam, C.R.A. & Contreras, C. (2016). The Interrelation of Lean and Green Manufacturing Practices:A Case of Push or Pull in Implementation. 2016 Proceedings of PICMET '16: Technology Management for Social Innovation.

Hameed, D. & Waris, I. (2018). Eco labels and eco conscious consumer behavior: The mediating effect of green trust and environmental concern. *Journal of Management Sciences,* 5(2):86-105.

Hameed, I., Siddiqui, S. J. & Husain, J. (2016). Conceptualizing humor in advertising: The moderating role of self-monitoring. *Pakistan Business Review,* 18(3): 692-709.

Haninun, H., Lindrianasari, L. & Denziana, A. (2018). The effect of environmental performance and disclosure on financial performance. *International Journal of Trade and Global Markets*, *11*(1-2): 138-148.

Harrison, J. S. & Wicks, A. C. (2013). Stakeholder theory, value, and firm performance. *Business Ethics Quarterly*, 23(1): 97-124.

Harrison, J. S., Freeman, R. E. & Abreu, M.C.S.D. (2015). Stakeholder theory as an ethical approach to effective management: Applying the theory to multiple contexts. *Revista brasileira de gestão de negócios*, *17*(55): 858-869.

Hassett, M.E. & Paavilainen-Mäntymäki, E. (2013). Handbook of longitudinal research methods in organisations and business studies. Cheltenham: Edward Elgar.

Hatakeda, T., Kokubu, K., Kajiwara, T. & Nishitani, K. (2012). Factors influencing corporate environmental protection activities for greenhouse gas emission reductions: The relationship between environmental and financial performance. *Environmental and Resource Economics*, *53*(4): 455-481.

He, W. & Shen, R. (2017). ISO 14001 certification and corporate technological innovation: Evidence from Chinese firms. *Journal of Business Ethics*, 4(6):1-21.

He, W., Liu, C., Lu, J. & Cao, J. (2015). Impacts of ISO 14001 adoption on firm performance: Evidence from China. *China Economic Review*, 32, 43-56.

He, X., Chakrabarty, S. & Eden, L. (2016). The global emergence of Chinese multinationals: A resource-based view of ownership and performance. *Asian Business & Management*, *15*(1): 1-31.

Heflin, F. & Wallace, D. (2017). The BP oil spill: shareholder wealth effects and environmental disclosures. *Journal of Business Finance & Accounting*, *44*(3-4): 337-374.

Henri, J. F., Boiral, O. & Roy, M. J. (2016). Strategic cost management and performance: The case of environmental costs. *The British Accounting Review*, *48*(2): 269-282.

Henriques, J. & Catarino, J. (2016). Motivating towards energy efficiency in small and medium enterprises. *Journal of Cleaner Production*, *139*, 42-50.

Herciu, M. & Șerban, R.A. (2018). Measuring Firm Performance: Testing a Proposed Model. *Studies in Business and Economics*, *13*(2): 103-114.

Heymans, A. & Santana, L. (2018). How efficient is the Johannesburg Stock Exchange really? *South African Journal of Economic and Management Sciences*, *21*(1): 1-14.

Higgs, C. (2015). Small businesses, big impact: Environmental responsibility and the small business sector. [Online]. Available: http://alive2green.com/small-business-big-impact-environmental-responsibility-small-business-sector/. [Accessed on 20 December 2017].

Hillary, R. & Burr, P. (2011). Evidence-based Study into the Benefits of EMSs for SMEs. DEFRA, London. [Online]. Available: http://www. defra. gov. uk. Accessed on 12 September 2019.

Hong, P., Kwon, H.B. & Roh, J.J. (2009). Implementation of strategic green orientation in supply chain. *European Journal of Innovation Management*, 12(4):512-532.

Hornibrook, S., May, C. & Fearne, A. (2015). Sustainable development and the consumer: Exploring the role of carbon labelling in retail supply chains. *Business Strategy and the Environment,* 24(4):266–276.

Horváthová, E. (2016). Environmental policy and firm financial performance. Doctoral dissertation, Charles University in Prague.

Horváthová, E. (2016). The impact of environmental performance on firm performance: Short-term costs and long-term benefits? *Ecological Economics*, *84*, 91-97.

Hsu, C.C., Tan, K.C. & Mohamad Z.S.H. (2016). Strategic orientations, sustainable supply chain initiatives, and reverse logistics: Empirical evidence from an emerging market. *International Journal of Operations & Production Management*, 36(1): 86-110.

Hsu, C.C., Tan, K.C. & Mohamad Zailani, S.H. (2016). Strategic orientations, sustainable supply chain initiatives, and reverse logistics: Empirical evidence from an emerging market. *International Journal of Operations & Production Management*, *36*(1):86-110.

Hussain, N., Rigoni, U. & Cavezzali, E. (2018). Does it pay to be sustainable? Looking inside the black box of the relationship between sustainability performance and financial performance. *Corporate Social Responsibility and Environmental Management,* 25(6):1198-1211.

Hussain, S. T., Lei, S., Akram, T., Haider, M. J., Hussain, S. H. & Ali, M. (2018). Kurt Lewin's change model: A critical review of the role of leadership and employee involvement in organizational change. *Journal of Innovation & Knowledge*, *3*(3): 123-127.

Huxster, J. K., Uribe-Zarain, X. & Kempton, W. (2015). Undergraduate understanding of climate change: the influences of college major and environmental group membership on survey knowledge scores. *The Journal of Environmental Education*, *46*(3):149-165.

Ilaboya, O. J. & Ohiokha, I. F. (2016). Firm Age, Size and Profitability Dynamics: A Test of Learning by Doing and Structural Inertia Hypotheses. *Business and Management Research*, *5*(1):29-39.

Indo-German Expert Group, (2014). Decoupling economic growth from resource consumption: a transformation strategy with manifold socio-economic benefits for India and German. [Online]. Available: https://www.giz.de/de/downloads/giz2014-en-IGEG_2_decoupling-econimic-growth.pdf. Accessed on 12 June 2019.

International Energy Agency (IEA), (2014). World Energy Outlook 2014. [Online]. Available: https://www.iea.org/newsroom/news/2014/november/world-energy-outlook-2014.html. Accessed on 18 November 2019.

International Energy Agency (IEA), (2015). Accelerating energy efficiency in Small andMediumsizedEnterprises.[Online].Available:https://www.iea.org/publications/freepublications/publication/SME_2015.pdf. [Accessed on 28 December 2017].

International Energy Agency, (2019). Shaping a secure and sustainable energy future. [Online]. Available: https://www.iea.org/. Accessed on 14 July 2019.

International Resource Panel (IRP), (2017). Resource efficiency: Potential and economic implications. A report of the International Resource Panel. United Nations Environment Programme. Nairobi, Kenya.

International Resource Panel, (2018). Resource efficiency for sustainable development: key messages for the group of 20. [Online]. Available: http://www.resourcepanel.org/sites/default/files/documents/document/media/think piece_-_resource_efficiency_-_key_messages_for_the_g20_270818.pdf. Accessed on 23 May 2019.

International Resource Panel, (2019). Global resources outlook. [Online]. Available: https://www.resourcepanel.org. Accessed on 17 November 2019.

Ioppolo, G., Cucurachi, S., Salomone, R., Saija, G. & Shi, L. (2016). Sustainable local development and environmental governance: A strategic planning experience. *Sustainability*, *8*(2):1-16.

Iqbal, Q., Hassan, S.H., Akhtar, S. & Khan, S. (2018). Employee's green behavior for environmental sustainability: a case of banking sector in Pakistan. *World Journal of Science, Technology and Sustainable Development*, *15*(2):118-130.

Iranmanesh, M., Zailani, S., Hyun, S.S., Ali, M.H. & Kim, K. (2019). Impact of Lean Manufacturing Practices on Firms' Sustainable Performance: Lean Culture as a Moderator. *Sustainability*, *11*(4): 1-20.

Issah, M. & Antwi, S. (2017). Role of macroeconomic variables on firms' performance: Evidence from the UK. *Cogent Economics & Finance,* 5(1):1-18.

Jabbour, C.J.C., Maria Da Silva, E., Paiva, E.L. & Santos, F.C.A. (2012). Environmental management in Brazil: is it a completely competitive priority? *Journal of Cleaner Production*, 21,11-22.

Jabbour, C.J.C., Santos, F.C.A. & Nagano, M.S. (2008). Environmental Management System and Human Resource Practices: Is There a Link between Them in Four Brazilian Companies? *Journal of Cleaner Production*, 16, 1922-1925.

Jacobs, B.W., Singhal, V.R. & Subramanian, R. (2010). An empirical investigation of environmental performance and the market value of the firm. *Journal of Operations Management*, *28*(5):430-441.

James, K. (2017). South Africa's water shortage is huge risk to businesses and the economy. [Online]. Available: http://www.capetalk.co.za/articles/240440/south-africa-s-water- shortage-is-huge-risk-to-business-and-the-economy.[Accessed on 18 October 2017].

Jang, Y.J. (2016). Top managers' environmental values, leadership, and stakeholder engagement in promoting environmental sustainability in the restaurant. Doctoral dissertation, Iowa State University.

Jansen, J.J.P., Simsek, Z. & Cao, Q. (2012). Ambidexterity and performance in multi-unit contexts: cross-level moderating effects of structural and resource attributes. *Strategic Management Journal,* 33(11): 1286-1303.

Jansson, J., Nilsson, J., Modig, F. & Hed Vall, G. (2017). Commitment to sustainability in Small and Medium-Sized Enterprises: The influence of strategic orientations and management values. *Business Strategy and the Environment*, *26*(1):69-83.

Janzwood, A. (2017). Carbon Disclosure and Decarbonization:The Case of CDP. [Online].Available:https://www.researchgate.net/publication/322833216_Carbon_Disclosure_and_Global_Decarbonization_The_Case_of_CDP. Accessed on 17 November 2019.

Jayeola, O. (2015). The impact of environmental sustainability practice on the financial performance of SMEs: A study of some selected SMEs in Sussex. *International Journal of Business Management and Economic Research*, *6*(4): 214-230.

Jensen, M. C. & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics,* 3(4): 305-360.

Jerie, S. & Tevera, D. (2014). Solid waste management practices in the informal sector of Gweru, Zimbabwe. *Journal of Waste Management*, 4(3): 1-7.

Jha, M. K. & Rangarajan, K. (2020). Analysis of corporate sustainability performance and corporate financial performance causal linkage in the Indian context. *Asian Journal of Sustainability and Social Responsibility*, *5*(1):1-30.

Jo, H., Kim, H. & Park, K. (2015). Corporate environmental responsibility and firm performance in the financial services sector. *Journal of Business. Ethics*, 131(2): 257-284.

Johannesburg Stock Exchange (2020). The JSE and Sustainability. [Online]. Available: https://www.jse.co.za/about/sustainability. Accessed on 18 July 2020.

Johannesburg Stock Exchange. (2016). Setting a strong enabling framework [Online]. Available: https://www.jse.co.za/about/sustainability/regulator-influencer-advocate. Accessed on 06 June 2019.

Johnson, M. P. & Schaltegger, S. (2016). Two decades of sustainability management tools for Firms: how far have we come? *Journal of Small Business Management*, *54*(2):481-505.

Johnson, M.P. (2015). Sustainability management and Small and Medium-Sized Enterprises: managers' awareness and implementation of innovative tools. *Corporate Social Responsibility and Environmental Management*, *22*(5):271-285.

Jones, P., Wynn, M., Hillier, D. & Comfort, D. (2017). The sustainable development goals and information and communication technologies. *Indonesian Journal of Sustainability Accounting and Management*, *1*(1): 1-15.

Jones, T. M., Harrison, J. S. & Felps, W. (2018). How applying instrumental stakeholder theory can provide sustainable competitive advantage. *Academy of Management Review*, *43*(3): 371-391.

Juan, Z. (2011). R&D for environmental innovation and supportive policy: the implications for new energy automobile industry in China. *Energy Procedia*, *5*, 1003-1007.

Junior, R.M., Best, P.J. & Cotter, J. (2014). Sustainability reporting and assurance: a historical analysis on a world-wide phenomenon. *Journal of Business Ethics*, 120 (1):1-11.

Kahla, C. (2019). Standard Bank to close 91 branches and cut 1 200 jobs. [Online]. Available: https://www.thesouthafrican.com/business-finance/standard-bank-close-branches-cut-jobs/. Accessed on 11 September 2019.

Kammen, D.M. (2015). Peace through grids MIT Technology Review. [Online]. Available: https://www.technologyreview.com/s/536716/peace-through-grids/. Accessed on 2 July 2018.

Kantabutra, S. (2020). Toward an Organizational Theory of Sustainability Vision. *Sustainability*, *12*(3):1-26.

Kaplan, R.S. & Norton, D.P. (1992). The balanced scorecard: measures that drive performance. *Harvard Business Review*, 70(1):71-9.

Karagiorgos, T. (2010). Corporate social responsibility and financial performance: An empirical analysis on Greek companies. *European Research Studies,* 13, 85-108.

Kennon, J. (2017). Return on equity (ROE) and income statement analysis. [Online]. Available: https://www.thebalance.com/return-on-equity-roe-357601. [Accessed on 21 December 2017].

Khan, M., Serafeim, G. & Yoon, A. (2016). Corporate sustainability: First evidence on materiality. *The Accounting Review*, *91*(6):1697-1724.

Khanchanapong, T., Prajogo, D., Sohal, A. S., Cooper, B. K., Yeung, A. C. L. & Cheng, T.C. E. (2014). The unique and complementary effects of manufacturing technologies and lean practices on manufacturing operational performance. *International Journal of Production Economics*, 153, 191–203.

Khandelwal, M., Sharma, A. & Jain, V. (2019). Greenwashing: A study on the effects of greenwashing on consumer perception and trust build-up. *Research Review International Journal of Multidisciplinary,* 4(1):607-612.

Khudhair, A.A., Norwani, N.M., Ahmed, A.A.H.K. & Aljajawy, T.M. (2019). The Relationship between Corporate Social Responsibility and Financial Performance of Iraqi Corporations: A Literature. *Journal of Modern Accounting and Auditing*, 15(1): 28-33.

Kim, J. & and Im, C. (2017). Study on Corporate Social Responsibility (CSR): Focus on Tax Avoidance and Financial Ratio Analysis. *Sustainability*, 9, 1-15.

Kings, S. (2017). 50 000 litres of sewage flow into SA's rivers every second. [Online]. Available: https://mg.co.za/article/2017-07-21-south-africas-shit-has-hit-the-fan. Accessed on 17 November 2019.

Kiron, D., Kruschwitz, N., Haanaes, K., Reeves, M., & Goh, E. (2013). The innovation bottom line. [Online]. Available:http://sloanreview.mit.edu. Accessed on 6 June 2018.

Kiron, D., Unruh, G., Kruschwitz, N., Reeves, M., Rubel, H. & Felde, A.M.Z. (2017). Corporatesustainabilityatacrossroads.[Online].Available:https://sloanreview.mit.edu/projects/corporate-sustainability-at-a-crossroads/. Accessed on 18 December 2017.

Kobuthi, E., K'Obonyo, P. & Ogutu, M. (2018). Corporate Governance and Performance of Firms Listed on the Nairobi Securities Exchange. *International Journal of Scientific Research and Management,* 6(1): 2321-3418.

Kocmanova, A., Hrebicek, J. & Docekalova, M. (2011). Corporate governance and sustainability. *Economics and Management*, 16, 543-550.

Krause, O. (2005). Performance Measurement - Eine Stakeholder-Nutzenorientierte und Geschäft sprozess-basierte Methode. Dissertation, Technische Universität Berlin.

Kurniaty, S., Handayani, S.R. & Rahayu, S.M. (2018). Stock return and financial performance as moderation variable in influence of good corporate governance towards corporate value. *Asian Journal of Accounting Research*, 4(1):18-34.

Kurniawan, R., Zailani, S. H., Iranmanesh, M. & Rajagopal, P. (2017). The effects of vulnerability mitigation strategies on supply chain effectiveness: risk culture as moderator. *Supply Chain Management: An International Journal*, *22*(1): 1-15.

Kurunthachalam, S.K. (2014). Water conservation and sustainability: an utmost importance. *Hydrology: Current Research*, *5*(2):1-3.

Kushwaha, G.S. & Sharma, N.K. (2015). Green initiatives: a step towards sustainable development and firm's performance in the automobile industry. *Journal of Cleaner Production*, 121, 116-129.

Kwamega, M., Li, D. & Abrokwah, E. (2018). Supply chain management practices and agribusiness firms' performance: Mediating role of supply chain integration. *South African Journal of Business Management*, *49*(1): 1-11.

Laari, S., Töyli, J., Solakivi, T. & Ojala, L. (2016). Firm performance and customer-driven green supply chain management. *Journal of Cleaner Production*, 112, 1960-1970.

Laermann, M. (2016). *The Significance of ESG Ratings for Socially Responsible Investment Decisions*. Working paper. [Online]. Available: http//www.ssrn. com/sol3/papers. cfm. Accessed on 17 November 2019.

Lannelongue, G., Gonzalez-Benito, J. & Gonzalez-Benito, O. (2015). Input, output, and environmental management productivity: effects on firm performance. *Business Strategy and the Environment*, *24*(3):145-158.

Lassala, C., Apetrei, A. & Sapena, J. (2017). Sustainability matter and financial performance of companies. *Sustainability*, *9*(9):1-16.

Laughland, P. & Bansal, T. (2011). The top ten reasons why businesses aren't more sustainable. *Ivey Business Journal*, *75*(1): 1-14.

Lavorata, L. (2014). Influence of retailers' commitment to sustainable development on store image, consumer loyalty and consumer boycotts: Proposal for a model using the theory of planned behavior. *Journal of Retailing and Consumer Services*, *21*(6): 1021-1027.

Lazonick, W. (2014). Innovative Enterprise & Shareholder Value. The Academic-Industry Research Network. AIR Working Paper #14-03/01.[Online]. Available:https://www.theairnet.org/files/research/WorkingPapers/Lazonick_InnovativeEnterpriseandShareholderValue_AIR-WP14_0301.pdf. Accessed on 17 July 2019.

Lee K.H, Cin, B.C. & Lee, E.Y. (2016). Environmental responsibility and firm performance: the application of an environmental, social and governance model. *Business Strategy and the Environment*, 26(1): 40-53.

Lee, J., Bhatt, S. & Suri, R. (2018). When consumers penalize not so green products. *Psychology & Marketing,* 35(1): 36-46.

Leenders, M. A. & Chandra, Y. (2013). Antecedents and consequences of green innovation in the wine industry: the role of channel structure. *Technology Analysis & Strategic Management*, *25*(2):203-218.

Leigh, G.R. (2017). Integrated Reporting: The South African Experience. [Online]. Available: https://www.cpajournal.com/2017/07/28/integrated-reporting-south-african-experience/. Accessed on 01 April 2018.

Lewandowski, S. (2017). Corporate carbon and financial performance: The role of emission reductions. *Business Strategy and the Environment*, *26*(8): 1196-1211.

Li, L. (2013). Market-based vs. accounting-based performance of banks in Asian emerging markets. *Asian Journal of Business Research,* 1178(8933):1-12.

Lin, B. & Tan, R. (2016). Ecological total-factor energy efficiency of China's energy intensive industries. *Ecological Indicators*, *70*, 480-497.

Lin, C., Kuei, C.H. & Chai, K.W. (2013). Identifying critical enablers and pathways to high performance supply chain quality management. *International Journal of Operations & Production Management*, *33*(3): 347-370.

Lin, R.J., Tan, K.H. & Geng, Y. (2013). Market demand, green product innovation, and firm performance: evidence from Vietnam motorcycle industry. *Journal of Cleaner Production*, 40, 101-107.

Lindblom, C.K. (1994). The implications of organizational legitimacy for corporate social performance and disclosure. Paper presented at the *Critical Perspectives on Accounting Conference*, New York.

Lingaraja, K., Selvam, M. & Vasanth, V (2015). Long Run Dynamic Linkages between Emerging Stock Markets in Asia and a Developed Stock Market (DJIA). *Research Journal of Applied Sciences*, *10*(5): 203-211.

Linneman, M.H., Hoekstra, A.Y. & Berkhout, W. (2015). Ranking Water Transparency of Dutch Stock-Listed Companies. *Sustainability*, 7, 4341-4359.

Liu, Y., Zhou, X., Yang, J. & Hoepner, A.G. (2017). Corporate Carbon Emissions and Financial Performance: Does Carbon Disclosure Mediate the Relationship in the UK? [Online]. Available: https://ssrn.com/abstract=2941123 or http://dx.doi.org/10.2139/ssrn.2941123 . Accessed on 17 November 2019.

Lo, C.K., Yeung, A.C. & Cheng, T.C.E. (2012). The impact of environmental management systems on financial performance in fashion and textiles industries. *International Journal of Production Economics,* 135(2): 561-567.

Lo, S.M. (2014). Effects of supply chain position on the motivation and practices of firms going green. *International Journal of Operations & Production Management*, 34(1):93-114.

LoBiondo-Wood, G. & Haber, J. (2017). *Nursing research-E-book: methods and critical appraisal for evidence-based practice*. Elsevier Health Sciences.

