Sustainable environmental practices and financial performance: Evidence from listed small and medium-sized enterprise in the United Kingdom

Abstract

In this article, we investigate the financial implication of sustainable environmental practices on UK small and

medium-sized enterprises (SMEs)–traded firms. Existing literature indicates that there is a direct relationship

between sustainable environmental practices and financial performance. However, studies looking at this

relationship have focused mainly on large firms with little attention paid to SMEs. Further, those looking at

environmental and financial performance relationships have often used a single measure of performance in

their studies. This study bridges these research gaps by focusing on listed SMEs in the United Kingdom using

multiple measures of sustainable environmental policy indices on a panel of 201 SMEs on the Alternative

Investment Market from 2011 to 2016. Evidence from our panel data analysis suggests significant and a

nonlinear (concave) relationship between sustainable environmental practices and firms' financial

performance. Specifically, energy efficiency practices, greenhouse gases, material, and resource efficiency

revealed an inverted U-shaped relationship with financial performance. The results will offer guidance to

management in terms of allocating resources to sustainable environmental practices investment.

**Keywords:** environmental practices; financial performance; sustainable; development; SMEs; stakeholder

engagement

1. **Introduction**

The past three decades have witnessed a widespread debate on the rising prominence of climate change and greenhouse gases (GHG) emission issues on the global environment. Consequently, the question of what leads corporations to provide climate and GHG emission information has emerged as a topic of considerable interest among researchers and practitioners alike (Department for Farming and Rural Affairs, 2010; Lee et al., 2015). Hence, leading to significant literature devoted to various aspects of environmentally sustainable practices (Aiyub, Arifin, Awang, & Jahi, 2009; Hillary & Burr, 2011; Trumpp & Guenther, 2017). Existing evidence indicates that stakeholder groups often influence firms to widen their disclosure of sustainable environmental practices scope, with an emphasis on social and environmental information (Berthelot, Cormier, & Magnan, 2003; Brammer & Millington, 2004; Patten, 1992). Indeed, there is growing evidence that suggests that corporations have employed new environmental solutions in search of legitimacy; which could enhance their competitiveness through the protection of natural resources (Miroshnychenko, Barontini, & Testa, 2017; Pane Haden, Oyler, & Humphreys, 2009; Testa, Boiral, & Iraldo, 2015).

 In economics, issues regarding the environment have traditionally been subjected to debates as to whether it is a social or private cost and have often been left to the government to deal with it (Davis, 1973; Figge & Hahn, 2004). However, empirical evidence shows that environmental practices and financial performance are positively correlated (Iwata & Okada, 2011; Trumpp & Guenther, 2017)); and as such, improvements in financial performance encourage the pursuance of sustainable environmental practices (Trumpp & Guenther, 2017). Accordingly, environmental problems need to be handled through the market mechanisms by corporations and not necessarily from government intervention (Porter & Linde, 1995).

 However, while empirical studies on environmental practices and financial performance relationships have established positive association (e.g. Christmann 2000, Aragón-Correa et al. 2008, López-Gamero et al. 2009, Hayward et al. 2013), others have found either negative or no association (e.g. Fogler & Nutt 1975, Cordeiro & Sarkis 1997; Busch & Hoffmann 2011, Woo et al. 2014). The inconsistencies within the empirical literature suggest a lack of consensus as to whether it pays to pursue sustainable environmental policies by the corporation or not. Given that the existing literature has both reported potential benefits and cost of sustainable environmental practices on firm’s financial performance, the relationship between sustainable environmental policies and firm performance may be complicated than just reporting positive and negative associations.

 While existing studies offer valuable insights for the furtherance of the related work, the empirical evidence remained focused on large firms and very little attention is paid to SMEs. According to Kumar, Khurshid & Waddell (2014), there are significant differences between SMEs and large businesses and these differences normally exist in policy-making procedures, and structure and the utilization of resources (Ghobadian & Gallear, 1996). Therefore, it is not expected that the implementation of sustainable environmental practices for larger firms and SMEs will yield the same results. This study thus complements existing studies by providing a possible explanation for the contradictory findings on the relationship between sustainable environmental practices and financial performance by looking at the extent to which environmental practices affect financial performance (Is whether a non-linear relationship exists or not), particularly for listed SMEs. Further, existing literature shows that researchers have focused extensively on using a single measure of performance (Earnhart & Lizal, 2010; Filbeck & Gorman, 2004; Naila, 2013) hence, providing a narrow scope to the various sustainable environmental practices carried out by firms. In order to bridge these research gaps, multiple sustainable environmental practices are used in this study.

 In order to achieve these, the study adopts an ordinary least square (OLS) and two-stage least square regression on a sample of 201 quoted SMEs in the UK Alternative Investment Market (AIM) from 2011 to 2016. The findings from the study revealed that sustainable environmental policies in relation to energy efficiency practices, pollution prevention and control, waste management, materials and resource efficiency and stakeholder engagement have a significant association with performance (ROA). Specifically, the study discovered that in most cases, the relationship between sustainable environmental practices and financial performance is non-linear; and are positive for a lower level of environmental engagement and unfavourable for a higher level of environmental engagement. However, our findings remain consistent after controlling for endogeneity and adopting other alternative measures of financial performance.