Lozano, R. (2015). A holistic perspective on corporate sustainability drivers. *Corporate Social Responsibility and Environmental Management*, *22*(1): 32-44.

Lu, W. & Taylor, M. E. (2016). Which factors moderate the relationship between sustainability performance and financial performance? A meta-analysis study. *Journal of International Accounting Research*, *15*(1): 1-15.

Lu, W. & Taylor, M.E. (2015). Which factors moderate the relationship between sustainability performance and financial performance? A meta-analysis study. *Journal of International Accounting Research*, 15(1): 1-15.

Lucas, M.T. & Noordewier, T.G. (2016). Environmental management practices and firm financial performance: The moderating effect of industry pollution-related factors. *International Journal of Production Economics*, *175*, 24-34.

Lundgren, T., Marklund, P.O. & Zhang, S.S. (2016). Industrial energy demand and energy efficiency – Evidence from Sweden. *Resource and Energy Economics,* 43, 130-152.

MacLean, T., Litzky, B.E. & Holderness, D.K. (2015). When organizations don't walk their talk: A cross-level examination of how decoupling formal ethics programs affects organizational members. *Journal of Business Ethics*, 128(2): 351-368.

Maditinos, D., Sevic, Z. & Theriou, N. (2006). A Review of the Empirical Literature on Earnings and Economic Value Added (EVA) in Explaining Stock Market Returns. Which Performance Measure is More Value Relevant in the Athens Stock Exchange (ASE)? In Annual Conference of the Hellenic Finance and Accounting Association Thessaloniki (pp. 15-16).

Madugba, J.U. & Okafor, M.C. (2016). Impact of Corporate Social Responsibility on Financial Performance: Evidence from Listed Banks in Nigeria. *Expert Journal of Finance*, 4, 1-9.

Maher, M. & Anderson, T. (2000). Corporate governance: Effects on firm performance and economic growth. The Tilburg University Law and Economics Conference on "Convergence and Diversity in Corporate Governance Regimes and Capital Markets", Eindhoven, the Netherlands, 4-5 November 1999.

Maleka, T., Nyirenda, G. & Fakoya, M. (2017). The Relationship between Waste Management Expenditure and Waste Reduction Targets on Selected JSE Companies. *Sustainability*, *9*(9):1-20.

Mann, D. (2014). Creating a Lean Culture: Tools to Sustain Lean Conversions; Productivity Press: New York, NY, USA.

Manrique, S. & Martí-Ballester, C.P. (2017). Analyzing the Effect of Corporate Environmental Performance on Corporate Financial Performance in Developed and Developing Countries. *Sustainability,* 9, 1-30.

Mansell, S. (2013). Capitalism, Corporations and the Social Contract: A Critique of Stakeholder Theory. Cambridge: Cambridge University Press.

Mans-Kemp, N. (2014). Corporate governance and the financial performance of selected Johannesburg Stock Exchange industries. Doctoral dissertation, Stellenbosch University.

Marashdeh, Z.M.S. (2014). *The effect of corporate governance on firm performance in Jordan.* Doctoral dissertation, University of Central Lancashire.

Marques, F., Sérgio Miranda Mendonça, P. & José Chiappetta Jabbour, C. (2010). Social dimension of sustainability in retail: case studies of small and medium Brazilian supermarkets. *Social Responsibility Journal*, *6*(2): 237-251.

Martí-Ballester, C.P. (2017). Sustainable energy systems and company performance: Does the implementation of sustainable energy systems improve companies' financial performance? *Journal of Cleaner Production*, *162*, S35-S50.

Martín-de Castro, G., Amores-Salvadó, J. & Navas-López, J.E. (2016). Environmental management systems and firm performance: improving firm environmental policy through stakeholder engagement. *Corporate Social Responsibility and Environmental Management*, *23*(4): 243-256.

Masa'deh, R., Tayeh, M., Al-Jarrah, I.M. & Tarhini, A. (2015). Accounting vs. Market-based Measures of Firm Performance Related to Information Technology Investments. *International Review of Social Sciences and Humanities,* 9(1):129-145.

Masocha, R. & Fatoki, O. (2018). The impact of coercive pressures on sustainability practices of small businesses in South Africa. *Sustainability,* 10(9):1-14.

Mazzi, A., Toniolo, S., Manzardo, A., Ren, J. & Scipioni, A. (2016). Exploring the direction on the environmental and business performance relationship at the firm level. Lessons from a literature review. *Sustainability*, *8*(11):1-25.

Mbasera, M., Du Plessis, E., Saayman, M. & Kruger, M. (2016). Environmentally-friendly practices in hotels. *Acta Commercii*, *16*(1): 1-8.

McEachern, M. G., Middleton, D. & Cassidy, T. (2020). Encouraging sustainable behaviour change via a social practice approach: a focus on apparel consumption practices. *Journal of Consumer Policy*, 43, 397-418.

McGinn, D. (2009). The greenest big companies in America. *Newsweek,* 154(13): 34-54.

Mchunu (2019). Steinhoff shares tumble on negative financials. [Online]. Available: https://www.iol.co.za/business-report/companies/steinhoff-shares-tumble-on-negative-financials-22971265. Accessed on 10 May 2019.

Mckinsey & Company (2019). The business opportunity in water conservation. [Online]. Available: https://www.mckinsey.com/business-functions/sustainability/our-insights/the-business-opportunity-in-water-conservation# . Accessed on 05 September 2019.

Meixell, M. J., Luoma, P. & Saenz, M. J. (2015). Stakeholder pressure in sustainable supply chain management: a systematic review. *International Journal of Physical Distribution & Logistics Management,* 45(1):69-89.

Menarndt, A. & Menard, L. (2018). Evaluating the environmental impacts of Trump's presidency. [Online]. Available: https://psmag.com/environment/trumps-impact-on-the-environment. Accessed on 25 February 2019.

Mendoza, J.M.F., Sanyé-Mengual, E., Angrill, S., García-Lozano, R., Feijoo, G., Josa, A. & Rieradevall, J. (2015). Development of urban solar infrastructure to support low-carbon mobility. *Energy Policy*, *85*, 102-114.

Mendoza, J.M.F., Sharmina, M., Gallego-Schmid, A., Heyes, G. & Azapagic, A. (2017). Integrating backcasting and eco-design for the circular economy: The BECE framework. *Journal of Industrial Ecology*, *21*(3): 526-544.

Mensah, I. (2014). Different shades of green: Environmental management in hotels in Accra. *International Journal of Tourism Research*, *16*(5):450-461.

Mhlanga, T. (2018). South Africans are drowning in e-waste.[Online]. Available: https://mg.co.za/article/2018-03-16-00-south-africans-are-drowning-in-e-waste. Accessed on 20 June 2018.

Mihai, F. C. & Ingrao, C. (2018). Assessment of biowaste losses through unsound waste management practices in rural areas and the role of home composting. *Journal of Cleaner Production*, *172*, 1631-1638.

Miles, S. (2012). Stakeholder: Essentially Contested or Just Confused? *Journal of Business Ethics,* 108(3):285-298.

Milios, L. (2016). Policies for Resource Efficient and Effective Solutions: A review of concepts, current policy landscape and future policy considerations for the transition to a Circular Economy, Lundi University.

Milkias, A., Tadesse, T. & Zeleke, H. (2018). Evaluating the effects of in-situ rainwater harvesting techniques on soil moisture conservation and grain yield of maize (Zea mays L.) in Fedis district, Eastern Hararghe, Ethiopia. Turkish Journal of Agriculture-Food Science and Technology, 6(9): 1129-1133.

Miralles-Quirós, M.M., Miralles-Quirós, J.L. & Gonçalves, L.MV. (2018). The Value Relevance of Environmental, Social, and Governance Performance: The Brazilian Case. *Sustainability,* 10, 1-15.

Miroshnychenko, I., Barontini, R. & Testa, F. (2017). Green practices and financial performance: A global outlook. *Journal of Cleaner Production,* 147, 340-351.

Misani, N. & Pogutz, S. (2015). Unraveling the effects of environmental outcomes and processes on financial performance: A non-linear approach. *Ecological Economics*, *109*, 150-160.

Mnguni, A. & Tucker, C. (2012). Energy Efficient Buildings in South Africa. [Online]. Availableat:http://www.bowman.co.za/FileBrowser/ArticleDocuments/EnergyEfficientBuildings-in-South-Africa.pdf. Accessed 21 June 2018.

Mohiuddin, M. (2014). Natural environment as stakeholder and sustainability. *International Journal of Sustainable Society,* 6(2):1-15.

Montabon, F., Sroufe, R. & Narasimhan, R (2007). An examination of corporate reporting, environmental management practices and firm performance. *Journal of Operations Management*, 25, 998-1014.

Moreira F., Alves A.C. & Sousa, R.M. (2010) Towards Eco-efficient Lean Production Systems. In: Ortiz Á., Franco R.D., Gasquet P.G. (eds) Balanced Automation

Systems for Future Manufacturing Networks. BASYS 2010. IFIP Advances in Information and Communication Technology, vol 322. Springer, Berlin, Heidelberg.

Morrow, V., Boddy, J. & Lamb, R. (2014). The ethics of secondary data analysis. [Online]. Available:http://eprints.ncrm.ac.uk/3301/1/NOVELLA_NCRM_ethics_of_secondary_analysis.pdf. Accessed on 19 November 2019.

Mousa, G. & Hassan, N. T. (2015). Legitimacy theory and environmental practices: Short notes. *International Journal of Business and Statistical Analysis*, *2*(1):41-53.

Mugambiwa, S. S. & Dzomonda, O. (2018). Climate change and vulnerability discourse by students at a South African university. *Jàmbá: Journal of Disaster Risk Studies*, *10*(1): 1-6.

Muhammad, N., Scrimgeour, F., Reddy, K. & Abidin, S. (2015). The relationship between environmental performance and financial performance in periods of growth and contraction: Evidence from Australian publicly listed companies. *Journal of Cleaner Production*, *102*, 324-332.

Müller, L. (2016). Corporate Social Responsibility and its effect on stock price. Masters thesis, Jonkoping University.

Mullins, M.A. (2014). Stock Market Prices: Determinants and Consequences. PhD theses. London School of Economics.

Munoz, E., Zhao, L. & Yang, D.C. (2017). Issues in Sustainability Accounting Reporting. *Accounting and Finance Research*, 6(3): 64-71.

Muposhi, A. & Dhurup, M. (2016). The influence of green atmospherics on store image, store loyalty and green purchase behaviour. In: Proceedings of the 28th Annual Conference of the Southern African Institute of Management Scientists. Management Dynamics : Journal of the Southern African Institute for Management Scientists.

Muralidharan, E. & Pathak, S. (2018). Sustainability, transformational leadership, and social entrepreneurship. *Sustainability*, *10*(2):1-22.

Murphy, C.J. (2002). The profitable correlation between environmental and financial performance: a review of the research. Light Green Advisors. [Online]. Available: http://www.lightgreen.com/pc.pdf. Accessed on 11 September 2019.

Murphy, M. (2016). Population definitions for comparative surveys in education. Available: https://research.acer.edu.au/cgi/viewcontent.cgi?article=1022&context=ar_misc. Accessed on 01 May 2019.

Murphy, P.E. & Price, G.G. (2005). Tourism and sustainable development. *Global tourism*, *3*, 167-193.

Myeza, Z. (2017). The effects of waste management on profitability in a flexible packaging company. Masters Thesis, University of the Witwatersrand, Johannesburg.

Naila, D. L. (2012). The effect of environmental regulations on financial performance in Tanzania: A survey of manufacturing companies quoted on the Dar Es Salaam Stock Exchange. *International Journal of Economics and Financial Issues*, 3(1): 99-112.

Ndlendle, S. (2017). JSE listed firms characterise SA economy – CCRED. [Online]. Available: https://www.iol.co.za/business-report/jse-listed-firms-characterise-sa-economy-ccred-10592760. Accessed on 24 May 2019.

Neeveditah, P. M., Karishma, A. & Devi, R. N. (2017). Environmental Management Systems and Financial Performance: The Case of Listed Companies in Mauritius. *Theoretical Economics Letters*, *7*(7): 2054-2069.

Nekmahmud, M. & Fekete-Farkas, M. (2020). Why Not Green Marketing? Determinates of Consumers' Intention to Green Purchase Decision in a New Developing Nation. *Sustainability*, *12*(19):1-31.

Nguyen, T. (2016). Small and medium-sized enterprises and sustainable development: The case of Vietnam, Doctor of Philosophy (PhD), Management, RMIT University.

Nugraha, I.P., Rarasati, A.D. & Adiwijaya, A.J.S. (2019). Analysis of Stakeholder Engagement in the Regional Water Supply System of Jatigede Project: A Study of

Actor-Network Theory. In *Journal of International Conference Proceedings* (Vol. 2, No. 1).

Nuryaman, A.R. (2013). The effect of corporate social responsibility activities on profitability and stock prices. *Journal of Global Management,* 6(1): 113-124.

Nyirenda, G. (2014). Environmental management practices and firm performance in a South African mining firm. Masters, Dissertation, University of Limpopo.

Nyirenda, G., Ngwakwe, C. & Ambe, C.M. (2014). Environmental management practices and firm performance in a South African mining firm. *Managing Global Transitions,* 11(3):243-260.

O'Riordan, L. & Fairbrass, J. (2014). Managing CSR stakeholder engagement: A new conceptual framework. *Journal of Business Ethics*, *125*(1):121-145.

Ochiri, G., Wario, G., Odhiambo, R. & Arasa, R. (2015). Effects of waste reduction strategy on firm performance: a survey of publishing firms in Kenya. *International Journal of Economics, Commerce and Management,* 3(5):1228-1241.

Okatan, K. & Alankuş, O. B. (2017). Effect of organizational culture on internal innovation capacity. *Journal of Organisational Studies and Innovation, 4*(3):18-50.

Okuboyejo, S.B. (2013). Environmental sustainability orientation of small and medium sized businesses in South Africa. Dissertation, university of Pretoria.

Olley, J.E., Jgose, J.I., Rudin, V. & Alabaster, G. (2014). Developing a common framework for integrated Solid Waste Management advances in Managua, Nicaragua. *Waste Management and Research*, 32(9): 822-833.

Ong, T., Teh, B. & Ang, Y. (2014). The Impact of Environmental Improvements on the Financial Performance of Leading Companies Listed in Bursa Malaysia. *International Journal of Trade, Economics and Finance,* 5(5):386-391.

Organisation for Economic Co-operation and Development, (2017). OECD work on Environment. [Online]. Available: http://www.oecd.org/environment/OECD-work-on-environment-2017-2018.pdf. Accessed on 17 May 2019.

Ortolano, L., Sanchez-Triana, E., Afzal, J., Ali, C. L. & Rebellón, S. A. (2014). Cleaner production in Pakistan's leather and textile sectors. *Journal of Cleaner Production*, *68*, 121-129.

Orts, E. & Strudler, A. (2002). The ethical and environmental limits of Stakeholder Theory. *Business Ethics Quarterly,* 12(2): 215-233.

Orzan, G., Cruceru, A., Bălăceanu, C. & Chivu, R. G. (2018). Consumers' Behavior Concerning Sustainable Packaging: An Exploratory Study on Romanian Consumers. *Sustainability*, *10*(6): 1-11.

Osazefua, I.J. (2019). Operational efficiency and financial sustainability of listed manufacturing companies in Nigeria. *Journal of Accounting and Taxation,* 11(1): 17-31.

Owusu, P. A. & Asumadu-Sarkodie, S. (2016). A review of renewable energy sources, sustainability issues and climate change mitigation. *Cogent Engineering*, *3*(1):16-33.

Palladino, L.M. (2019). Ending Shareholder Primacy in Corporate Governance. https://rooseveltinstitute.org/wpcontent/uploads/2019/02/RI_EndingShareholderPrimacy_workingpaper_201902.pdf. Accessed on 17 July 2019.

Palma-Mendoza, J.A., Neailey, K. & Roy, R. (2014) 'Business process re-design methodology to support supply chain integration. *International Journal of Information Management,* 34(1):167-176.

Pampanelli, A. B., Found, P. & Bernardes, A. M. (2014). A Lean & Green Model for a production cell. *Journal of Cleaner Production,* 85, 19-30.

Pandian, T. M. & Narendran, M. (2015). Impact of financial performance indicators (FPIs) on profitability. *International Journal of Current Research,* 7(01):12141-12149.

Parida, S. & Wang, Z. (2018). Financial crisis and corporate social responsible mutual fund flows. *International Journal of Financial Studies*, *6*(1):1-19.

Park, B.I. & Ghauri, P.N. (2015). Determinants influencing CSR practices in small and medium sized MNE subsidiaries: A stakeholder perspective. *Journal of World Business*, *50*(1):192-204.

Park, H.M. (2011). Practical guides to panel data modelling: A step by step analysis using Stata. [Online]. Available: http://www.iuj.ac.jp/faculty/kucc625/method/panel/panel_iuj.pdf. Accessed on 22 May 2019.

Patino, C. M. & Ferreira, J. C. (2018). Inclusion and exclusion criteria in research studies: definitions and why they matter. *Jornal Brasileiro de Pneumologia*, *44*(2): 84-84.

Patten, M. L. & Newhart, M. (2017). *Understanding research methods: An overview of the essentials*. Routledge.

Pauliuk, S., Wang, T. & Müller, D. B. (2011). Moving toward the circular economy: The role of stocks in the Chinese steel cycle. *Environmental science & Technology*, *46*(1): 148-154.

Pavlinović, S. (2013). Motives for Voluntary Environmental Investments. In *The 2nd Virtual International Conference in Advanced Research in Scientific Areases (ARSA)*. University of Ziline ,2013. 149-152 (ISBN: 978-80-554-0825-5).

Pedace, R. (2013). Econometrics for dummies. Hoboken, NJ: Wiley.

Perez, A. C., Grafton, B., Mohai, P., Hardin, R., Hintzen, K. & Orvis, S. (2015). Evolution of the environmental justice movement: activism, formalization and differentiation. *Environmental Research Letters*, *10*(10):105-115.

Peura, P. (2013). From Malthus to sustainable energy-Theoretical orientations to reforming the energy sector. *Renewable and Sustainable Energy Reviews*, *19*, 309-327.

Pienaar, R. A. & Howard, M. (2014, October). From 50 dump sites to 50 waste disposal facilities-challenges and lessons learnt. In *Proceedings of the 20th WasteCon Conference, Somerset West, Cape Town, South Africa* (pp. 6-10).

Piesse, M. (2016). South Africa: Drought Threatens Food, Energy and Water Security 2016.Availableonline:http://www.futuredirections.org.au/wp-content/uploads/2016/03/South-Africa-Drought-ThreatensFood-Energy-and-Water-Security.pdf (Accessed on 25 April 2018).

Ployhart, R. E. & Vandenberg, R. J. (2010). Longitudinal research: The theory, design, and analysis of change. *Journal of Management,* 36(1): 94-120.

Pons, M., Bikfalvi, A., Llach, J. & Palcic, I. (2013). Exploring the impact of energy efficiency technologies on manufacturing firm performance. *Journal of Cleaner Production*, *52*, 134-144.

Porter, M. E. & Van der Linde, C. (1995). Toward a new conception of the environment-competitiveness relationship. *Journal of Economic Perspectives*, *9*(4): 97-118.

Prieto-Sandoval, V., Alfaro, J. A., Mejía-Villa, A. & Ormazabal, M. (2016). ECO-labels as a multidimensional research topic: Trends and opportunities. *Journal of Cleaner Production*, *135*, 806-818.

Przychodzen, J. & Przychodzen, W. (2015). Relationships between eco-innovation and financial performance–evidence from publicly traded companies in Poland and Hungary. *Journal of Cleaner Production*, *90*, 253-263.

Puri, R. K. & Bharti, V. (2015). Effects of organizational culture on innovation: an empirical investigation in software industries (hypothesis development a review). *International Journal in Management & Social Science*, *3*(2):56-71.

Putz, R. (2017). Exploring U-shaped relationships between Corporate Environmental Management Performance and Corporate Financial Performance (A&C). Masters Dissertation, Radbound University.

Qian, W. (2012). Revisiting the link between environmental performance and financial performance: who cares about private companies? [Online]. Available: https://pdfs.semanticscholar.org/51f0/7cae151f079d5b2271f7066a8a9dca70746d.pdf. Accessed on 08 August 2019.

Qiu, Y., Shaukat, A. & Tharyan, R. (2016). Environmental and social disclosures: Link with corporate financial performance. *The British Accounting Review,* 48(1): 102-116.

Rahman, A.A., Ismail, N.A. & Ariffin, Z.Z. (2016). From Green to Lean: Firms' Waste Management Practices and Their Impacts on Business Performance. *Journal of Social Sciences & Humanities,* 24 (S): 29-46.

Raj, A. (2015). The relation between corporate water risk, water accounting and financial performance of metal mining firms. Masters dissertation, University of Waterloo, Canada.

Raj, J.R. & Seetharaman, A. (2013). Role of Waste and Performance Management in the Construction Industry. *Journal of Environmental Science and Technology,* 6, 119-129.

Rajala, R., Westerlund, M. & Lampikoski, T. (2016). Environmental sustainability in industrial manufacturing: re-examining the greening of Interface's business model. *Journal of Cleaner Production*, *115*, 52-61.

Ramakrishnan, D. (2008). Financial Performance and Stakeholder Management. [Online].Available:https://www.researchgate.net/publication/228320865_Financial_Performance_and_Stakeholder_Management. Accessed on 17 May 2019.

Raza, S. A., Farooq, M.S. & Khan, N. (2011). Firm and industry effects on firm profitability: an empirical analysis of KSE. *Forthcoming in: International Research Journal of Finance and Economics,* 36, 1-5.

Reddy, K. & Gordon, L. (2010). The effect of sustainability reporting on financial performance: An empirical study using listed companies. *Journal of Asia Entrepreneurship and Sustainability,* VI(2):19-42.

Reisig, M.D. & Bain, S.N. (2016). University legitimacy and student compliance with academic dishonesty codes: A partial test of the process-based model of self-regulation. *Criminal Justice and Behavior*, *43*(1): 83-101.

Republic of South Africa. Environment Conservation Act 73 of 1989. Government Gazette No. 11927, Notice No. 1188. 1989. [Online]. Available:https://www.environment.gov.za/sites/default/files/legislations/environment_conservation_act73of1989.pdf. Accessed on 20 July 2019.

Republic of South Africa. National Environmental Management: Waste Act 59 of 2008. Government Gazette No. 32000, Notice No. 278. 2009. [Online]. Available: https://www.environment.gov.za/sites/default/files/legislations/nema_amendment_act59.pdf. Accessed on 20 July 2019.

Rexhäuser, S. & Rammer, C. (2014). Environmental innovations and firm profitability: unmasking the Porter hypothesis. *Environmental and Resource Economics*, *57*(1): 145-167.

Riaz, H., Saeed, A., Baloch, M.S. & Khan, Z.A. (2019). Valuation of Environmental Management Standard ISO 14001: Evidence from an Emerging Market. *Journal of Risk and Financial Management*, *12*(1):1-14.

Richards, T. (2018). Government warns SA will run out of water by 2030. [Online]. Available: https://www.msn.com/en-za/weather/topstories/government-warns-sa-will-run-out-of-water-by-2030/ar-BBMTeQ8?li=BBqg6Q6&ocid=wispr. Accessed on 23 September 2018.

Riillo, C. A. F. (2017). Beyond the question "Does it pay to be green?": How much green? and when? *Journal of Cleaner Production*, *141*, 626-640.

Rishi, M., Jauhari, V. & Joshi, G. (2015). Marketing sustainability in the luxury lodging industry: a thematic analysis of preferences amongst the Indian transition generation. *Journal of Consumer Marketing,* 32(5): 376-391.

Robaina, M. & Madaleno, M. (2020). The relationship between emissions reduction and financial performance: Are Portuguese companies in a sustainable development path? *Corporate Social Responsibility and Environmental Management*, *27*(3): 1213-1226.

Roca, L.C. & Searcy, C. (2012). An analysis of indicators disclosed in corporate sustainability reports. *Journal of Cleaner Production,* 20(1): 103-108.

Rodgers, W., Choy, H. L. & Guiral, A. (2013). Do investors value a firm's commitment to social activities? *Journal of Business Ethics,* 114, 607-623.

Rodrigo, P., Duran, I. J. & Arenas, D. (2016). Does it really pay to be good, everywhere? A first step to understand the corporate social and financial performance link in Latin American controversial industries. *Business Ethics: A European Review,* 25(3): 286-309.

Rodrigo, S. (2015). Modern methods of packaging reduce the amount of waste that society produces. [Online]. Available: https://writepass.com/journal/2015/01/modern-methods-of-packaging-reduce-the-amount-of-waste-that-society-produces/. Accessed on 27 June 2018.

Roka, Y. B. (2017). Plagiarism: Types, Causes and How to Avoid This Worldwide Problem. *Nepal Journal of Neuroscience*, *14*(3): 2-6.

Rokhmawati, A. & Gunardi, A. (2017). Is going green good for profit? Empirical evidence from listed manufacturing firms in Indonesia. *International Journal of Energy Economics and Policy*, 7(4):181-192.

Rokhmawati, A. (2015). The effect of greenhouse gas emissions on financial performance of listed manufacturing firms in Indonesia. Doctoral thesis, University of Canberra.

Rokhmawati, A., Gunardi, A. & Rossi, M. (2017). How Powerful is Your Customers' Reaction to Carbon Performance? Linking Carbon and Firm Financial Performance. *International Journal of Energy Economics and Policy*, *7*(6): 85-95.

Saari, A. (2017). The benefits of efficient waste management for organizations. Bachelor's Thesis, Aalto University.

Sahu, S. (2014). Energy use patterns and firm performance: Evidence from Indian industries. *Journal of Energy Development*, *40*, 111-133.

Salvarli, H. & Salvarli, M. S. (2017). Trends on energy policy and sustainable development in Turkey. *Energy Sources, Part B: Economics, Planning, and Policy*, *12*(6): 512-518.

Salvioni, D. M., Gennari, F. & Bosetti, L. (2016). Sustainability and convergence: the future of corporate governance systems? *Sustainability*, *8*(11):1-25.

Samiloglu, F., Oztop, A. O. & Kahraman, Y. E. (2017). The Determinants of Firm Financial Performance: Evidence from Istanbul Stock Exchange (BIST). *Journal of Economics and Finance,* 8, 62-67.

Samsonowa, T. (2011). *Industrial research performance management: Key performance indicators in the ICT industry*. Springer Science & Business Media, New York.

Sánchez-Hernández, M. I., Robina-Ramírez, R. & De Clercq, W. (2017). Water Management Reporting in the Agro-Food Sector in South Africa. *Water*, *9*(11): 1-20.

Sánchez-Hernández, M. I., Robina-Ramírez, R., & De Clercq, W. (2017). Water management reporting in the Agro-Food sector in South Africa. *Water*, *9*(11):1-20.

Santos, J.B. & Brito, L.A.L. (2012). Toward a subjective measurement model for firm performance. *BAR-Brazilian Administration Review*, *9*(SPE): 95-117.

Sanyé-Mengual, E., Lozano, R. G., Farreny, R., Oliver-Solà, J., Gasol, C. M. & Rieradevall, J. (2014). Introduction to the eco-design methodology and the role of product carbon footprint. In *Assessment of Carbon Footprint in Different Industrial Sectors, Volume 1* (pp. 1-24). Springer, Singapore. [Online]. Available: https://www.researchgate.net/publication/276266304_Introduction_to_the_Eco-Design_Methodology_and_the_Role_of_Product_Carbon_Footprint. Accessed on 19 August 2019.

Sarango-Lalangui, P., Álvarez-García, J. & del Río-Rama, M. (2018). Sustainable practices in small and medium-sized enterprises in Ecuador. *Sustainability,* 10(6):1-15.

Saunders, M. N. & Lewis, P. (2012). *Doing research in business & management: An essential guide to planning your project*. Pearson. Harlow.

Saunders, M., Lewis, P. & Thornhill, A. (2019). *Research methods for business students. 8th edition. Pearson Education Limited, England.*

Schaltegger S. & Lüdeke-Freund F. (2013). Business Cases for Sustainability. In: Idowu S.O., Capaldi N., Zu L., Gupta A.D. (eds) Encyclopedia of Corporate Social Responsibility. Springer, Berlin, Heidelberg.

Schaltegger, S. & Burritt, R. (2014). Measuring and managing sustainability performance of supply chains: Review and sustainability supply chain management framework. *Supply Chain Management: An International Journal*, *19*(3): 232-241.

Scholtens, B. (2014). Indicators of responsible investing. *Ecological Indicators,* 36, 382-385.

Schreiner, B. (2013). Viewpoint-Why has the South African National Water Act been so difficult to implement. *Water Alternatives*, *6*(2): 239-245.

Scott, R. (2014). *Institutions and organisations: ideas, interests and identities (4th ed.).* London: Sage Publications, Inc.

Sekyi, R. (2011). AKOBEN: Ghana's new initiative for environmental performance rating and disclosure in the mining sector. In *Proceedings Tailings and Mine Waste*.[Online].Available:https://open.library.ubc.ca/cIRcle/collections/59368/items/1.0107731. Accessed on 16 July 2019.

Selvam, M., Gayathri, J., Vasanth, V., Lingaraja, K. & Marxiaoli, S. (2016). Determinants of firm performance: A Subjective Model. *International Journal of Social Science Studies,* 4(7): 90-100.

Seo, S., Ahn, H. K., Jeong, J. & Moon, J. (2016). Consumers' attitude toward sustainable food products: Ingredients vs. Packaging. *Sustainability*, *8*(10):

Sethibe, T. & Steyn, R. (2016). Innovation and organisational performance: A critical review of the instruments used to measure organisational performance. *The*

Southern African Journal of Entrepreneurship and Small Business Management, *8*(1): 1-12.

Shrestha, S., Jha, M.K. & Dahal, K. R. (2019). A Review on Sustainability of Rainwater Harvesting with Especial Reference to Nepal. *International Journal of Multidisciplinary Research and Studies*, 2(02):11-23.

Shurig, S. (2015). Who will fund the renewable solution to the energy crisis? [Online]. Available: https://www.theguardian.com/global-development-professionals-network/2014/jun/05/renewable-energy-electricty-africa-policy. Accessed on 20 June 2018.

Siew, R.Y., Balatbat, M.C. & Carmichael, D.G. (2013). The relationship between sustainability practices and financial performance of construction companies. *Smart and Sustainable Built Environment*, *2*(1):6-27.

Singh, R. (2016). An investigation into the drivers and barriers to energy efficiency within medium and large manufacturing firms operating within the eThekwini municipal area (Doctoral dissertation, University of Pretoria).

Singh, S., Darwish, T. K. & Potočnik, K. (2016). Measuring organizational performance: A case for subjective measures. *British Journal of Management*, *27*(1): 214-224.

Snorrason, S.T. (2012). Asymmetric economic integration: Size characteristics of economies, trade costs and welfare. Heidelberg: Springer-Verlag.

Social Sustainability Policy, (2016). A city for all: Towards a socially just and resilient Sydney.[Online].Available:http://www.cityofsydney.nsw.gov.au/__data/assets/pdf_file/0005/262346/Social-Sustainability-Policy.pdf. [Accessed on 12 February 2018].

Soepardi, A., Pratikto, P., Santoso, P. B., Tama, I. P. & Thollander, P. (2018). Linking of barriers to energy efficiency improvement in Indonesia’s steel industry. *Energies*, *11*(1):1-22.

Solnørdal, M.T. & Foss, L. (2018). Closing the Energy Efficiency Gap—A Systematic Review of Empirical Articles on Drivers to Energy Efficiency in Manufacturing Firms. *Energies*, 11, 1-30.

Song, H., Zhao, C. & Zeng, J. (2017). Can environmental management improve financial performance: An empirical study of A-shares listed companies in China. *Journal of Cleaner Production*, *141*, 1051-1056.

Sorooshian, S. & Ting, K.C. (2018). Reasons for implementing ISO 14001 in Malaysia. *Environmental Quality Management,* 27(4):125-133.

South African Department of Water Affairs (DWA) (2013). National Water Resource Strategy June 2013. 2nd edition. Pretoria: DWA.

South African Institute of Chartered Accountants, (2011). An integrated report is a new requirement for listed companies. [Online]. Available: https://www.saica.co.za/tabid/695/itemid/2344/an-integrated-report-is-a-new-requirement-for-list.aspx. Accessed on 2 July 2018.

Soytas, M. A., Denizel, M. & Usar, D. (2016). Corporate Sustainability: Empirical Evidence of Causality on Financial Performance. [Online]. Available: https://www.researchgate.net/profile/Meltem_Denizel/publication/320676864_Corporate_Sustainability_Empirical_Evidence_of_Causality_on_Financial_Performance/links/59f37388aca272607e291222/Corporate-Sustainability-Empirical-Evidence-of-Causality-on-Financial-Performance.pdf. Accessed on 12 September 2019.

Sridhar, K. & Jones, G. (2013). The three fundamental criticisms of the Triple Bottom Line approach: An empirical study to link sustainability reports in companies based in the Asia-Pacific region and TBL shortcomings. *Asian Journal of Business Ethics*, 2(1): 91-111.

Starik, M. (1995). Should trees have managerial standing? Toward stakeholder status for non-human nature. *Journal of business ethics*, *14*(3): 207-217.

Stout, L. (2012). The Shareholder Primacy Myth. 1st ed. Oakland: Berrett-Koehler Publishers.

Strouhal, J., Gurvits, N., Nikitina-Kalamäe, M. & Startseva, E. (2015). Finding the link between CSR reporting and corporate financial performance: Evidence on Czech and Estonian listed companies. *Central European Business Review*, 4(3): 48-59.

Struwig, F.W. & Stead, G.B. (2013). Research: Planning, designing and reporting. Second edition. Cape Town: Pearson Education.

Strydom, M. & Bradfield, C. (2019). A brief overview of the Carbon Tax Act, which took effect on 1 June 2019. [Online]. Available: https://www.golegal.co.za/allowances-carbon-tax-act-update/. Accessed on 17 July 2019.

Suchman, M.C. (1995). Managing legitimacy: Strategic and institutional approaches. *Academy of Management Review*, *20*(3): 571-610.

Sukholthaman, P. & Sharp, A. (2016). A system dynamics model to evaluate effects of source separation of municipal solid waste management: A case of Bangkok, Thailand. *Waste Management*, *52*, 50-61.

Sun, M., Sun, Y. & Li, C. (2014). Integration of material flow cost accounting and ERP software. In *Science and Information Conference (SAI), 2014* (pp. 87-92). IEEE.

Sustainability Accounting Standards Board (SASB), (2018). Standards Overview. [Online]. Available: https://www.sasb.org/standards-overview/. Accessed on 20 November 2019.

Sutter, J. D. & Berlinger, J. (2015). Final draft of climate deal formally accepted in Paris. CNN. Cable News Network, Turner Broadcasting System. *Inc.: Atlanta, GA, USA*.

Tafirenyika, M. (2019). Harnessing African stock exchanges to promote growth. [Online]. Available: https://www.un.org/africarenewal/magazine/august-2012/harnessing-african-stock-exchanges-promote-growth. Accessed on 10 May 2019.

Taherdoost, H. (2016). Sampling methods in research methodology; How to choose a sampling technique for research. *International Journal of Academic Research in Management,* 5(2):18-27.

Taiwo, O., Otieno, F. & Venter, C. (2008). Towards attaining the Polokwane waste reduction goals-where are we? *Stads-en Streeksbeplanning= Town and Regional Planning*, 53, 25-31.

Tajelawi, O.A. & Garbharran, H.L. (2015). MFCA: an environmental management accounting technique for optimal resource efficiency in production processes. *International Journal of Mechanical and Industrial Engineering*, 9(11):3765-3770.

Tang, M., Walsh, G., Lerner, D., Fitza, M. A. & Li, Q. (2018). Green Innovation, Managerial Concern and Firm Performance: An Empirical Study. *Business Strategy and the Environment*, *27*(1): 39-51.

Taouab, O. & Issor, Z. (2019). Firm Performance: Definition and Measurement Models. *European Scientific Journal,* 15(1):93-106.

Tarziján, J. & Ramirez, C. (2011). Firm, industry and corporation effects revisited: A mixed multilevel analysis for Chilean companies. *Applied Economics Letters*, *18*(1): 95-100.

Tasneem, F., Hamza, S.M. & Basit, A. (2016). The Impact of Environmental Reporting on Firms' Performance. *International Journal of Accounting & Business Management,* 4(2): 275-301.

Teece, D.J. (2017). A capability theory of the firm: an economics and (strategic) management perspective. *New Zealand Economic Papers*, 1-43.

Teegavarapu, S., Summers, J. D. & Mocko, G. M. (2008). Case study method for design research: A justification. In ASME 2008 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference (pp. 495-503). American Society of Mechanical Engineers.

Tempelman, E., B. van der Grinten, B., Mul, E.J. & de Pauw. I. (2015). Nature inspired design handbook: A practical guide towards positive impact products. Delft, the Netherlands: Delft University of Technology.

Testa, F., Iraldo, F., Vaccari, A. & Ferrari, E. (2015). Why eco-labels can be effective marketing tools: Evidence from a study on Italian consumers. *Business Strategy and the Environment,* 24(4): 252-265.

The Constitution of South Africa, (1996). Government gazette. [Online]. Available: https://www.gov.za/sites/default/files/gcis_document/201409/act108of1996s.pdf. Accessed on 17 November 2019.

The United Nations World Water Development Report (2016). Water and jobs. [Online]. Available: http://unesdoc.unesco.org/images/0024/002439/243938e.pdf. Accessed on 20 June 2018.

Thorne, L., Mahoney, L.S. & Manetti, G. (2014). Motivations for issuing standalone CSR reports: A survey of Canadian firms. *Accounting, Auditing & Accountability Journal*, 27(4):686- 714.

Tinavapi, C.T. (2017). Effect of Stock Market development on Long-run Economic Growth-Case of South Africa. Masters dissertation, The Graduate School of Business University of Cape Town.

Tolossa, T. T., Abebe, F. B. & Girma, A. A. (2020). Rainwater harvesting technology practices and implication of climate change characteristics in Eastern Ethiopia. *Cogent Food & Agriculture*, *6*(1):1-11.

Torres-Reyna, O. (2014). Panel Data Analysis Fixed & Random Effects. [Online]. Available: https://www.princeton.edu/~otorres/Panel101.pdf. Accessed on 20 November 2019.

Tortajada, C. & Nambiar, S. (2019). Communications on Technological Innovations: Potable Water Reuse. *Water,* 11(2):1-15.

Tortajada, C. (2016). Nongovernmental organizations and influence on global public policy. *Asia & the Pacific Policy Studies*, *3*(2): 266-274.

Tregidga, H., Milne, M. & Kearins, K. (2006). Organizational legitimacy and social and environmental reporting research: the potential of discourse analysis. In *5th Australasian Conference on Social and Environmental Accounting Research, Wellington*.

Treviño, L.K., den Nieuwenboer, N. A., Kreiner, G.E. & Bishop, D.G. (2014). Legitimating the legitimate: A grounded theory study of legitimacy work among Ethics and Compliance Officers. *Organizational Behavior and Human Decision Processes*, *123*(2): 186-205.

Trianni, A., Cagno, E., Marchesani, F. & Spallina, G. (2017). Classification of drivers for industrial energy efficiency and their effect on the barriers affecting the investment decision-making process. *Energy Efficiency*, *10*(1):199-215.

Trinks, A., Mulder, M. & Scholtens, B. (2020). An efficiency perspective on carbon emissions and financial performance. *Ecological Economics*, *175*, 106632.

Tripathi, D. K, Kaushal, A. & Sharma, V. (2013). Reality of triple bottom line. *Global Journal of Management and Business Studies,* 3, 153-158.

Trumpp, C. & Guenther, T. (2017). Too little or too much? Exploring U-shaped relationships between corporate environmental performance and corporate financial performance. *Business Strategy and the Environment*, *26*(1): 49-68.

Trumpp, C., Endrikat, J., Zopf, C. & Guenther, E. (2015). Definition, conceptualization and measurement of corporate environmental performance: a critical examination of a multidimensional construct. *Journal of Business Ethics*, 126(2): 185-204.

Umobong, A.A. (2015). Assessing the impact of liquidity and profitability on growth of profits in pharmaceutical firms in Nigeria. *European Journal of Accounting, Auditing and Finance Research*, 3(10):97-114.

Unam, J.M. (2012). Materials management for business success: The Case of the Nigerian Bottling Company Plc, *International Journal of Economics and Management Sciences,* 1(7): 50-56.

United Nations Environment Programme (2011). Decoupling natural resource use and environmental impacts from economic growth. [Online]. Available: https://www.environment.gov.za/sites/default/files/docs/decoupling_natural_resourceuse.pdf. Accessed on 17 November 2019.

United Nations Environment Programme (2015). Global Waste Management Outlook. 2015. [Online]. Available:http://www.unep.org/ourplanet/september-2015/unep-publications/global-wastemanagement-outlook. Accessed on 21 June 2018.

United Nations Environmental Programme, (2014). Enforcement of Environmental Law: Good Practices from Africa, Central Asia, ASEAN Countries and China. [Online].Available:https://wedocs.unep.org/bitstream/handle/20.500.11822/9968/enforcement- environmental-laws.pdf?sequence=1&isAllowed=y. Accessed on 16 July 2019.

United Nations Environmental Programme, (2018). Single-use plastics: A road map for sustainability.[Online].Available:https://wedocs.unep.org/bitstream/handle/20.500.11822/25496/singleUsePlastic_sustainability.pdf?isAllowed=y&sequence=1. Accessed on 17 November 2019.

United Nations International Children's Emergency Fund (UNICEF), (2017). Water, Sanitation and Hygiene. [Online]. Available: https://www.unicef.org/wash/. Accessed on 17 November 2019.

United Nations World Water Assessment Programme (2016). The United Nations World Water development report 2016: Water and jobs. Paris: UNESCO. [Online]. Available:http://www.unesco.org/new/en/naturalsciences/environment/water/wwap/wwdr/2016-water-and-jobs/. Accessed on 12 September 2019.

United States Environmental Protection Agency (2019). WaterSense. [Online]. Available: https://www.epa.gov/watersense/statistics-and-facts. Accessed on 05 September 2019.

UN–United Nation. Sustainable Development Goals, United Nations (2015). [Online]. Available: https: //sustainabledevelopment.un.org/?menu=1300. Accessed on 05 September 2019.

US Department of Energy, (2015). Energy efficiency and renewable energy. [Online]. Available:https://www.energy.gov/sites/prod/files/2015/09/f26/A%20Common%20 Definition%20for%20Zero%20Energy%20Buildings.pdf. Accessed on 20 November 2019.

Uwuigbe, U., Teddy, O., Uwuigbe, O.R., Emmanuel, O., Asiriuwa, O., Eyitomi, G.A. & Taiwo, O.S. (2018). Sustainability reporting and firm performance: A bi-directional approach. *Academy of Strategic Management Journal,* 17(3): 1-16.

Vakilifard, H.R. (2011). Decision-making in Financial Issues. Financial Management, Jangal Publication, Tehran.

Valero-Gil, J., Rivera-Torres, P. & Garcés-Ayerbe, C. (2017). How is environmental proactivity accomplished? Drivers and barriers in firms' pro-environmental change process. *Sustainability*, *9*(8):1-15.

Vanalle, R. M., Ganga, G. M. D., Godinho Filho, M. & Lucato, W. C. (2017). Green supply chain management: An investigation of pressures, practices, and performance within the Brazilian automotive supply chain. *Journal of Cleaner Production*, 151, 250-259.

Vanpoucke, E., Vereecke, A. & Wetzels, M. (2014). Developing supplier integration capabilities for sustainable competitive advantage: A dynamic capabilities approach. *Journal of Operations Management,* 32(7-8):446-461.

Vasanth, V., Selvam, M., Lingaraja, K., Miencha, I.O. & Raja, M. (2015). Testing Environmental Kuznets Curve Hypothesis at firm level in India. *Journal of Sustainable Development*, *8*(8):201-212.

Venanzi, D. (2010). Financial performance measures and value creation: a review. [Online].Available:https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1716209. Accessed on 24 May 2019.

Verma, E. (2017). Financial performance - understanding its concepts and importance. [Online].Available:https://www.simplilearn.com/financial-performance-rar21-article. Accessed on 11 October 2017.

Vermeulen, Y., Niemann, W. & Kotzé, T. (2016). Supply chain integration: A qualitative exploration of perspectives from plastic manufacturers in Gauteng. *Journal of Transport and Supply Chain Management,* 10(1):1-13.

Verrier, B., Rose, B., Caillaud, E. & Remita, H. (2014). Combining organizational performance with sustainable development issues: The Lean and Green project benchmarking repository. *Journal of Cleaner Production*, 85, 83–93.

Vij, S. & Bedi, H.S. (2016). Are subjective business performance measures justified? *International Journal of Productivity and Performance Management*, *65*(5): 603-621.

Vijfvinkel, S., Bouman, N. & Hessels, J. (2011). Environmental sustainability and financial performance of Firms. *EIM Research Reports*. [Online]. Available: http://ondernemerschap.panteia.nl/pdf-ez/h201101.pdf. [Accessed on 11 January 2018].

Vinayagamoorthi, V., Selvam, M., Lingaraja, K. & Rajesh, R. (2015). Nexus between Profitability and Environmental Performance of Indian Firms-An Analysis with Granger Causality. *International Journal of Energy Economics and Policy,* 5(2):433-439.

Vinodh, S., Arvind, K.R. & Somanaathan, M. (2011). Tools and techniques for enabling sustainability through lean initiatives. *Clean Technology and Environmental Policy,* 13, 469–479.

Vucetich, J. A. & Nelson, M. P. (2010). Sustainability: virtuous or vulgar? *BioScience*, *60*(7): 539-544.

Wahba, H. (2010). How do institutional shareholders manipulate corporate environmental strategy to protect their equity value? A study of the adoption of ISO 14001 by Egyptian firms. *Business Strategy and the Environment,*19, 495-511.

Wahga, A. I., Blundel, R. & Schaefer, A. (2018). Understanding the drivers of sustainable entrepreneurial practices in Pakistan's leather industry: A multi-level approach. *International Journal of Entrepreneurial Behavior & Research*, *24*(2): 382-407.

Walliman, N. (2017). *Research methods: The basics*. Routledge.

Wang, X. & Wood, L. C. (2016). The Influence of Supply Chain Sustainability Practices on Suppliers. In *Handbook of Research on Global Supply Chain Management* (pp. 531-544).

Warra, L.W. & Oqdeh, S.K. (2018). Do Liquidity and Firm Size Affect Profitability and Does Capital Structure Play a Moderator Role: Study Based on Jordanian Data. *International Research Journal of Finance and Economics,* 170 (2018):27-40.

Weber, O., Koellner, T., Habegger, D., Steffensen, H. & Ohnemus, P. (2008). The relation between the GRI indicators and the financial performance of firms. *Progress in Industrial Ecology-An International Journal*, 5(3): 236–254.

Wei, Z., Shen, H., Zhou, K. Z. & Li, J. J. (2017). How does environmental corporate social responsibility matter in a dysfunctional institutional environment? Evidence from China. *Journal of Business Ethics*, *140*(2): 209-223.

Western Cape Government, (2014). District waste management. [Online]. Available: https://www.westerncape.gov.za/assets/departments/premier/7818-waste-manage-1-sept-17.pdf. Accessed on 17 November 2017.

Whelan, T. & Fink, C. (2016). The Comprehensive Business Case for Sustainability. [Online]. Available: http://everestenergy.nl/new/wp-content/uploads/HBR-Article-The-comprehensive-business-case-for-sustainability.pdf. Accessed on 1 July 2018.

Whetman, L.L. (2017). The Impact of Sustainability Reporting on Firm Profitability. *Undergraduate Economic Review*, *14*(1): 1-19.

Wijayanto, A., Suhadak, D. M. & Nuzula, N. F. (2019). The effect of competitive advantage on financial performance and firm value: evidence from Indonesian manufacturing companies. *Russian Journal of Agricultural and Socio-Economic Sciences,* 1(85):35-44.

Williams, R. (2012). Panel Data 4: Fixed Effects vs Random Effects Models. [Online]. Available: https://www3.nd.edu/~rwilliam/stats3/panel04-fixedvsrandom.pdf. Accessed on 20 November 2019.

Wilson, J. (2014). Essentials of business research: A guide to doing your research project. Sage.

Winston, A. (2018). Explaining the business case for sustainability again and again and again. [Online]. Available: https://sloanreview.mit.edu/article/explaining-the-business-case-for-sustainability-again-and-again-and-again/. Accessed on 20 July 2020.

Winston, A., Favaloro, G. & Healy, T. (2017). Energy Strategy for the C-Suite. [Online]. Available: https://hbr.org/2017/01/energy-strategy-for-the-c-suite. Accessed on 5 August 2018.

Wong, C. W., Lai, K. H., Shang, K. C., Lu, C.S. & Leung, T.K.P. (2012). Green operations and the moderating role of environmental management capability of suppliers on manufacturing firm performance. *International Journal of Production Economics*, *140*(1): 283-294.

Worae, T.A. & Ngwakwe, C.C. (2017). Environmental responsibility and financial performance nexus in South Africa: panel Granger causality analysis. *Environmental Economics,* 8(3): 29-34.

World Economic Forum, (2016). 3 reasons things are looking up for African economies. [Online]. Available: https://www.weforum.org/agenda/2016/05/what-s-the-future-of-economic-growth-in-africa/. Accessed on 13 June 2019.

World Health Organization (WHO), (2017). Progress on Drinking Water, Sanitation and Hygiene: 2017 Update and SDG Baselines. Geneva: World Health Organization (WHO) and the United Nations Children's Fund (UNICEF). [Online]. Accessible:

https://www.who.int/mediacentre/news/releases/2017/launch-version-report-jmp-water-sanitation-hygiene.pdf. Accessed on 26 February 2019.

Xu, D., Huo, B. & Sun, L. (2014). Relationships between intra-organisational resources, supply chain integration and business performance: An extended resource-based view. *Industrial Management & Data Systems,* 114(8):1186–1206.

Xue, M., Boadu, F. & Xie, Y. (2019). The Penetration of Green Innovation on Firm Performance: Effects of Absorptive Capacity and Managerial Environmental Concern. *Sustainability*, 11(9):1-24.

Yang, M.G.M., Hong, P. & Modi, S.B. (2011). Impact of lean manufacturing and environmental management on business performance: An empirical study of manufacturing firms. *International Journal of Production Economics,* 129, 251-261.

Yang, X. & Yao, Y. (2012). Environmental compliance and firm performance: Evidence from China. *Oxford Bulletin of Economics and Statistics*, 74(3): 397-424.

Yildiz Ç.S. & Sezen, B. (2019). Effects of green supply chain management practices on sustainability performance. *Journal of Manufacturing Technology Management*, *30*(1): 98-121.

Yip, C., Han, N.L.R. & Sng, B.L. (2016). Legal and ethical issues in research. *Indian Journal of Anaesthesia,* 60(9): 684-688.

Yosifon, D. (2018). *Corporate Friction: How Corporate Law Impedes American Progress and what to Do about it*. Cambridge University Press.

Younger, P. (2013). Good small business guide 2013: How to start and grow your own business. *Reference Reviews,* 27(8):4–47.

Yu, H. C. & Tsai, B. Y. (2018). Environmental policy and sustainable development: An empirical study on carbon reduction among Chinese enterprises. *Corporate Social Responsibility and Environmental Management*, 25(5): 1019-1026.

Yu, K., Cadeaux, J. & Song, H. (2012). Alternative forms of fit in distribution flexibility strategies. *International Journal of Operations & Production Management*, *32*(10):1199-1227.

Yusof, N. A., Mustafa Kamal, E., Kong-Seng, L. & Iranmanesh, M. (2014). Are innovations being created or adopted in the construction industry? Exploring innovation in the construction industry. *Sage Open*, *4*(3): 21-33.

Zaccheaus, S. A., Oluwagbemiga, O. E., & Olugbenga, O. M. (2014). Effects of corporate social responsibility performance (CSR) on stock prices: Empirical study of listed manufacturing companies in Nigeria. *Journal of Business and Management*, *16*(8): 112-117.

Zailani, S. H., Seva Subaramaniam, K., Iranmanesh, M. & Shaharudin, M. R. (2015). The impact of supply chain security practices on security operational performance among logistics service providers in an emerging economy: Security culture as moderator. *International Journal of Physical Distribution & Logistics Management*, *45*(7): 652-673.

Zamfir, A., Cristina Mocanu , C. & Grigorescu , A. (2017). Circular economy and decision models among European Firms. *Sustainability*, *9*(9):1-15.

Zawawi, N.F.M. & Wahab, S. (2019). Organizational sustainability: a redefinition? *Journal of Strategy and Management*, 3, 1-13.

Zhang, Q. (2016). Corporate governance, institutional investors and firm performance: A comparative study of South Africa and China. Doctoral Dissertation, Stellenbosch University.

Zhang, S. (2016). Energy Efficiency and Firm Performance. Doctoral thesis, Swedish University of Agricultural Sciences.

Zhong, R.Q. (2013). The Bearing of the Cost for Corporate Social Responsibility in the Legal Perspective. *Journal of Xiamen University (Arts & Social Sciences),* (1):140-148.

Ziaei Nafchi, M. & Mohelská, H. (2020). Organizational Culture as an Indication of Readiness to Implement Industry 4.0. *Information*, *11*(3):1-11.

Zikmund, W. G., Babin, B. J., Carr, J. C. & Griffin, M. (2010). *Business Research Methods*, 8th edition, South-Western Cengage Learning.

Zokaei, K. (2013). Environmentally-friendly business is profitable business. [Online]. Available: https://www.theguardian.com/sustainable-business/environmentally-friendly-sustainable-business-profitable. Accessed on 21 August 2018.

APPENDICES

Appendix 1- Environmental sustainability raw data

Firm Code 0	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	0	1	1	1	1	1	1	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	0	1	1	1	1	1	1	1
Electricity savings	0	1	1	1	1	1	1	1
Total	1	4	4	4	4	4	4	4
Water efficiency								
Total volume of water recycled	0	1	1	1	1	1	1	1
Total volume of water reused	0	1	1	1	1	1	1	1
Reduction in water use	0	1	1	1	1	1	1	1
Total	0	3	3	3	3	3	3	3
Waste management								
Amount of waste recycled	0	1	1	1	1	1	1	1
Amount of waste reused	0	1	1	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	0	1	1	1	1	1	1	1
Total	1	4	4	4	4	4	4	4
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	1	1	1	1	1	1	1
Reductions in indirect emissions (scope 2)	1	1	1	1	1	1	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Materials efficiency								
Use of lesser material	0	0	0	0	0	0	0	1
Easily recycled material	1	0	0	0	0	0	0	1
Use of biodegradable material	0	0	0	0	0	0	0	0
Improved raw material handling	1	1	1	1	1	1	1	1
Total	2	1	1	1	1	1	1	3
Green products and services innovation								
Eco design	0	0	0	0	0	0	0	0
Green packaging	0	0	0	0	0	0	0	0
Eco labelling	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1

Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 1	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	1	1	1	1	1	1	1	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	1	1	1	1	1	1	1	1
Electricity savings	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Water efficiency								
Total volume of water recycled	1	1	1	1	1	1	1	1
Total volume of water reused	1	1	1	1	1	1	1	1
Reduction in water use	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Waste management								
Amount of waste recycled	1	1	1	1	1	1	1	1
Amount of waste reused	1	1	1	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	0	0	0	0	0	0	1	0
Total	3	3	3	3	3	3	4	3
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	1	1	1	1	1	1	1
Reductions in indirect emissions (scope 2)	1	1	1	1	1	1	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	0	0	0	0	0	0	1	0
Total	2	2	2	2	2	2	3	2
Materials efficiency								
Use of lesser material	0	0	0	0	0	0	0	0
Easily recycled material	1	1	1	1	1	1	0	1
Use of biodegradable material	0	0	0	0	0	0	0	0
Improved raw material handling	1	1	1	1	1	1	1	1
Total	2	2	2	2	2	2	1	2
Green products and services innovation								
Eco design	0	0	0	0	0	0	0	0

Green packaging	0	0	0	0	0	0	0	0
Eco labelling	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 2	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	0	0	1	0	1	1	1	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	0	0	1	0	1	1	1	1
Electricity savings	0	0	1	0	1	1	1	1
Total	1	1	4	1	4	4	4	4
Water efficiency								
Total volume of water recycled	0	1	1	1	1	1	1	1
Total volume of water reused	0	1	0	1	0	1	1	1
Reduction in water use	1	1	1	1	0	1	1	1
Total	1	3	2	3	1	3	3	3
Waste management								
Amount of waste recycled	0	1	1	1	1	1	1	1
Amount of waste reused	0	1	1	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	0	1	0	1	0
Total	2	4	4	3	4	3	4	3
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	1	1	0	0	1	1	1
Reductions in indirect emissions (scope 2)	1	1	1	0	0	1	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	0	1	1	1	0	1	1	0
Total	2	3	3	1	0	3	3	2
Materials efficiency								
Use of lesser material	0	0	0	0	0	0	0	0
Easily recycled material	1	1	1	1	1	1	0	1

Use of biodegradable material	1	1	0	0	0	0	0	0
Improved raw material handling	1	1	1	1	1	1	1	1
Total	3	3	2	2	2	2	1	2
Green products and services innovation								
Eco design	0	0	0	0	0	0	0	0
Green packaging	0	0	0	0	0	0	0	0
Eco labelling	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 3	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	1	1	1	1	0	1	1	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	1	1	1	1	0	1	1	1
Electricity savings	1	1	1	1	0	1	1	1
Total	4	4	4	4	1	4	4	4
Water efficiency								
Total volume of water recycled	1	1	1	1	1	1	1	1
Total volume of water reused	1	1	0	1	1	1	1	1
Reduction in water use	1	1	1	1	1	1	1	1
Total	3	3	2	3	3	3	3	3
Waste management								
Amount of waste recycled	1	1	1	1	1	1	1	1
Amount of waste reused	1	1	1	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	1	1	1	1	0	1	1
Reductions in indirect emissions (scope 2)	1	1	1	1	1	0	1	1

Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	0	1	1
Total	3	3	3	3	3	0	3	3
Materials efficiency								
Use of lesser material	1	1	1	1	1	1	1	1
Easily recycled material	1	1	1	1	1	1	1	1
Use of biodegradable material	0	0	0	0	0	0	0	1
Improved raw material handling	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	4
Green products and services innovation								
Eco design	0	0	0	0	0	0	0	1
Green packaging	0	0	0	0	0	0	0	1
Eco labelling	0	0	0	0	0	0	0	1
Total	0	0	0	0	0	0	0	3
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 4	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	0	0	0	1	1	1	1	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	0	0	0	1	1	1	1	1
Electricity savings	0	0	0	1	1	1	1	1
Total	1	1	1	4	4	4	4	4
Water efficiency								
Total volume of water recycled	1	1	0	0	1	1	1	1
Total volume of water reused	1	1	0	0	0	1	1	1
Reduction in water use	1	1	0	0	0	1	1	1
Total	3	3	0	0	1	3	3	3
Waste management								
Amount of waste recycled	1	1	0	1	1	1	1	1
Amount of waste reused	1	1	0	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1

Use of alternative raw materials with less waste	1	1	0	0	1	0	1	0
Total	4	4	1	3	4	3	4	3
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	1	1	1	0	1	1	1
Reductions in indirect emissions (scope 2)	1	1	1	1	0	1	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	0	1	1	1
Total	3	3	3	3	0	3	3	3
Materials efficiency								
Use of lesser material	0	0	0	0	0	0	0	1
Easily recycled material	1	1	1	1	1	1	0	1
Use of biodegradable material	1	1	1	1	1	1	1	1
Improved raw material handling	0	0	0	0	0	0	0	0
Total	2	2	2	2	2	2	1	3
Green products and services innovation								
Eco design	0	0	0	0	0	0	0	0
Green packaging	0	0	0	0	0	0	0	0
Eco labelling	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
Environmental compliance								
Presence of ISO 14001	0	0	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	2	2	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 5	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	1	1	1	1	1	1	1	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	1	1	1	1	1	1	1	1
Electricity savings	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Water efficiency								
Total volume of water recycled	1	1	1	1	1	1	1	1
Total volume of water reused	1	1	1	1	1	1	1	1
Reduction in water use	1	1	1	1	1	1	1	1

Total	3	3	3	3	3	3	3	3
Waste management								
Amount of waste recycled	1	1	1	1	1	1	1	1
Amount of waste reused	1	1	1	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	1	1	1	1	1	1	1
Reductions in indirect emissions (scope 2)	1	1	1	1	1	1	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Materials efficiency								
Use of lesser material	1	1	1	1	1	1	1	1
Easily recycled material	1	1	1	1	1	1	1	1
Use of biodegradable material	1	1	0	0	1	1	1	1
Improved raw material handling	1	1	1	1	1	1	1	1
Total	4	4	3	3	4	4	4	4
Green products and services innovation								
Eco design	0	0	0	0	0	0	0	0
Green packaging	0	0	0	0	0	0	0	0
Eco labelling	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 6	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	1	1	1	1	1	0	0	0
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	1	1	1	1	1	0	0	0
Electricity savings	1	1	1	1	1	0	0	0

Total	4	4	4	4	4	1	1	1
Water efficiency								
Total volume of water recycled	1	1	1	1	1	1	1	1
Total volume of water reused	1	1	1	1	1	1	1	1
Reduction in water use	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Waste management								
Amount of waste recycled	1	1	1	1	1	1	1	1
Amount of waste reused	1	1	1	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	1	1	1	1	0	1	1
Reductions in indirect emissions (scope 2)	1	1	1	1	1	0	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	1	3	3
Materials efficiency								
Use of lesser material	0	0	0	0	0	0	0	0
Easily recycled material	1	1	1	1	1	1	1	1
Use of biodegradable material	1	1	1	1	1	1	1	1
Improved raw material handling	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Green products and services innovation								
Eco design	0	0	0	0	0	0	0	0
Green packaging	0	0	0	0	0	0	0	0
Eco labelling	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 7	2011	2012	2013	2014	2015	2016	2017	2018

Energy efficiency								
Reduction in energy use	1	1	1	1	1	1	1	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	1	1	1	1	1	1	1	1
Electricity savings	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Water efficiency								
Total volume of water recycled	1	1	1	1	1	1	1	1
Total volume of water reused	1	1	1	1	1	1	1	1
Reduction in water use	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Waste management								
Amount of waste recycled	1	1	1	1	1	1	1	1
Amount of waste reused	1	1	1	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	1	1	1	1	1	0	1
Reductions in indirect emissions (scope 2)	1	1	1	1	1	1	0	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	1	3
Materials efficiency								
Use of lesser material	1	1	1	1	1	1	1	1
Easily recycled material	1	1	1	1	1	1	1	1
Use of biodegradable material	1	1	1	1	1	1	1	1
Improved raw material handling	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Green products and services innovation								
Eco design	1	1	1	1	1	1	1	1
Green packaging	1	1	1	1	1	1	1	1
Eco labelling	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Environmental compliance								
Presence of ISO 14001	0	0	0	0	0	0	0	0
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	2	2	2	2	2	2	2	2
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1

collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 8	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	0	1	1	0	0	1	0	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	0	1	1	0	1	1	0	1
Electricity savings	0	1	1	0	1	1	1	1
Total	1	4	4	1	3	4	2	4
Water efficiency								
Total volume of water recycled	1	1	1	1	1	0	0	1
Total volume of water reused	1	1	1	1	1	0	0	1
Reduction in water use	1	1	0	1	1	0	0	1
Total	3	3	2	3	3	0	0	3
Waste management								
Amount of waste recycled	1	1	1	1	1	1	1	1
Amount of waste reused	1	1	1	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	1	1	0	1	1	1	0
Reductions in indirect emissions (scope 2)	1	0	1	0	0	1	0	0
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	3	2	3	1	2	3	2	1
Materials efficiency								
Use of lesser material	1	1	1	1	1	1	1	1
Easily recycled material	1	1	1	1	1	1	1	1
Use of biodegradable material	1	1	1	1	1	1	1	1
Improved raw material handling	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Green products and services innovation								
Eco design	1	1	1	1	1	1	1	1
Green packaging	1	1	1	1	1	1	1	1
Eco labelling	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1

Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 9	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	0	1	1	1	0	1	0	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	1	1	1	1	1	1	0	1
Electricity savings	1	1	1	1	1	1	0	1
Total	3	4	4	4	3	4	1	4
Water efficiency								
Total volume of water recycled	1	1	1	1	1	1	1	1
Total volume of water reused	1	1	1	1	1	1	1	1
Reduction in water use	0	0	1	1	1	1	0	1
Total	2	2	3	3	3	3	2	3
Waste management								
Amount of waste recycled	1	1	1	1	1	1	1	1
Amount of waste reused	1	1	1	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	1	0	0	1	0	1	1
Reductions in indirect emissions (scope 2)	1	1	0	0	0	0	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	3	3	1	1	2	1	3	3
Materials efficiency								
Use of lesser material	0	1	1	1	1	1	1	1
Easily recycled material	0	0	1	1	1	1	1	1
Use of biodegradable material	0	0	0	0	1	0	1	0
Improved raw material handling	1	1	1	1	1	1	1	1
Total	1	2	3	3	4	3	4	3
Green products and services innovation								
Eco design	0	0	0	0	0	0	0	0
Green packaging	0	0	0	0	0	0	0	0

Eco labelling	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 10	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	0	1	0	1	0	1	0	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	0	1	0	1	0	1	0	1
Electricity savings	0	1	0	1	0	1	0	1
Total	1	4	1	4	1	4	1	4
Water efficiency								
Total volume of water recycled	1	1	1	1	1	1	1	1
Total volume of water reused	1	1	1	1	1	1	1	1
Reduction in water use	0	1	1	1	1	1	0	0
Total	2	3	3	3	3	3	2	2
Waste management								
Amount of waste recycled	1	1	1	1	1	1	1	1
Amount of waste reused	1	1	1	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Carbon emission reduction								
Reductions in direct emissions (scope 1)	0	1	0	1	0	1	0	1
Reductions in indirect emissions (scope 2)	0	1	0	1	0	1	0	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	1	3	1	3	1	3	1	3
Materials efficiency								
Use of lesser material	1	1	1	1	1	1	1	1
Easily recycled material	1	1	1	1	1	1	1	1
Use of biodegradable material	0	0	0	0	0	0	0	0

Improved raw material handling	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Green products and services innovation								
Eco design	0	0	0	0	0	0	0	0
Green packaging	1	0	0	0	0	0	0	0
Eco labelling	1	0	0	0	0	0	0	0
Total	2	0	0	0	0	0	0	0
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 11	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	0	1	0	0	1	0	1	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	1	1	0	0	0	0	0	1
Electricity savings	0	1	0	0	1	0	1	1
Total	2	4	1	1	3	1	3	4
Water efficiency								
Total volume of water recycled	1	1	1	1	1	0	1	1
Total volume of water reused	1	1	1	0	1	0	1	1
Reduction in water use	0	1	1	0	1	0	1	1
Total	2	3	3	1	3	0	3	3
Waste management								
Amount of waste recycled	1	1	1	1	1	1	1	1
Amount of waste reused	1	1	1	1	1	0	1	0
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	3	4	3
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	1	0	0	1	1	1	0
Reductions in indirect emissions (scope 2)	1	1	0	0	1	0	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1

Total	3	3	1	1	3	2	3	2
Materials efficiency								
Use of lesser material	1	1	1	1	1	1	1	1
Easily recycled material	1	1	1	1	1	1	1	1
Use of biodegradable material	1	1	1	1	1	1	1	1
Improved raw material handling	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Green products and services innovation								
Eco design	1	1	1	1	1	1	1	1
Green packaging	1	1	1	1	1	1	1	1
Eco labelling	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 12	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	0	1	0	0	1	0	1	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	1	1	0	0	0	0	0	1
Electricity savings	0	1	0	0	1	0	1	1
Total	2	4	1	1	3	1	3	4
Water efficiency								
Total volume of water recycled	1	1	1	1	1	0	1	1
Total volume of water reused	1	1	1	0	1	0	1	1
Reduction in water use	0	1	1	0	1	0	1	1
Total	2	3	3	1	3	0	3	3
Waste management								
Amount of waste recycled	1	1	1	1	1	1	1	1
Amount of waste reused	1	1	1	1	1	0	1	0
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1

Total	4	4	4	4	4	3	4	3
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	1	0	0	1	1	1	0
Reductions in indirect emissions (scope 2)	1	1	0	0	1	0	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	3	3	1	1	3	2	3	2
Materials efficiency								
Use of lesser material	1	1	1	1	1	1	1	1
Easily recycled material	1	1	1	1	1	1	1	1
Use of biodegradable material	1	1	1	1	1	1	1	1
Improved raw material handling	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Green products and services innovation								
Eco design	1	1	1	1	1	1	1	1
Green packaging	1	1	1	1	1	1	1	1
Eco labelling	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 13	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	0	1	0	0	1	0	1	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	1	1	0	0	0	0	0	1
Electricity savings	0	1	0	0	1	0	1	1
Total	2	4	1	1	3	1	3	4
Water efficiency								
Total volume of water recycled	1	1	1	1	1	0	1	1
Total volume of water reused	1	1	1	0	1	0	1	1
Reduction in water use	0	1	1	0	1	0	1	1
Total	2	3	3	1	3	0	3	3

Waste management								
Amount of waste recycled	1	1	1	1	1	1	1	1
Amount of waste reused	1	1	1	1	1	0	1	0
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	3	4	3
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	1	0	0	1	1	1	0
Reductions in indirect emissions (scope 2)	1	1	0	0	1	0	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	3	3	1	1	3	2	3	2
Materials efficiency								
Use of lesser material	1	1	1	1	1	1	1	1
Easily recycled material	1	1	1	1	1	1	1	1
Use of biodegradable material	1	1	1	1	1	1	1	1
Improved raw material handling	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Green products and services innovation								
Eco design	1	1	1	1	1	1	1	1
Green packaging	1	1	1	1	1	1	1	1
Eco labelling	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
Collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 14	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	0	0	0	0	0	1	0	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	0	0	0	0	0	1	0	1
Electricity savings	0	0	0	0	0	1	0	1
Total	1	1	1	1	1	4	1	4

Water efficiency								
Total volume of water recycled	1	1	1	1	1	1	1	1
Total volume of water reused	1	1	1	0	0	1	0	1
Reduction in water use	1	1	1	0	0	1	0	1
Total	3	3	3	1	1	3	1	3
Waste management								
Amount of waste recycled	1	1	1	1	1	1	1	1
Amount of waste reused	1	1	1	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	0	0	0	0	0	0	0	0
Total	3	3	3	3	3	3	3	3
Carbon emission reduction								
Reductions in direct emissions (scope 1)	0	1	0	0	1	1	0	1
Reductions in indirect emissions (scope 2)	1	1	0	0	1	1	0	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	2	3	1	1	3	3	1	3
Materials efficiency								
Use of lesser material	1	1	1	1	1	1	1	1
Easily recycled material	0	0	0	0	0	0	0	0
Use of biodegradable material	0	0	0	0	0	0	0	0
Improved raw material handling	1	1	1	1	1	1	1	1
Total	2	2	2	2	2	2	2	2
Green products and services innovation								
Eco design	0	0	0	0	0	0	0	0
Green packaging	0	0	0	0	0	0	0	0
Eco labelling	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 15	2011	2012	2013	2014	2015	2016	2017	2018

Energy efficiency								
Reduction in energy use	1	1	1	1	1	1	1	1
Investments in renewable energy	0	1	1	1	1	1	1	1
Fuel savings	1	1	1	1	1	1	1	1
Electricity savings	1	1	1	1	1	1	1	1
Total	3	4	4	4	4	4	4	4
Water efficiency								
Total volume of water recycled	1	0	0	1	1	1	1	1
Total volume of water reused	1	0	0	0	0	1	1	1
Reduction in water use	1	0	0	1	0	1	1	1
Total	3	0	0	2	1	3	3	3
Waste management								
Amount of waste recycled	1	1	0	1	1	1	0	0
Amount of waste reused	1	1	0	0	0	0	0	0
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	0	0	0	0	0	0	0	0
Total	3	3	1	2	2	2	1	1
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	0	0	1	1	1	0	1
Reductions in indirect emissions (scope 2)	1	0	0	1	1	1	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	3	1	1	3	3	3	2	3
Materials efficiency								
Use of lesser material	1	1	1	1	1	1	1	1
Easily recycled material	1	0	0	0	0	0	0	0
Use of biodegradable material	1	0	0	0	0	0	0	0
Improved raw material handling	1	1	1	1	1	1	1	1
Total	4	2	2	2	2	2	2	2
Green products and services innovation								
Eco design	0	0	0	0	0	0	0	0
Green packaging	0	0	0	0	0	0	0	0
Eco labelling	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
Environmental compliance								
Presence of ISO 14001	0	0	0	0	0	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	2	2	2	2	2	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1

collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 16	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	1	0	0	1	0	1	0	0
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	1	0	0	1	0	1	0	0
Electricity savings	1	0	1	1	0	1	0	0
Total	4	1	2	4	1	4	1	1
Water efficiency								
Total volume of water recycled	1	1	1	1	1	0	0	1
Total volume of water reused	1	1	1	1	1	0	0	1
Reduction in water use	1	1	1	1	1	0	0	1
Total	3	3	3	3	3	0	0	3
Waste management								
Amount of waste recycled	1	1	1	1	1	1	1	1
Amount of waste reused	1	1	1	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Carbon emission reduction								
Reductions in direct emissions (scope 1)	0	1	0	0	1	1	0	1
Reductions in indirect emissions (scope 2)	0	1	0	0	1	0	0	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	1	3	1	1	3	2	1	3
Materials efficiency								
Use of lesser material	1	1	1	1	1	1	1	1
Easily recycled material	1	1	1	1	1	1	1	1
Use of biodegradable material	1	1	1	1	1	1	1	1
Improved raw material handling	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Green products and services innovation								
Eco design	1	1	1	1	1	1	1	1
Green packaging	1	1	1	1	1	1	1	1
Eco labelling	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1

Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 17	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	0	0	1	1	1	0	1	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	0	0	1	1	1	0	1	1
Electricity savings	0	0	0	1	1	0	1	1
Total	1	1	3	4	4	1	4	4
Water efficiency								
Total volume of water recycled	1	1	1	1	1	0	1	1
Total volume of water reused	1	1	1	1	1	0	1	1
Reduction in water use	1	1	1	1	1	0	1	1
Total	3	3	3	3	3	0	3	3
Waste management								
Amount of waste recycled	1	1	1	1	1	1	1	1
Amount of waste reused	1	1	1	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Carbon emission reduction								
Reductions in direct emissions (scope 1)	0	1	0	0	1	1	0	1
Reductions in indirect emissions (scope 2)	0	1	0	0	1	0	0	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	1	3	1	1	3	2	1	3
Materials efficiency								
Use of lesser material	1	1	1	1	1	1	1	1
Easily recycled material	1	1	1	1	1	1	1	1
Use of biodegradable material	1	1	1	1	1	1	1	1
Improved raw material handling	0	0	0	0	0	0	0	0
Total	3	3	3	3	3	3	3	3
Green products and services innovation								
Eco design	0	0	0	0	0	0	0	0
Green packaging	0	0	0	0	0	0	0	0
Eco labelling	0	0	0	0	0	0	0	0

Total	0	0	0	0	0	0	0	0
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 18	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	0	0	0	0	1	0	0	0
Investments in renewable energy	1	1	1	1	1	1	1	0
Fuel savings	0	0	0	0	1	0	0	0
Electricity savings	0	0	0	0	1	0	0	0
Total	1	1	1	1	4	1	1	0
Water efficiency								
Total volume of water recycled	1	1	0	0	0	0	0	0
Total volume of water reused	1	1	0	0	0	0	0	0
Reduction in water use	1	1	0	0	0	0	0	0
Total	3	3	0	0	0	0	0	0
Waste management								
Amount of waste recycled	1	1	0	1	0	0	0	0
Amount of waste reused	1	1	0	1	0	0	0	0
Waste reduction initiatives	1	1	0	1	0	0	0	0
Use of alternative raw materials with less waste	1	1	1	1	0	0	0	0
Total	4	4	1	4	0	0	0	0
Carbon emission reduction								
Reductions in direct emissions (scope 1)	0	1	0	1	0	0	0	0
Reductions in indirect emissions (scope 2)	0	1	0	1	0	0	0	0
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	0	1	0
Total	1	3	1	3	1	0	1	0
Materials efficiency								
Use of lesser material	1	1	1	1	1	1	1	0
Easily recycled material	1	1	1	1	1	1	1	0
Use of biodegradable material	1	1	1	1	1	1	1	0
Improved raw material handling	0	0	0	0	0	0	0	0

Total	3	3	3	3	3	3	3	0
Green products and services innovation								
Eco design	0	0	0	0	0	0	0	0
Green packaging	0	0	0	0	0	0	0	0
Eco labelling	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
Environmental compliance								
Presence of ISO 14001	0	0	0	0	0	0	0	0
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	2	2	2	2	2	2	2	2
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 19	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	1	0	1	0	0	0	1	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	1	0	1	0	0	0	1	1
Electricity savings	1	0	1	1	1	0	1	1
Total	4	1	4	2	2	1	4	4
Water efficiency								
Total volume of water recycled	1	1	1	1	1	1	1	1
Total volume of water reused	1	1	1	1	1	1	1	1
Reduction in water use	1	1	1	0	1	0	1	1
Total	3	3	3	2	3	2	3	3
Waste management								
Amount of waste recycled	1	1	1	1	1	1	1	1
Amount of waste reused	1	1	1	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	1	1	0	0	1	1	1
Reductions in indirect emissions (scope 2)	1	0	1	1	1	1	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	3	2	3	2	2	3	3	3

Materials efficiency								
Use of lesser material	1	1	1	1	1	1	1	1
Easily recycled material	1	1	1	1	1	1	1	1
Use of biodegradable material	1	1	1	1	1	1	1	1
Improved raw material handling	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Green products and services innovation								
Eco design	1	1	1	1	1	1	1	1
Green packaging	1	1	1	1	1	1	1	1
Eco labelling	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 20	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	0	0	1	0	0	0	1	1
Investments in renewable energy	0	1	1	0	1	0	1	1
Fuel savings	1	0	1	0	0	0	1	1
Electricity savings	1	0	1	1	1	0	1	1
Total	2	1	4	1	2	0	4	4
Water efficiency								
Total volume of water recycled	0	1	1	1	1	1	1	1
Total volume of water reused	0	1	1	1	1	1	1	1
Reduction in water use	0	1	1	0	1	0	1	1
Total	0	3	3	2	3	2	3	3
Waste management								
Amount of waste recycled	0	1	1	1	1	1	1	1
Amount of waste reused	1	1	1	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	0	1	1	1	1	1	1	1
Total	2	4	4	4	4	4	4	4
Carbon emission reduction								

Reductions in direct emissions (scope 1)	1	1	1	0	0	1	1	1
Reductions in indirect emissions (scope 2)	1	0	1	1	1	1	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	3	2	3	2	2	3	3	3
Materials efficiency								
Use of lesser material	1	1	1	1	1	1	1	1
Easily recycled material	1	1	1	1	1	1	1	1
Use of biodegradable material	1	1	1	1	1	1	1	1
Improved raw material handling	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Green products and services innovation								
Eco design	0	0	0	0	0	0	0	0
Green packaging	1	1	1	1	1	1	1	1
Eco labelling	1	1	1	1	1	1	1	1
Total	2	2	2	2	2	2	2	2
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 21	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	0	0	1	1	1	1	0	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	0	0	1	1	1	1	0	1
Electricity savings	1	0	1	1	1	1	0	1
Total	2	1	4	4	4	4	1	4
Water efficiency								
Total volume of water recycled	1	0	0	1	0	1	0	1
Total volume of water reused	1	0	0	1	0	1	0	1
Reduction in water use	1	0	0	0	1	0	1	1
Total	3	0	0	2	1	2	1	3
Waste management								
Amount of waste recycled	0	0	0	1	1	1	1	1

Amount of waste reused	0	0	0	1	1	0	0	0
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	0	0	0	0	0	0	0	1
Total	1	1	1	3	3	2	2	3
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	0	1	0	1	1	0	1
Reductions in indirect emissions (scope 2)	1	1	1	0	0	1	0	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	3	2	3	1	2	3	1	3
Material efficiency								
Use of lesser material	0	0	0	0	0	0	0	1
Easily recycled material	0	0	0	0	0	0	0	0
Use of biodegradable material	0	0	0	0	0	0	0	0
Improved raw material handling	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	1
Green products and services innovation								
Eco design	0	0	0	0	0	0	0	0
Green packaging	0	0	0	0	0	0	0	0
Eco labelling	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 22	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	1	1	1	1	1	1	1	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	1	1	1	1	1	1	1	1
Electricity savings	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Water efficiency								
Total volume of water recycled	1	1	0	1	0	1	0	1
Total volume of water reused	1	1	0	1	0	1	0	1

Reduction in water use	1	1	0	1	0	1	1	1
Total	3	3	0	3	0	3	1	3
Waste management								
Amount of waste recycled	1	1	1	1	1	1	1	1
Amount of waste reused	1	1	1	1	1	1	1	0
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	3
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	0	1	1	1	1	1	1
Reductions in indirect emissions (scope 2)	1	0	1	1	1	1	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	3	1	3	3	3	3	3	3
Materials efficiency								
Use of lesser material	0	0	0	0	0	0	0	1
Easily recycled material	1	1	1	1	1	1	1	1
Use of biodegradable material	0	0	0	0	0	0	0	0
Improved raw material handling	0	0	0	0	0	0	0	0
Total	1	1	1	1	1	1	1	2
Green products and services innovation								
Eco design	0	0	0	0	0	0	0	0
Green packaging	0	0	0	0	0	0	0	0
Eco labelling	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 23	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	1	0	1	0	1	0	1	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	1	0	1	0	1	1	1	1
Electricity savings	1	0	1	0	1	1	1	1

Total	4	1	4	1	4	3	4	4
Water efficiency								
Total volume of water recycled	1	0	0	0	0	0	1	0
Total volume of water reused	0	0	0	0	0	0	1	0
Reduction in water use	0	0	0	0	0	1	1	0
Total	1	0	0	0	0	1	3	0
Waste management								
Amount of waste recycled	1	1	1	1	1	1	1	1
Amount of waste reused	1	1	1	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	0	0	0	1	0	1	0
Reductions in indirect emissions (scope 2)	1	0	0	0	1	0	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	3	1	1	1	3	1	3	2
Materials efficiency								
Use of lesser material	0	0	0	0	0	0	0	1
Easily recycled material	1	1	1	1	1	1	1	1
Use of biodegradable material	0	0	0	0	0	0	0	0
Improved raw material handling	0	0	0	0	0	0	0	0
Total	1	1	1	1	1	1	1	2
Green products and services innovation								
Eco design	0	0	0	0	0	0	0	0
Green packaging	0	0	0	0	0	0	0	0
Eco labelling	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 24	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								

Reduction in energy use	0	0	0	0	0	0	0	0
Investments in renewable energy	0	0	0	1	1	0	0	0
Fuel savings	0	0	0	0	0	0	0	0
Electricity savings	0	0	0	0	0	0	0	0
Total	0	0	0	1	1	0	0	0
Water efficiency								
Total volume of water recycled	0	0	0	0	0	0	0	0
Total volume of water reused	0	0	0	0	0	0	0	0
Reduction in water use	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
Waste management								
Amount of waste recycled	0	0	0	0	0	0	0	0
Amount of waste reused	0	0	0	0	0	0	0	0
Waste reduction initiatives	0	0	0	0	0	0	0	0
Use of alternative raw materials with less waste	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
Carbon emission reduction								
Reductions in direct emissions (scope 1)	0	0	0	0	0	0	1	0
Reductions in indirect emissions (scope 2)	0	0	0	0	0	0	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	0	0	0	0	0	1	1	1
Total	0	0	0	0	0	1	3	2
Materials efficiency								
Use of lesser material	0	0	0	0	0	0	0	0
Easily recycled material	0	0	0	0	0	0	0	0
Use of biodegradable material	0	0	0	0	0	0	0	0
Improved raw material handling	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
Green products and services innovation								
Eco design	0	0	0	0	0	0	0	0
Green packaging	0	0	0	0	0	0	0	0
Eco labelling	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
Environmental compliance								
Presence of ISO 14001	0	0	0	0	0	0	0	0
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	2	2	2	2	2	2	2	2
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1

Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 25	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	0	1	1	1	1	1	1	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	0	1	1	1	1	1	1	1
Electricity savings	0	1	1	1	1	1	1	1
Total	1	4	4	4	4	4	4	4
Water efficiency								
Total volume of water recycled	1	1	1	1	1	1	1	1
Total volume of water reused	1	1	1	1	1	1	1	1
Reduction in water use	0	1	1	1	1	1	1	1
Total	2	3	3	3	3	3	3	3
Waste management								
Amount of waste recycled	1	1	1	1	1	1	1	1
Amount of waste reused	1	1	1	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Carbon emission reduction								
Reductions in direct emissions (scope 1)	0	1	0	1	1	1	1	1
Reductions in indirect emissions (scope 2)	0	1	0	1	1	1	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	0	1	1	1	1	1
Total	1	3	0	3	3	3	3	3
Materials efficiency								
Use of lesser material	0	0	0	0	0	0	0	0
Easily recycled material	1	1	1	1	1	1	1	1
Use of biodegradable material	1	1	1	1	1	1	1	1
Improved raw material handling	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Green products and services innovation								
Eco design	1	1	1	1	1	1	1	1
Green packaging	1	1	1	1	1	1	1	1
Eco labelling	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1

Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 26	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	0	0	0	1	1	1	1	0
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	0	1	0	1	1	1	1	0
Electricity savings	1	1	1	1	1	0	1	0
Total	2	3	2	4	4	3	4	1
Water efficiency								
Total volume of water recycled	1	1	1	1	1	1	1	1
Total volume of water reused	1	1	1	1	1	1	1	1
Reduction in water use	0	1	0	1	0	0	1	1
Total	2	3	2	3	2	2	3	3
Waste management								
Amount of waste recycled	1	1	1	0	1	1	1	0
Amount of waste reused	1	1	1	0	0	1	0	0
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1
Total	4	4	4	2	3	4	3	2
Carbon emission reduction								
Reductions in direct emissions (scope 1)	0	1	1	0	1	1	1	1
Reductions in indirect emissions (scope 2)	1	1	1	1	1	1	1	0
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	2	3	3	2	3	3	3	2
Materials efficiency								
Use of lesser material	0	0	0	0	0	0	0	0
Easily recycled material	0	0	0	0	0	0	0	0
Use of biodegradable material	0	0	0	0	0	0	0	0
Improved raw material handling	1	1	1	1	1	1	1	1
Total	1	1	1	1	1	1	1	1
Green products and services innovation								
Eco design	0	0	0	0	0	0	0	0
Green packaging	0	0	0	0	0	0	0	0
Eco labelling	0	0	0	0	0	0	0	0

Total	0	0	0	0	0	0	0	0
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 27	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	0	0	1	1	1	1	1	0
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	0	0	1	1	1	1	1	0
Electricity savings	0	0	1	1	1	1	1	0
Total	1	1	4	4	4	4	4	1
Water efficiency								
Total volume of water recycled	1	0	0	1	0	0	1	0
Total volume of water reused	1	0	0	1	0	0	1	1
Reduction in water use	1	1	0	1	0	0	1	1
Total	3	1	0	3	0	0	3	2
Waste management								
Amount of waste recycled	1	0	1	0	0	0	0	1
Amount of waste reused	1	0	1	0	0	0	0	0
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1
Total	4	2	4	2	2	2	2	3
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	0	1	1	0	1	1	1
Reductions in indirect emissions (scope 2)	1	0	1	1	0	1	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	3	1	3	3	1	3	3	3
Materials efficiency								
Use of lesser material	0	0	0	0	0	0	0	0
Easily recycled material	1	1	1	1	1	1	1	1
Use of biodegradable material	1	1	1	1	1	1	1	1
Improved raw material handling	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3

Green products and services innovation								
Eco design	1	1	1	1	1	1	1	1
Green packaging	1	1	1	1	1	1	1	1
Eco labelling	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Environmental compliance								
Presence of ISO 14001	0	0	0	0	0	0	0	0
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	2	2	2	2	2	2	2	2
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 28	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	0	1	1	1	0	0	1	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	0	1	1	1	0	0	1	1
Electricity savings	0	1	1	1	0	0	1	1
Total	1	4	4	4	1	1	4	4
Water efficiency								
Total volume of water recycled	1	0	0	1	1	1	1	1
Total volume of water reused	1	0	0	1	1	1	1	1
Reduction in water use	1	1	0	1	1	1	1	1
Total	3	1	0	3	3	3	3	3
Waste management								
Amount of waste recycled	1	1	1	1	0	0	0	1
Amount of waste reused	1	1	1	1	1	0	0	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1
Total	4	4	4	4	3	2	2	4
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	1	1	0	1	0	1	1
Reductions in indirect emissions (scope 2)	1	1	1	1	0	0	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	3	3	3	2	2	1	3	3
Materials efficiency								
Use of lesser material	0	0	0	0	0	0	0	0

Easily recycled material	1	1	1	1	1	1	1	1
Use of biodegradable material	1	1	1	1	1	1	1	1
Improved raw material handling	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Green products and services innovation								
Eco design	1	1	1	1	1	1	1	1
Green packaging	1	1	1	1	1	1	1	1
Eco labelling	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 29	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	1	0	1	1	0	1	1	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	1	0	1	1	0	1	1	1
Electricity savings	1	1	1	1	0	1	1	1
Total	4	2	4	4	1	4	4	4
Water efficiency								
Total volume of water recycled	0	0	0	0	1	1	1	1
Total volume of water reused	0	0	0	0	1	1	1	1
Reduction in water use	0	0	0	0	1	1	1	1
Total	0	0	0	0	3	3	3	3
Waste management								
Amount of waste recycled	0	0	0	1	0	1	1	1
Amount of waste reused	0	0	0	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1
Total	2	2	2	4	3	4	4	4
Carbon emission reduction								
Reductions in direct emissions (scope 1)	0	1	0	0	1	1	1	1
Reductions in indirect emissions (scope 2)	0	1	0	0	0	1	1	1

Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	1	3	1	1	2	3	3	3
Materials efficiency								
Use of lesser material	1	1	1	1	1	1	1	1
Easily recycled material	1	1	1	1	1	1	1	1
Use of biodegradable material	1	1	1	1	1	1	1	1
Improved raw material handling	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Green products and services innovation								
Eco design	1	1	1	1	1	1	1	1
Green packaging	1	1	1	1	1	1	1	1
Eco labelling	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Environmental compliance								
Presence of ISO 14001	0	0	0	0	0	0	0	0
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	2	2	2	2	2	2	2	2
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 30	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	1	1	1	1	1	1	0	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	1	1	1	1	1	1	1	1
Electricity savings	1	1	1	1	1	1	0	1
Total	4	4	4	4	4	4	2	4
Water efficiency								
Total volume of water recycled	0	1	0	0	0	0	1	0
Total volume of water reused	0	1	0	0	0	0	1	0
Reduction in water use	0	1	0	0	0	0	1	0
Total	0	3	0	0	0	0	3	0
Waste management								
Amount of waste recycled	1	1	0	1	1	1	1	1
Amount of waste reused	1	1	0	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1

Total	4	4	2	4	4	4	4	4
Carbon emission reduction								
Reductions in direct emissions (scope 1)	0	0	0	0	0	0	1	1
Reductions in indirect emissions (scope 2)	0	0	0	0	0	0	0	1
Investments in technology to trap CO_2 and convert it to other economical uses	0	1	1	1	1	0	1	1
Total	0	1	1	1	1	0	2	3
Materials efficiency								
Use of lesser material	0	0	0	0	0	0	0	0
Easily recycled material	1	1	1	1	1	1	1	1
Use of biodegradable material	1	1	1	1	1	1	1	1
Improved raw material handling	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Green products and services innovation								
Eco design	0	0	0	0	0	0	0	0
Green packaging	0	0	0	0	0	0	0	0
Eco labelling	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0
Environmental compliance								
Presence of ISO 14001	1	1	1	1	1	1	1	1
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Firm Code 31	2011	2012	2013	2014	2015	2016	2017	2018
Energy efficiency								
Reduction in energy use	1	1	1	1	1	1	1	1
Investments in renewable energy	1	1	1	1	1	1	1	1
Fuel savings	1	1	1	1	1	1	1	0
Electricity savings	1	1	1	1	1	1	1	0
Total	4	4	4	4	4	4	4	2
Water efficiency								
Total volume of water recycled	1	1	0	1	1	1	1	1
Total volume of water reused	1	1	0	1	1	1	1	1
Reduction in water use	1	1	0	1	1	1	1	1
Total	3	3	0	3	3	3	3	3

Waste management								
Amount of waste recycled	1	1	1	1	1	1	1	1
Amount of waste reused	1	1	1	1	1	1	1	1
Waste reduction initiatives	1	1	1	1	1	1	1	1
Use of alternative raw materials with less waste	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Carbon emission reduction								
Reductions in direct emissions (scope 1)	1	1	1	0	1	1	1	1
Reductions in indirect emissions (scope 2)	1	1	1	0	1	1	1	1
Investments in technology to trap CO_2 and convert it to other economical uses	1	1	1	1	1	1	1	1
Total	3	3	3	1	3	3	3	3
Material efficiency								
Use of lesser material	1	1	1	1	1	1	1	1
Easily recycled material	1	1	1	1	1	1	1	1
Use of biodegradable material	1	1	1	1	1	1	1	1
Improved raw material handling	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4
Green products and services innovation								
Eco design	1	1	1	1	1	1	1	1
Green packaging	1	1	1	1	1	1	1	1
Eco labelling	1	1	1	1	1	1	1	1
Total	3	3	3	3	3	3	3	3
Environmental compliance								
Presence of ISO 14001	0	0	0	0	0	0	0	0
Absence of fines and penalties	1	1	1	1	1	1	1	1
Internal environmental policies	1	1	1	1	1	1	1	1
Total	2	2	2	2	2	2	2	2
Stakeholder engagement								
Stakeholder identification	1	1	1	1	1	1	1	1
Stakeholder communication on environmental issues	1	1	1	1	1	1	1	1
collaboration with other firms or organisations	1	1	1	1	1	1	1	1
Collaboration with stakeholders	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4

Processed environmental sustainability commitment data loaded in Stata

Code	Year	Energy	Water	Waste	Emissions	Materials	GreenP	Compliance	Stakeholder
0	2018	4	3	4	3	3	0	3	4
0	2017	4	3	4	3	1	0	3	4
0	2016	4	3	4	3	1	0	3	4
0	2015	4	3	4	3	1	0	3	4
0	2014	4	3	4	3	1	0	3	4
0	2013	4	3	4	3	1	0	3	4
0	2012	4	3	4	3	1	0	3	4
0	2011	1	0	1	3	2	0	3	4
1	2018	4	3	3	2	2	0	3	4
1	2017	4	3	4	3	1	0	3	4
1	2016	4	3	3	2	2	0	3	4
1	2015	4	3	3	2	2	0	3	4
1	2014	4	3	3	2	2	0	3	4
1	2013	4	3	3	2	2	0	3	4
1	2012	4	3	3	2	2	0	3	4
1	2011	4	3	3	2	2	0	3	4
2	2018	4	3	3	2	2	0	3	4
2	2017	4	3	4	3	1	0	3	4
2	2016	4	3	3	3	2	0	3	4
2	2015	4	1	4	0	2	0	3	4
2	2014	1	3	3	1	2	0	3	4
2	2013	4	2	4	3	2	0	3	4
2	2012	1	3	4	3	3	0	3	4
2	2011	1	1	2	2	3	0	3	4
3	2018	4	3	4	3	3	3	3	4

3	2017	4	3	4	3	3	0	3	4
3	2016	4	3	4	0	3	0	3	4
3	2015	1	3	4	3	3	0	3	4
3	2014	4	3	4	3	3	0	3	4
3	2013	4	1	4	3	3	0	3	4
3	2012	4	3	4	3	3	0	3	4
3	2011	4	3	4	3	3	0	3	4
4	2018	4	3	3	3	2	0	3	4
4	2017	4	3	3	1	1	0	3	4
4	2016	4	3	3	2	3	0	3	4
4	2015	4	1	0	2	2	0	3	4
4	2014	4	0	3	2	3	0	3	4
4	2013	1	3	3	2	3	0	3	4
4	2012	1	3	3	2	3	0	2	4
4	2011	1	3	3	2	3	0	2	4
5	2018	4	3	4	3	4	0	3	4
5	2017	4	3	4	3	4	0	3	4
5	2016	4	3	4	3	4	0	3	4
5	2015	4	3	4	3	4	0	3	4
5	2014	4	3	4	3	3	0	3	4
5	2013	4	3	4	3	3	0	3	4
5	2012	4	3	4	3	4	0	3	4
5	2011	4	3	4	3	4	0	3	4
6	2018	1	3	4	3	3	0	3	4
6	2017	1	3	4	3	3	0	3	4
6	2016	1	3	4	3	3	0	3	4
6	2015	4	3	4	3	3	0	3	4
6	2014	4	3	4	3	3	0	3	4

6	2013	4	3	4	3	3	0	3	4
6	2012	4	3	4	3	3	0	3	4
6	2011	4	3	4	3	3	0	3	4
7	2018	4	3	4	3	4	3	2	4
7	2017	4	3	4	1	4	3	2	4
7	2016	4	3	4	3	4	3	2	4
7	2015	4	3	4	3	4	3	2	4
7	2014	4	3	4	3	4	3	2	4
7	2013	4	3	4	3	4	3	2	4
7	2012	4	3	4	3	4	3	2	4
7	2011	4	3	4	3	4	3	2	4
8	2018	4	3	4	1	4	3	3	4
8	2017	3	0	4	2	4	3	3	4
8	2016	4	0	4	3	4	3	3	4
8	2015	3	3	4	2	4	3	3	4
8	2014	1	3	4	1	4	3	3	4
8	2013	4	2	4	3	4	3	3	4
8	2012	4	3	4	2	4	3	3	4
8	2011	1	3	4	3	4	3	3	4
9	2018	4	3	4	3	3	0	3	4
9	2017	1	2	4	3	4	0	3	4
9	2016	4	3	4	1	3	0	3	4
9	2015	3	3	4	1	4	0	3	4
9	2014	4	3	4	1	3	0	3	4
9	2013	4	3	4	1	3	0	3	4
9	2012	4	2	4	3	2	0	3	4
9	2011	3	2	4	3	1	0	3	4
10	2018	4	2	4	3	3	0	3	4

10	2017	1	2	4	1	3	0	3	4
10	2016	4	3	4	3	3	0	3	4
10	2015	1	3	4	1	3	0	3	4
10	2014	4	3	4	3	3	0	3	4
10	2013	1	3	4	1	3	0	3	4
10	2012	4	2	4	3	3	0	3	4
10	2011	1	2	4	1	3	2	3	4
11	2018	4	3	3	2	4	3	3	4
11	2017	3	3	4	3	4	3	3	4
11	2016	1	0	3	2	4	3	3	4
11	2015	3	3	4	3	4	3	3	4
11	2014	1	1	4	1	4	3	3	4
11	2013	1	3	4	1	4	3	3	4
11	2012	4	3	4	3	4	3	3	4
11	2011	2	2	4	3	4	3	3	4
12	2018	4	3	3	2	4	3	3	4
12	2017	3	3	4	3	4	3	3	4
12	2016	1	0	3	2	4	3	3	4
12	2015	3	3	4	3	4	3	3	4
12	2014	1	1	4	1	4	3	3	4
12	2013	1	3	4	1	4	3	3	4
12	2012	4	3	4	3	4	3	3	4
12	2011	2	2	4	3	4	3	3	4
13	2018	4	3	3	2	4	3	3	4
13	2017	3	3	4	3	4	3	3	4
13	2016	1	0	3	2	4	3	3	4
13	2015	3	3	4	3	4	3	3	4
13	2114	1	1	4	1	4	3	3	4

13	2013	1	3	4	1	4	3	3	4
13	2012	4	3	4	3	4	3	3	4
13	2011	2	2	4	3	4	3	3	4
14	2018	4	3	3	3	2	0	3	4
14	2017	1	1	3	1	2	0	3	4
14	2016	4	3	3	3	2	0	3	4
14	2015	1	1	3	3	2	0	3	4
14	2114	1	1	3	1	2	0	3	4
14	2013	1	3	3	1	2	0	3	4
14	2012	1	3	3	3	2	0	3	4
14	2011	1	3	3	2	2	0	3	4
15	2018	4	3	1	3	2	0	3	4
15	2017	4	3	1	2	2	0	3	4
15	2016	4	3	2	3	2	0	3	4
15	2015	4	1	2	3	2	0	2	4
15	2114	4	2	2	3	2	0	2	4
15	2013	4	0	1	1	2	0	2	4
15	2012	4	0	3	3	2	0	2	4
15	2011	3	3	3	3	4	0	2	4
16	2018	1	3	4	3	4	3	3	4
16	2017	1	0	4	1	4	3	3	4
16	2016	4	0	4	2	4	3	3	4
16	2015	1	3	4	3	4	3	3	4
16	2114	4	3	4	1	4	3	3	4
16	2013	2	3	4	1	4	3	3	4
16	2012	1	3	4	3	4	3	3	4
16	2011	4	3	4	1	4	3	3	4
17	2018	4	3	4	3	3	0	3	4

17	2017	4	3	4	1	3	0	3	4
17	2016	1	0	4	2	3	0	3	4
17	2015	4	3	4	3	3	0	3	4
17	2114	4	3	4	1	3	0	3	4
17	2013	3	3	4	1	3	0	3	4
17	2012	1	3	4	3	3	0	3	4
17	2011	1	3	4	1	3	0	3	4
18	2018	0	0	0	0	0	0	2	4
18	2017	1	0	0	1	3	0	2	4
18	2016	1	0	0	0	3	0	2	4
18	2015	4	0	0	1	3	0	2	4
18	2114	1	0	4	3	3	0	2	4
18	2013	1	0	1	1	3	0	2	4
18	2012	1	3	4	3	3	0	2	4
18	2011	1	3	4	1	3	0	2	4
19	2018	4	3	4	3	4	3	3	4
19	2017	4	3	4	3	4	3	3	4
19	2016	1	2	4	3	4	3	3	4
19	2015	2	3	4	2	4	3	3	4
19	2114	2	2	4	2	4	3	3	4
19	2013	4	3	4	3	4	3	3	4
19	2012	1	3	4	2	4	3	3	4
19	2011	4	3	4	3	4	3	3	4
20	2018	4	3	4	3	4	0	3	4
20	2017	4	3	4	3	4	0	3	4
20	2016	0	2	4	3	4	0	3	4
20	2015	2	3	4	2	4	0	3	4
20	2114	1	2	4	2	4	0	3	4

20	2013	4	3	4	3	4	0	3	4
20	2012	1	3	4	2	4	0	3	4
20	2011	2	0	2	3	4	0	3	4
21	2018	4	3	3	3	1	0	3	4
21	2017	1	1	2	1	0	0	3	4
21	2016	4	2	2	3	0	0	3	4
21	2015	4	1	3	2	0	0	3	4
21	2114	4	2	3	1	0	0	3	4
21	2013	4	0	1	3	0	0	3	4
21	2012	1	0	1	2	0	0	3	4
21	2011	2	1	1	3	0	0	3	4
22	2018	4	3	3	3	2	0	3	4
22	2017	4	1	4	3	1	0	3	4
22	2016	4	3	4	3	1	0	3	4
22	2015	4	0	4	3	1	0	3	4
22	2114	4	3	4	3	1	0	3	4
22	2013	4	0	4	3	1	0	3	4
22	2012	4	3	4	1	1	0	3	4
22	2011	4	3	4	3	1	0	3	4
23	2018	4	0	4	2	2	0	3	4
23	2017	4	3	4	3	1	0	3	4
23	2016	3	1	4	1	1	0	3	4
23	2015	4	0	4	3	1	0	3	4
23	2014	1	0	4	1	1	0	3	4
23	2013	4	0	4	1	1	0	3	4
23	2012	1	0	4	1	1	0	3	4
23	2011	4	1	4	3	1	0	3	4
24	2018	0	0	0	2	0	0	2	4

24	2017	0	0	0	3	0	0	2	4
24	2016	0	0	0	1	0	0	2	4
24	2015	1	0	0	0	0	0	2	4
24	2114	1	0	0	0	0	0	2	4
24	2013	0	0	0	0	0	0	2	4
24	2012	0	0	0	0	0	0	2	4
24	2011	0	0	0	0	0	0	2	4
25	2018	4	3	4	3	3	3	3	4
25	2017	4	3	4	3	3	3	3	4
25	2016	4	3	4	3	3	3	3	4
25	2015	4	3	4	3	3	3	3	4
25	2114	4	3	4	3	3	3	3	4
25	2013	4	3	4	0	3	3	3	4
25	2012	4	3	4	3	3	3	3	4
25	2011	1	2	4	1	3	3	3	4
26	2018	1	3	2	2	1	0	3	4
26	2017	4	3	3	3	1	0	3	4
26	2016	3	2	4	3	1	0	3	4
26	2015	4	2	3	2	1	0	3	4
26	2114	4	3	2	3	1	0	3	4
26	2013	2	2	4	3	1	0	3	4
26	2012	3	3	4	2	1	0	3	4
26	2011	2	2	4	2	1	0	3	4
27	2018	1	2	3	3	3	3	2	4
27	2017	4	3	2	3	3	3	2	4
27	2016	4	0	2	3	3	3	2	4
27	2015	4	0	2	1	3	3	2	4
27	2114	4	3	2	3	3	3	2	4

27	2013	4	0	4	3	3	3	2	4
27	2012	1	1	2	1	3	3	2	4
27	2011	1	3	4	3	3	3	2	4
28	2018	4	3	4	3	3	3	3	4
28	2017	4	3	2	3	3	3	3	4
28	2016	1	3	2	1	3	3	3	4
28	2015	1	3	3	2	3	3	3	4
28	2114	4	3	4	2	3	3	3	4
28	2013	4	0	4	3	3	3	3	4
28	2012	4	1	4	3	3	3	3	4
28	2011	1	3	4	3	3	3	3	4
29	2018	4	3	4	3	4	3	2	4
29	2017	4	3	4	3	4	3	2	4
29	2016	4	3	4	3	4	3	2	4
29	2015	1	3	3	2	4	3	2	4
29	2114	4	0	4	1	4	3	2	4
29	2013	4	0	2	1	4	3	2	4
29	2012	2	0	2	3	4	3	2	4
29	2011	4	0	2	1	4	3	2	4
30	2018	4	0	4	3	3	0	3	4
30	2017	2	3	4	2	3	0	3	4
30	2016	4	0	4	1	3	0	3	4
30	2015	4	0	4	1	3	0	3	4
30	2114	4	0	4	1	3	0	3	4
30	2013	4	0	2	1	3	0	3	4
30	2012	4	3	4	1	3	0	3	4
30	2011	4	0	4	0	3	0	3	4
31	2018	2	3	4	3	4	3	2	4

31	2017	4	3	4	3	4	3	2	4
31	2016	4	3	4	3	4	3	2	4
31	2015	4	3	4	3	4	3	2	4
31	2114	4	3	4	1	4	3	2	4
31	2013	4	0	4	3	4	3	2	4
31	2012	4	3	4	3	4	3	2	4
31	2011	4	3	4	3	4	3	2	4

Appendix 2-Financial performance raw data

Firm Code	Year	Liquidity	Firm size	ROA	ROE	EPS	Share Price	Tobin's Q
0	2018	2.62	248	4.88	17.61	2,526	11,301	0.78
0	2017	1.66	167	-6.97	5.84	1,684	7,661	0.65
0	2016	1.23	184	-4.69	-2.37	494	8,480	0.75
0	2015	1.74	198	-1.76	0.41	803	9,128	0.66
0	2014	1.89	408	2.91	12.32	1,900	18,826	1.25
0	2013	2.82	345	7.64	6.79	1,735	16,034	0.99
0	2012	2.40	373	14.65	14.82	1,615	17,367	1.13
0	2011	2.41	406	16.54	15.65	1,559	19,068	1.35
1	2018	1.41	1351	11.35	14.47	2,893	51,497	1.58
1	2017	1.54	934	6.06	4.68	1,482	34,784	1.23
1	2016	1.39	728	3.03	1.58	713	27,157	1.06
1	2015	1.95	477	-17.12	-29.99	41	17,816	0.83
1	2014	1.34	899	1.24	1.23	301	33,625	1.16
1	2013	1.46	1002	1.79	-2.75	556	37,505	1.29
1	2012	1.40	1132	-7.85	-13.40	-562	42,381	1.49
1	2011	1.21	1430	8.18	6.37	1,365	53,495	1.60
2	2018	1.95	786	11.21	13.89	2,705	29,964	0.85
2	2017	1.99	676	11.48	14.83	3,047	25,176	0.83
2	2016	1.91	556	5.89	9.00	2,161	20,750	0.81
2	2015	2.36	191	-8.21	-27.87	370	7,164	0.59
2	2014	2.13	579	-0.22	-8.97	1,302	21,651	0.81
2	2013	1.94	586	2.67	-2.80	984	21,951	0.80
2	2012	2.05	683	-0.61	-3.85	780	25,586	0.89
2	2011	2.36	818	12.25	13.79	3,588	30,605	0.89
3	2018	1.55	0	4.46	4.63	703	0	0.34
3	2017	1.57	0	1.05	-7.72	80	0	0.37
3	2016	1.53	586	6.37	2.49	397	14,363	0.96
3	2015	1.91	415	4.45	-2.87	-230	10,261	0.74
3	2014	1.68	394	5.24	-1.92	-206	9,757	0.81
3	2013	1.80	503	-20.82	-66.94	193	12,515	0.92
3	2012	1.37	1007	10.83	14.80	2,431	26,303	1.23
3	2011	2.73	1384	20.50	27.90	2,773	36,257	1.80
4	2018	0.42	1294	-1.75	12.71	1,704	15,639	0.93
4	2017	0.43	1347	-1.89	12.75	1,717	16,175	0.92
4	2016	0.42	1396	-1.86	15.81	1,770	16,489	0.94
4	2015	0.48	1192	-1.51	16.05	1,687	14,099	0.90
4	2014	0.42	1503	-1.50	15.98	1,538	17,757	0.97

4	2013	0.60	1100	-1.50	15.50	1,398	12,988	0.88
4	2012	0.28	1123	-1.52	12.55	1,227	15,658	0.97
4	2011	0.31	1013	-1.31	15.53	1,356	14,138	0.95
5	2018	2.51	6340	13.17	6.16	923	30,021	0.61
5	2017	1.85	4077	10.93	11.07	1,473	19,304	0.54
5	2016	1.44	3822	-3.86	-12.63	-1,764	18,097	0.60
5	2015	1.27	5403	5.53	2.42	459	25,606	0.57
5	2014	1.23	7199	14.33	16.48	2,820	34,105	0.70
5	2013	0.97	5810	13.36	14.23	1,972	27,525	0.63
5	2012	0.93	4903	18.56	22.73	2,378	23,227	0.69
5	2011	1.28	5381	27.25	36.40	3,148	25,491	0.79
6	2018	0.77	11742	40.35	8.88	4,763	47,805	4.69
6	2017	0.90	21304	28.70	63.43	12,045	86,734	7.05
6	2016	1.04	15615	19.78	67.11	4,107	77,036	4.05
6	2015	1.09	17073	20.86	75.08	4,106	84,234	4.44
6	2014	1.04	12922	29.28	55.94	3,031	63,760	5.34
6	2013	1.13	10948	30.63	51.14	3,038	54,026	4.85
6	2012	1.13	8623	32.83	48.70	2,570	44,672	4.67
6	2011	1.08	7835	28.06	34.07	1,980	38,673	4.56
7	2018	1.25	473	18.58	33.32	612	19,384	4.48
7	2017	1.14	346	19.75	38.71	536	14,639	3.82
7	2016	1.06	297	19.97	44.61	462	12,596	3.78
7	2015	1.06	225	19.65	47.43	399	9,392	3.18
7	2014	1.02	160	21.82	55.18	342	6,626	2.96
7	2013	1.01	141	21.93	54.59	302	5,712	3.01
7	2012	1.05	140	23.01	51.07	274	5,553	3.66
7	2011	0.94	99	24.19	67.49	250	3,949	3.00
8	2018	3.10	593	7.46	7.90	3,689	10,522	1.66
8	2017	3.70	571	8.36	7.19	2,828	9,922	1.88
8	2016	3.42	531	11.93	15.75	4,733	10,183	1.82
8	2015	3.13	532	12.10	8.25	2,952	10,207	1.84
8	2014	3.80	5340	17.82	17.44	571	10,231	2.59
8	2013	3.05	3904	16.68	17.68	471	7,479	2.21
8	2012	3.16	2482	18.63	17.56	312	4,755	2.20
8	2011	3.18	2021	14.52	14.02	186	3,873	2.21
9	2018	1.50	0	-4.80	-12.44	93	0	0.36
9	2017	1.30	0	3.77	-0.61	346	0	0.28
9	2016	1.22	328	7.82	5.70	382	3,998	0.65
9	2015	1.61	315	1.28	-7.48	-51	4,059	0.63
9	2014	1.53	380	3.44	0.34	43	4,928	0.51
9	2013	1.70	268	-8.04	-8.70	-45	3,502	0.37
9	2012	1.76	737	7.97	11.02	816	10,115	0.61

9	2011	1.17	945	15.37	14.99	970	13,071	0.88
10	2018	1.77	154	-19.23	-28.70	-171	2,149	0.41
10	2017	2.41	258	-14.68	-17.56	-137	3,599	0.53
10	2016	2.55	326	-0.62	-0.13	12	4,594	0.55
10	2015	2.03	378	-5.76	-7.31	36	6,227	0.58
10	2014	2.44	679	-0.22	0.02	86	11,194	0.97
10	2013	2.79	584	3.24	1.96	330	9,635	0.86
10	2012	2.25	844	8.55	8.33	685	13,926	1.27
10	2011	2.27	1088	14.28	13.96	1,105	18,112	1.78
11	2018	0.39	969	-0.33	10.66	855	9,887	0.72
11	2017	0.40	911	-0.16	10.04	817	9,510	0.72
11	2016	0.45	996	-0.23	13.30	811	10,970	0.73
11	2015	0.44	6106	-0.62	6.68	638	10,455	0.70
11	2014	0.48	465	-0.56	8.52	546	8,032	0.76
11	2013	0.47	387	-0.62	7.97	429	6,740	0.74
11	2012	0.68	275	-0.86	6.09	321	4,792	0.78
11	2011	1.04	281	-0.42	10.31	421	5,247	0.78
12	2018	0.39	968	-0.33	10.66	855	9,877	0.75
12	2017	0.40	904	-0.16	10.04	817	9,443	0.76
12	2016	0.45	988	-0.23	13.30	811	10,878	0.77
12	2015	0.44	617	-0.62	6.68	638	10,564	0.74
12	2014	0.48	466	-0.58	8.89	594	8,064	0.79
12	2013	0.47	387	-0.58	7.41	462	6,743	0.76
12	2012	0.68	275	-0.83	5.92	341	4,802	0.80
12	2011	1.04	279	-0.42	10.31	421	5,205	0.80
13	2018	1.07	143	2.24	22.77	1,056	16,518	1.24
13	2017	1.07	126	2.31	23.04	997	14,548	1.24
13	2016	1.05	136	2.13	28.13	1,063	15,659	1.23
13	2015	1.06	106	2.66	30.43	1,026	12,455	1.20
13	2014	1.06	97	2.42	25.64	735	11,377	1.25
13	2013	1.08	75	2.72	23.15	645	8,835	1.26
13	2012	1.07	62	2.40	16.15	473	7,290	1.29
13	2011	1.06	61	2.24	19.32	562	7,201	1.25
14	2018	3.79	858	25.95	27.27	3,028	26,664	1.46
14	2017	4.01	1134	34.24	35.48	3,047	35,212	1.91
14	2016	4.03	546	26.70	30.96	2,730	17,115	1.11
14	2015	2.92	116	5.45	2.43	1,182	3,617	0.56
14	2014	1.39	782	37.71	51.65	3,432	24,407	1.81
14	2013	2.28	1318	63.73	74.15	4,808	41,124	3.38
14	2012	1.70	1767	63.37	81.61	3,797	55,050	5.27
14	2011	1.53	1608	92.89	107.64	5,313	50,108	4.80
15	2018	1.05	378	17.70	10.56	109	2,581	2.25

15	2017	0.47	351	15.56	5.66	77	2,427	2.31
15	2016	0.68	406	23.47	29.46	193	3,846	3.42
15	2015	0.77	378	27.22	36.11	180	3,651	3.47
15	2014	0.70	479	43.62	57.89	178	4,628	5.35
15	2013	0.74	409	37.78	38.92	170	3,944	5.13
15	2012	0.77	330	35.90	37.96	141	3,186	5.10
15	2011	0.85	191	35.44	36.59	120	1,842	3.67
16	2018	0.84	220	5.97	13.64	417	10,228	0.83
16	2017	0.86	273	9.16	23.75	694	12,630	1.13
16	2016	0.92	72	8.47	21.42	598	12,621	1.11
16	2015	0.85	228	7.61	19.74	516	10,541	0.91
16	2014	0.89	305	7.58	20.24	510	14,105	1.33
16	2013	0.86	294	8.93	24.80	615	13,575	1.32
16	2012	0.91	406	15.30	39.35	891	18,789	2.15
16	2011	0.96	296	10.79	21.15	433	13,852	2.12
17	2018	0.00	0	-7.76	-14.27	485	9,581	1.19
17	2017	0.00	0	6.35	5.23	526	11,971	1.31
17	2016	0.00	0	7.37	5.97	623	19,377	2.10
17	2015	1.68	1063	#N/A	#N/A	#N/A	#N/A	2.10
17	2014	1.36	570	#N/A	#N/A	#N/A	#N/A	2.10
17	2013	1.47	503	#N/A	#N/A	#N/A	#N/A	2.10
17	2012	1.40	231	#N/A	#N/A	#N/A	#N/A	2.10
17	2011	1.31	179	#N/A	#N/A	#N/A	#N/A	2.10
18	2018	1.42	273	-2.83	6.13	93	1,807	0.53
18	2017	1.43	317	-2.58	6.69	118	2,016	0.53
18	2016	1.45	358	-2.51	8.88	134	2,276	0.53
18	2015	1.19	457	-1.94	11.64	185	2,936	0.22
18	2014	0.50	408	-1.73	12.93	207	2,627	0.46
18	2013	0.35	335	-2.09	11.02	162	2,155	0.52
18	2012	0.30	272	-2.68	9.78	145	1,749	0.64
18	2011	1.96	253	-2.50	7.22	130	1,701	0.61
19	2018	1.35	1471	16.13	22.43	2,886	30,307	1.54
19	2017	1.35	1535	15.17	18.32	2,196	31,630	1.78
19	2016	1.22	1334	16.32	21.19	2,212	27,474	1.61
19	2015	1.34	1485	13.15	17.42	1,749	30,595	1.77
19	2014	1.50	910	13.16	18.44	1,433	18,751	1.46
19	2013	1.44	787	9.76	13.24	1,171	16,213	1.30
19	2012	1.29	448	7.71	8.98	669	9,242	1.05
19	2011	1.28	280	10.09	11.84	711	5,767	0.77
20	2018	1.35	1440	16.13	22.43	2,886	29,664	1.16
20	2017	1.35	1537	15.17	18.32	2,196	31,656	1.29
20	2016	1.22	1336	16.32	21.19	2,212	27,516	1.33

20	2015	1.34	1504	13.15	17.42	1,749	30,994	1.39
20	2014	1.50	916	13.16	18.44	1,433	18,867	1.13
20	2013	1.44	789	9.76	13.24	1,171	16,261	1.12
20	2012	1.29	446	7.71	8.98	669	9,197	0.84
20	2011	1.28	279	10.09	11.84	711	5,753	0.56
21	2018	0.80	1621	11.68	10.28	337	8,604	1.07
21	2017	0.92	2455	8.81	4.76	182	13,029	1.46
21	2016	1.02	2257	7.14	-2.55	-77	11,981	1.41
21	2015	1.07	2523	14.22	13.80	746	13,675	1.25
21	2014	1.28	3931	24.97	24.96	1,536	21,573	2.13
21	2013	1.29	3676	26.22	22.97	1,386	20,059	2.40
21	2012	1.07	3100	28.02	23.26	1,089	16,916	2.49
21	2011	1.21	2617	26.73	23.35	1,069	14,165	2.03
22	2018	1.02	1302	-1.05	15.97	2,793	26,402	0.99
22	2017	1.08	1182	-1.13	14.20	2,452	23,746	0.98
22	2016	1.07	1155	-1.24	13.38	2,400	23,293	0.98
22	2015	0.61	895	-1.15	14.34	2,284	18,794	0.95
22	2014	0.97	1110	-1.20	14.62	2,127	23,857	1.02
22	2013	1.05	942	-1.28	14.25	1,884	20,439	1.03
22	2012	1.05	830	-1.36	13.86	1,646	18,168	1.01
22	2011	1.00	655	-1.53	12.65	1,365	14,393	0.99
23	2018	1.18	371	32.69	50.25	49	2,725	2.19
23	2017	1.06	320	-5.58	-6.63	110	2,354	1.61
23	2016	1.07	444	7.95	16.38	119	3,281	2.24
23	2015	1.02	507	13.42	23.39	174	3,762	2.42
23	2014	0.97	440	14.16	24.37	158	3,292	2.53
23	2013	1.01	315	30.55	71.13	138	2,373	2.24
23	2012	1.05	242	-25.76	-422.65	95	1,842	1.56
23	2011	0.88	171	10.43	30.46	117	1,324	1.54
24	2018	0.74	352	2.52	27.40	2,099	30,647	0.83
24	2017	0.82	297	2.72	22.47	1,425	25,883	0.88
24	2016	0.75	271	3.50	17.63	1,086	23,581	1.04
24	2015	0.88	211	9.57	29.06	1,844	19,194	0.87
24	2014	0.83	244	6.45	22.53	1,446	21,329	1.13
24	2013	0.78	213	3.78	18.26	1,033	18,664	1.11
24	2012	0.70	214	4.68	18.64	995	18,805	1.28
24	2011	0.73	158	7.43	22.80	1,216	13,963	1.03
25	2018	1.62	514	8.22	15.35	772	9,539	0.82
25	2017	1.79	460	10.33	19.10	857	8,611	0.94
25	2016	1.36	376	11.61	24.94	858	7,091	0.90
25	2015	1.57	216	7.05	14.29	385	4,111	0.75
25	2014	1.60	236	5.40	12.12	328	4,516	0.79
25	2013	1.56	131	0.63	-13.01	-56	2,525	0.65

25	2012	1.66	123	6.84	6.62	74	2,380	0.64
25	2011	1.35	135	1.68	-13.72	-117	2,596	0.61
26	2018	1.36	2994	3.73	3.91	2,745	48,053	0.88
26	2017	1.69	2396	7.72	9.62	3,515	36,795	0.75
26	2016	2.60	2730	6.12	6.39	4,140	41,912	0.88
26	2015	2.58	2808	13.92	15.51	4,976	43,136	1.02
26	2014	2.50	4069	15.04	17.30	6,016	62,548	1.52
26	2013	2.48	2793	16.44	17.56	5,262	43,055	1.18
26	2012	2.12	2307	18.22	18.83	4,228	35,791	1.14
26	2011	2.19	2245	17.02	18.39	3,385	34,939	1.30
27	2018	0.22	2821	-0.89	16.63	1,748	17,433	0.81
27	2017	0.30	2984	-0.96	16.71	1,640	18,430	0.81
27	2016	0.29	2447	-1.11	14.73	1,440	15,122	0.78
27	2015	0.37	1846	-1.62	15.72	1,389	11,413	0.73
27	2014	0.50	2203	-1.16	13.07	1,081	13,964	0.71
27	2013	0.58	1945	-1.16	12.57	1,084	12,279	0.70
27	2012	0.64	1723	-1.36	14.63	963	11,220	0.78
27	2011	0.64	1487	-1.19	13.35	887	9,827	0.84
28	2018	1.09	2702	10.72	11.29	597	5,287	0.66
28	2017	1.06	3832	11.49	13.77	721	7,273	0.98
28	2016	0.99	2943	7.01	8.59	330	5,586	0.79
28	2015	0.92	3963	7.65	12.27	607	7,611	1.08
28	2014	0.83	1660	12.58	16.78	851	3,252	0.55
28	2013	0.89	73	-27.28	-65.11	87	1,442	0.35
28	2012	1.05	128	2.65	-0.73	311	2,517	0.38
28	2011	1.16	180	7.73	4.12	332	3,532	0.45
29	2018	3.11	358	23.68	25.49	616	8,095	3.25
29	2017	4.84	320	23.45	29.92	662	7,256	2.96
29	2016	3.27	395	24.52	32.51	668	9,069	3.59
29	2015	4.98	349	27.61	32.78	594	8,331	4.27
29	2014	4.99	312	30.56	36.22	577	7,544	4.01
29	2013	6.27	338	36.00	38.72	571	8,107	5.66
29	2012	6.82	375	36.52	37.20	527	8,865	6.09
29	2011	4.69	295	36.70	38.51	456	6,979	5.51
30	2018	1.07	428668	16.93	23.80	923	15,879	2.29
30	2017	1.09	341458	29.56	55.76	923	15,256	3.52
30	2016	1.07	335030	29.71	53.47	883	15,114	3.79
30	2015	0.95	256049	30.49	57.44	860	13,213	3.44
30	2014	0.91	230337	36.66	57.44	896	12,534	3.69
30	2013	0.85	191670	38.29	62.46	872	11,432	3.35
30	2012	0.96	160179	38.44	54.81	709	10,463	3.70
30	2011	0.81	82483	36.98	52.78	656	7,504	3.29
31	2018	0.96	537	-6.24	-27.07	346	5,597	2.52

31	2017	0.97	610	30.03	28.61	421	6,350	2.87
31	2016	0.94	795	22.91	21.91	456	8,283	3.39
31	2015	0.91	889	21.69	21.87	370	9,559	4.46
31	2014	1.05	584	20.41	43.57	365	7,700	3.88
31	2013	1.22	484	35.59	46.22	340	6,426	5.65
31	2012	1.17	373	30.44	45.87	267	5,008	4.79
31	2011	1.41	221	25.35	40.69	215	2,939	3.06

Appendix 3-Ordinary Least squares results

ROE model

```
. regress ROE Energy Waste Water Emissions Materials GreenP Compliance Stakeholder Liquidity Firmsize

      Source |       SS       df       MS              Number of obs =     256
-------------+------------------------------           F( 10,   245) =    2.78
       Model |  30868.2994    10  3086.82994           Prob > F      =  0.0028
    Residual |    271908.7   245  1109.83143           R-squared     =  0.1020
-------------+------------------------------           Adj R-squared =  0.0653
       Total |  302776.999   255  1187.36078           Root MSE      =  33.314

------------------------------------------------------------------------------
         ROE |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      Energy |   1.282749   1.649794     0.78   0.438    -1.966841    4.532339
       Waste |  -5.134025   2.716108    -1.89   0.060    -10.48393    .2158775
       Water |   3.363012   2.091768     1.61   0.109     -.757131    7.483155
   Emissions |    2.89356   2.498068     1.16   0.248    -2.026869    7.813989
   Materials |   2.918611   2.466222     1.18   0.238    -1.939092    7.776313
      GreenP |   .3949548   1.934902     0.20   0.838     -3.41621    4.206119
  Compliance |  -13.56394   5.991437    -2.26   0.024    -25.36524   -1.762647
 Stakeholder |   1.034287   7.057352     0.15   0.884    -12.86654    14.93511
   Liquidity |   1.325205   2.147832     0.62   0.538    -2.905368    5.555777
    Firmsize |   .0001638   .0000473     3.47   0.001     .0000707    .0002569
       _cons |   37.34494    33.1837     1.13   0.262     -28.0168    102.7067
```

ROA model

```
. regress ROA Energy Waste Water Emissions Materials GreenP Compliance Stakeholder Liquidity Firmsize
```

Source	SS	df	MS
Model	8887.7608	10	888.77608
Residual	44550.1095	245	181.837182
Total	53437.8704	255	209.560276

Number of obs =	256
F(10, 245) =	4.89
Prob > F =	0.0000
R-squared =	0.1663
Adj R-squared =	0.1323
Root MSE =	13.485

ROA	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Energy	.2268192	.6677942	0.34	0.734	-1.088531	1.542169
Waste	-.7908388	1.099411	-0.72	0.473	-2.956341	1.374664
Water	.6485593	.8466938	0.77	0.444	-1.019168	2.316287
Emissions	1.162435	1.011153	1.15	0.251	-.8292275	3.154098
Materials	.6079606	.998263	0.61	0.543	-1.358312	2.574233
GreenP	-.7684577	.7831984	-0.98	0.327	-2.311119	.7742034
Compliance	-5.800722	2.425179	-2.39	0.018	-10.57758	-1.023862
Stakeholder	3.326665	2.856634	1.16	0.245	-2.30003	8.95336
Liquidity	3.967777	.8693871	4.56	0.000	2.25535	5.680203
Firmsize	.0000836	.0000191	4.37	0.000	.0000459	.0001213
_cons	4.250299	13.43191	0.32	0.752	-22.20645	30.70704

EPS model

```
. regress EPS Energy Water Waste Emissions Materials GreenP Compliance Stakeholder Liquidity Firmsize
note: Stakeholder omitted because of collinearity
```

Source	SS	df	MS
Model	75241269.7	9	8360141.08
Residual	413995683	246	1682909.28
Total	489236953	255	1918576.29

Number of obs =	256
F(9, 246) =	4.97
Prob > F =	0.0000
R-squared =	0.1538
Adj R-squared =	0.1228
Root MSE =	1297.3

EPS	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Energy	-162.6615	64.21653	-2.53	0.012	-289.1459	-36.17714
Water	112.6293	81.22394	1.39	0.167	-47.35382	272.6123
Waste	-72.04561	105.675	-0.68	0.496	-280.1888	136.0976
Emissions	304.1527	97.25121	3.13	0.002	112.6014	495.7039
Materials	-179.072	95.94879	-1.87	0.063	-368.0579	9.913956
GreenP	-89.99811	74.65432	-1.21	0.229	-237.0413	57.04509
Compliance	539.7317	233.2814	2.31	0.022	80.24802	999.2155
Stakeholder	0	(omitted)				
Liquidity	234.4587	83.63738	2.80	0.005	69.72202	399.1955
Firmsize	.0012316	.0018399	0.67	0.504	-.0023923	.0048556
_cons	-273.6771	642.0329	-0.43	0.670	-1538.26	990.9056

Share price model

```
. regress SharePrice Energy Waste Water Emissions Materials GreenP Compliance Stakeholder Liquidity Firmsize
```

Source	SS	df	MS		
Model	1.0880e+10	10	1.0880e+09	Number of obs =	256
Residual	4.2924e+10	245	175200739	F(10, 245) =	6.21
Total	5.3804e+10	255	210996807	Prob > F =	0.0000
				R-squared =	0.2022
				Adj R-squared =	0.1697
				Root MSE =	13236

SharePrice	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Energy	-1411.377	655.4948	-2.15	0.032	-2702.501	-120.2523
Waste	-1578.755	1079.162	-1.46	0.145	-3704.374	546.863
Water	2453.078	831.0994	2.95	0.003	816.0665	4090.089
Emissions	2752.197	992.5301	2.77	0.006	797.2162	4707.177
Materials	-1062.531	979.8771	-1.08	0.279	-2992.589	867.5273
GreenP	-2255.86	768.7735	-2.93	0.004	-3770.108	-741.6114
Compliance	4981.806	2380.512	2.09	0.037	292.9258	9670.687
Stakeholder	-3537.6	2804.021	-1.26	0.208	-9060.663	1985.463
Liquidity	1016.959	853.3748	1.19	0.235	-663.9285	2697.846
Firmsize	.0175316	.0187815	0.93	0.352	-.0194621	.0545253
_cons	17699.1	13184.52	1.34	0.181	-8270.365	43668.57

Tobin's Q model

```
. regress TobinsQ Energy Waste Water Emissions Materials GreenP Compliance Stakeholder Liquidity Firmsize
```

Source	SS	df	MS		
Model	114.530938	10	11.4530938	Number of obs =	256
Residual	344.408291	245	1.40574813	F(10, 245) =	8.15
Total	458.93923	255	1.79976168	Prob > F =	0.0000
				R-squared =	0.2496
				Adj R-squared =	0.2189
				Root MSE =	1.1856

TobinsQ	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Energy	.0736927	.0587158	1.26	0.211	-.0419595	.1893449
Waste	.1307185	.0966657	1.35	0.178	-.0596834	.3211203
Water	-.0124647	.0744456	-0.17	0.867	-.1590996	.1341703
Emissions	.0629712	.0889057	0.71	0.479	-.1121457	.2380882
Materials	.0901377	.0877723	1.03	0.305	-.0827469	.2630222
GreenP	-.0783913	.0688627	-1.14	0.256	-.2140298	.0572472
Compliance	-1.322484	.2132339	-6.20	0.000	-1.74249	-.9024789
Stakeholder	.1378072	.2511696	0.55	0.584	-.35692	.6325344
Liquidity	.2901161	.0764409	3.80	0.000	.139551	.4406812
Firmsize	6.98e-06	1.68e-06	4.15	0.000	3.66e-06	.0000103
_cons	3.399848	1.181001	2.88	0.004	1.073638	5.726057

Appendix 4- Diagnostic tests

Multicollinearity

```
. vif
```

Variable	VIF	1/VIF
Materials	2.11	0.474123
Waste	2.02	0.494081
GreenP	1.83	0.547291
Water	1.49	0.671468
Compliance	1.40	0.715940
Emissions	1.27	0.785214
Energy	1.22	0.816757
Firmsize	1.17	0.855648
Stakeholder	1.04	0.959053
Liquidity	1.02	0.976330
Mean VIF	1.46	

Serial autocorrelation

ROE

```
. tsset time
        time variable:  time, 1 to 256
                delta:  1 unit

. estat bgodfrey, lag(1)

Breusch-Godfrey LM test for autocorrelation
```

lags(*p*)	chi2	df	Prob > chi2
1	0.031	1	0.8601

H0: no serial correlation

ROA

```
. estat bgodfrey, lag(1)

Breusch-Godfrey LM test for autocorrelation
```

lags(*p*)	chi2	df	Prob > chi2
1	83.420	1	0.0000

```
H0: no serial correlation
```

EPS

```
. estat bgodfrey, lag(1)

Breusch-Godfrey LM test for autocorrelation
```

lags(*p*)	chi2	df	Prob > chi2
1	83.420	1	0.0000

```
H0: no serial correlation
```

Share Price

```
. estat bgodfrey, lag(1)

Breusch-Godfrey LM test for autocorrelation
```

lags(*p*)	chi2	df	Prob > chi2
1	139.362	1	0.0000

```
H0: no serial correlation
```

Tobin’s Q

```
. estat bgodfrey, lag(1)

Breusch-Godfrey LM test for autocorrelation
```

lags(p)	chi2	df	Prob > chi2
1	160.709	1	0.0000

```
                    H0: no serial correlation
```

Heteroscedascity

ROE

```
. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of ROE

         chi2(1)      =   335.10
         Prob > chi2  =   0.0000
```

ROA

```
. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of ROA

         chi2(1)      =     0.74
         Prob > chi2  =   0.3902
```

EPS

```
. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of ROA

         chi2(1)      =     0.74
         Prob > chi2  =   0.3902
```

Share price

```
. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of SharePrice

         chi2(1)      =    82.10
         Prob > chi2  =   0.0000
```

Tobin's Q

```
. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of TobinsQ

         chi2(1)      =     8.91
         Prob > chi2  =   0.0028
```

Appendix 5- Fixed generalized least squares results

ROE

```
. xtgls ROE Energy Water Waste Emissions Materials GreenP Compliance Stakeholder Liquidity Firmsize, panel(hetero) corr(ar1)

Cross-sectional time-series FGLS regression

Coefficients:  generalized least squares
Panels:        heteroskedastic
Correlation:   common AR(1) coefficient for all panels  (0.2203)

Estimated covariances      =         8          Number of obs      =       256
Estimated autocorrelations =         1          Number of groups   =         8
Estimated coefficients     =        11          Time periods       =        32
                                                Wald chi2(10)      =     37.42
                                                Prob > chi2        =    0.0000
```

ROE	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Energy	-.4996511	.9653464	-0.52	0.605	-2.391695	1.392393
Water	-.18322	1.241316	-0.15	0.883	-2.616155	2.249715
Waste	.8954219	1.566322	0.57	0.568	-2.174513	3.965357
Emissions	1.129618	1.481394	0.76	0.446	-1.773861	4.033096
Materials	-.7624667	1.508428	-0.51	0.613	-3.718931	2.193998
GreenP	1.164538	1.139928	1.02	0.307	-1.06968	3.398757
Compliance	-11.83462	3.4652	-3.42	0.001	-18.62629	-5.042952
Stakeholder	.2171601	3.762962	0.06	0.954	-7.15811	7.59243
Liquidity	.3921404	1.254212	0.31	0.755	-2.066071	2.850352
Firmsize	.0001294	.0000256	5.05	0.000	.0000792	.0001796
_cons	44.15755	17.89149	2.47	0.014	9.090879	79.22423

ROA

```
. xtgls ROA Energy Water Waste Emissions Materials GreenP Compliance Stakeholder Liquidity Firmsize, panel(hetero) corr(ar1)

Cross-sectional time-series FGLS regression

Coefficients:  generalized least squares
Panels:        heteroskedastic
Correlation:   common AR(1) coefficient for all panels  (0.2527)

Estimated covariances      =         8          Number of obs      =       256
Estimated autocorrelations =         1          Number of groups   =         8
Estimated coefficients     =        11          Time periods       =        32
                                                Wald chi2(10)      =     46.36
                                                Prob > chi2        =    0.0000
```

ROA	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Energy	-.1948275	.5473692	-0.36	0.722	-1.267651	.8779964
Water	.9062845	.698231	1.30	0.194	-.4622231	2.274792
Waste	.4461493	.8992147	0.50	0.620	-1.316279	2.208578
Emissions	1.072301	.8542305	1.26	0.209	-.60196	2.746562
Materials	-.5833568	.8808607	-0.66	0.508	-2.309812	1.143098
GreenP	.0598504	.6567284	0.09	0.927	-1.227314	1.347014
Compliance	-4.734127	1.989625	-2.38	0.017	-8.633719	-.834534
Stakeholder	1.742424	2.019081	0.86	0.388	-2.214902	5.699751
Liquidity	3.359039	.7002676	4.80	0.000	1.98654	4.731538
Firmsize	.0000741	.0000151	4.91	0.000	.0000445	.0001036
_cons	6.724264	9.851771	0.68	0.495	-12.58485	26.03338

EPS

```
. xtgls EPS Energy Water Waste Emissions Materials GreenP Compliance Stakeholder Liquidity Firmsize, panel(hetero) corr(ar1)

Cross-sectional time-series FGLS regression

Coefficients:  generalized least squares
Panels:        heteroskedastic
Correlation:   common AR(1) coefficient for all panels  (0.0298)

Estimated covariances      =         8          Number of obs      =       256
Estimated autocorrelations =         1          Number of groups   =         8
Estimated coefficients     =        11          Time periods       =        32
                                                Wald chi2(10)      =     63.67
                                                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
         EPS |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      Energy |  -157.5277   56.82883    -2.77   0.006    -268.9102   -46.14522
       Water |   144.2857    72.1122     2.00   0.045     2.948383     285.623
       Waste |  -97.61835   95.81725    -1.02   0.308    -285.4167       90.18
   Emissions |    284.074   85.54287     3.32   0.001     116.4131     451.735
   Materials |   -192.863   87.84453    -2.20   0.028    -365.0352   -20.69091
      GreenP |  -109.0574   67.20034    -1.62   0.105    -240.7676    22.65287
  Compliance |   545.7638    204.024     2.67   0.007     145.8841    945.6435
 Stakeholder |   459.7603   255.6736     1.80   0.072    -41.35075    960.8714
   Liquidity |   238.6154   73.12317     3.26   0.001     95.29661    381.9342
    Firmsize |   .0015856   .0017814     0.89   0.373    -.0019058     .005077
       _cons |  -2044.149   1183.034    -1.73   0.084    -4362.852    274.5548
------------------------------------------------------------------------------
```

Share Price

```
. xtgls SharePrice Energy Water Waste Emissions Materials GreenP Compliance Stakeholder Liquidity Firmsize, panel(hetero) corr
> (ar1)

Cross-sectional time-series FGLS regression

Coefficients:  generalized least squares
Panels:        heteroskedastic
Correlation:   common AR(1) coefficient for all panels  (0.0494)

Estimated covariances      =         8          Number of obs      =       256
Estimated autocorrelations =         1          Number of groups   =         8
Estimated coefficients     =        11          Time periods       =        32
                                                Wald chi2(10)      =     75.18
                                                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
  SharePrice |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      Energy |  -1421.897   622.6049    -2.28   0.022     -2642.18   -201.6134
       Water |    2654.83   786.8352     3.37   0.001     1112.661    4196.999
       Waste |  -1866.009    1041.41    -1.79   0.073    -3907.135    175.1166
   Emissions |   2807.732   939.4598     2.99   0.003     966.4246    4649.039
   Materials |   -1319.45   958.8884    -1.38   0.169    -3198.837    559.9367
      GreenP |  -2235.509   733.8384    -3.05   0.002    -3673.805   -797.2117
  Compliance |   5493.066   2238.029     2.45   0.014      1106.61    9879.523
 Stakeholder |  -2364.112   2819.382    -0.84   0.402        -7890    3161.776
   Liquidity |   1281.386    793.505     1.61   0.106    -273.8551    2836.628
    Firmsize |   .0189978   .0187419     1.01   0.311    -.0177356    .0557313
       _cons |    12391.2   12990.94     0.95   0.340    -13070.58    37852.99
------------------------------------------------------------------------------
```

Tobin’s Q

```
. xtgls TobinsQ Energy Water Waste Emissions Materials GreenP Compliance Stakeholder Liquidity Firmsize, panel(hetero) corr(ar
> 1)

Cross-sectional time-series FGLS regression

Coefficients:  generalized least squares
Panels:        heteroskedastic
Correlation:   common AR(1) coefficient for all panels  (0.0937)

Estimated covariances      =         8          Number of obs      =       256
Estimated autocorrelations =         1          Number of groups   =         8
Estimated coefficients     =        11          Time periods       =        32
                                                Wald chi2(10)      =     72.11
                                                Prob > chi2        =    0.0000
```

TobinsQ	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Energy	.0523491	.0557023	0.94	0.347	-.0568254	.1615236
Water	.0111743	.0713435	0.16	0.876	-.1286563	.151005
Waste	.1542573	.0916638	1.68	0.092	-.0254005	.333915
Emissions	.0782832	.0858327	0.91	0.362	-.0899457	.2465121
Materials	.0430527	.0859413	0.50	0.616	-.1253892	.2114946
GreenP	-.0526423	.0661024	-0.80	0.426	-.1822007	.0769161
Compliance	-1.250481	.2007128	-6.23	0.000	-1.643871	-.8570912
Stakeholder	.079283	.2289279	0.35	0.729	-.3694074	.5279735
Liquidity	.2565272	.0728444	3.52	0.000	.1137548	.3992996
Firmsize	6.43e-06	1.56e-06	4.11	0.000	3.36e-06	9.49e-06
_cons	3.459262	1.084525	3.19	0.001	1.333632	5.584891

Appendix 6- Faculty approval letter

University of Limpopo
Faculty of Management and Law
OFFICE OF THE EXECUTIVE DEAN
Private Bag X1106, Sovenga, 0727, South Africa
Tel:(015) 268 2558, Fax: (015) 268 2873, Email: johannes.tsheola@ul.ac.za

22 March 2018

MR DZOMONDA O. (201113461)
SCHOOL OF ECONOMICS AND MANAGEMENT
DOCTOR OF COMMERCE (BUSINESS MANAGEMENT)

Dear O Dzomonda

FACULTY APPROVAL OF PROPOSAL

I have pleasure in informing you that your Doctoral proposal served at the Faculty Higher Degrees Committee meeting on **14 March 2018** and your title was approved as follows:

"Environmental Sustainability Commitment and Financial Performance of Firms Listed on the Johannesburg Stock Exchange, South Africa".

Note the following: The study

Ethical Clearance	Tick One
Requires no ethical clearance Proceed with the study	√
Requires ethical clearance (Human) (TREC) (apply online) Proceed with the study only after receipt of ethical clearance certificate	
Requires ethical clearance (Animal) (AREC) Proceed with the study only after receipt of ethical clearance certificate	

Yours faithfully

22/03/18

Prof MP Sebola
Chairperson: Faculty Higher Degree Committee

CC: Supervisor, Prof OO Fatoki; Co-Supervisor, Prof C. Ngwakwe and Prof MP Sebola, Acting Director, School of Economics and Management

Finding solutions for Africa

Appendix 7- Proof of English Editing

University of Limpopo
Department of Linguistics, Translation and Interpreting
School of Languages and Communication Studies
Private Bag x1106, Sovenga, 0727, South Africa
Tel: (015) 268 3707, Fax: (015) 268 2868, email:kubayij@yahoo.com

16 March 2020

Dear Sir/Madam

SUBJECT: EDITING OF THESIS

This is to certify that the thesis entitled 'Environmental Sustainability Commitment and Financial Performance of Firms Listed on the Johannesburg Stock Exchange, South Africa' by Dzomonda Obey (201113461) has been copy-edited, and that I am content with the quality of the thesis in terms of its adherence to editorial principles of cohesion, clarity of thought and precision.

Kind regards

Prof. SJ Kubayi (DLitt et Phil - Unisa)
Associate Professor
SATI Membership No. 1002606

Finding solutions for Africa

Appendix 8- Turnitin Report

PHD THESIS

by Obey Dzomonda

Submission date: 27-Jan-2020 08:30AM (UTC+0200)
Submission ID: 1246984398
File name: OBEY_DZOMONDA_PhD_THESIS_2020.docx (1.89M)
Word count: 111183
Character count: 642890

PHD THESIS

ORIGINALITY REPORT

14%	11%	5%	7%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	ro.uow.edu.au Internet Source	1%
2	hdl.handle.net Internet Source	1%
3	Submitted to University of Cape Town Student Paper	1%
4	uir.unisa.ac.za Internet Source	1%
5	link.springer.com Internet Source	<1%
6	www.researchgate.net Internet Source	<1%
7	mpra.ub.uni-muenchen.de Internet Source	<1%
8	www.canberra.edu.au Internet Source	<1%
9	Submitted to Universiteit van Amsterdam Student Paper	<1%