Our study makes the following contribution to literature: First, the study provides evidence on SMEs sustainable environmental practices and financial performance. Unlike the existing studies which have mostly focused on large firms (Filbeck & Gorman, 2004; Nollet, Filis, & Mitrokostas, 2015; Trumpp & Guenther, 2017), this study, for the first time present empirical evidence on the non-linear relationship between sustainable environmental practices and financial performance of listed SMEs; hence, providing a different dimension to the sustainable environmental practices and financial performance debate. This argument is particularly important as emphasised by Amankwah-Amoah & Syllias (2020), that SMEs may not be able to meet the additional regulatory and financial burden of sustainable environmental practices. Therefore, policy debate that emphasises gradual implementation approach would enhance the capacity of SMEs in transiting from short to long-term is essential in helping them to overcome the regulatory burden and financial constraints. Hillary & Burr (2011) argued that most environmental pollution originates from SMEs, and therefore, there is the need to pay attention to SMEs’ environmental practices. However, existing literature suggests that significant issue for SMEs about their environmental practices investments is the that SMEs do not often realise the financial benefits of such investments activities (Revell & Blackburn, 2007). This is premised on the difficulty in the estimation of costs and benefits of environmental investments initiatives ( Hoejmose, Brammer, & Millington, 2012). Hoejmose, Brammer, and Millington (2012) highlighted that at initial stages of environmental practices investment initiatives, the costs may outweigh economic benefits and as such SMEs are highly unlikely to take advantage of the same publicity enjoy by larger companies due to their relative invisibility and unaffordability of advertisement. Similarly, Aiyub et al. (2009) indicated that SMEs lack the resources to implement sustainable environmental practices as such investment initiatives are likely to reduce profit at the initial years. This study will, therefore, argument this line of literature that emphasises on the relationship between financial beneficial and sustainable environmental practices investment initiative in the context of listed SMEs firms.

 Further, unlike existing studies which concentrated on only one measure of environmental practices performance (e.g. Earnhart & Lizal, 2007; Filbeck & Gorman, 2004; Naila, 2013), this present study uses multiple measures of sustainable environmental indices, hence offering a broader perspective and insights into the discussion. Thus, the study is expected to address some of the inconsistent results in priors studies which have been attributed to the lack of objective environmental criteria (Horváthová, 2012). For instance, the work of Russo and Fouts (1997)which used Franklin Research Development Corporation (FRDC) environmental ratings as assessment indices have been criticized for being narrow for using only ‘’compliance’’ indicator as an environmental performance assessment tool. Other studies (Earnhart & Lizal, 2007; Filbeck & Gorman, 2004; Hassel, Nilsson, & Nyquist, 2005; Konar & Cohen, 2001; Moneva & Ortas, 2010; Vijfvinkel, Bouman, & Hessels, 2011) have used third party environmental rating index only available for larger firms and restricted to one or few environmental performance variables. Closest to our current study is the work of Wood and Graves (1997) which used Kinder Lydenberg Domini (KLD) index to assess corporate social performance and financial performance relationship. However, this prior study included social performance variables and therefore not restricted to only environmental variables. Thus, findings cannot be attributed to only environmental performances.

Inspired by the DEFRA (2013) and (Ilinitch, Soderstrom, & Thomas, 1998) environmental performance guidelines (indices), this study used handpicked data of sustainable environmental practices of listed UK SMEs. This data is considered comprehensive enough and includes multiple sustainable environmental activities. Similarly, by offering multiple sustainable environmental practices performance index as the performance assessment tool, we offer a broader framework, which could be adapted/adopted for future studies. This will not only broaden our understanding of the multiple sustainable environmental practices’ initiatives, but it also offers us the varying sustainable environmental practices assessment tool that could be used by SMEs practitioners to assess their environmental investment performance.

 Finally, the study identifies the type of sustainable environmental practices that are likely to enhance financial performance and therefore need to be given attention by the management of SMEs as these practices will help them devise environmental practice strategies and policies that will improve the prospect of their firms. Whereas most studies have used a composite of environmental variables (Aiyub et al., 2009; Hillary & Burr, 2011; López-Gamero et al., 2009), this study uses disaggregated environmental variables to show different aspects of environmental sustainability practices that are more relevant for listed SMEs. For example, whereas some SMEs that may be pursuing waste reduction measures may benefit financially, it does not necessarily mean that SMEs that seek pollution prevention and control may also benefit financially. Thus, the study provides additional evidence on environmental sustainability practices that are more financially beneficial to SMEs and therefore, the need to focus more on them.

 The rest of the study is structured as follows: The next section discusses the related literature and hypothesis. The third section presents the methodology- definition of SMEs, sample selection technique, the variables and the regression models. Section four presents the results and discussions of the study from an empirical and theoretical point of view. Finally, the last section discusses conclusions, contributions, implications and the limitations of the study.

**2.0 Related Literature, and Hypothesis**

This section discusses the theoretical framework that underpinned the study as well as the review of empirical literature and hypothesis.

***2.1 Theoretical Framework***

 The theoretical foundation of this study is based on the natural resource-based view (NRBV) and the stakeholder theory (ST). Thus, we use NRBV and ST in explaining the relationships between sustainable environmental practices and financial performance of listed UK SMEs.

 NRBV is an extension of the resource-based view. It introduces an interaction between the natural environment and the firm by suggesting that resources and capabilities affect the ability of the firm to sustain its competitive advantage. It suggests that businesses that can deal with the constraints of the physical environment through facilitating environmentally sustainable practices will gain competitive advantage and become profitable (Hart, 1995; Hart and Dowell, 2011; Almarri and Gardiner, 2014). The NRBV outlines three strategic capabilities as pollution prevention, product stewardship, and sustainable development, with each giving the firm a different form of competitive advantage, and different resources since each have different environmental drivers. Therefore, the ability of the firm to benefit from its internal resources and capabilities are contingent upon proper alignment with the environmental drivers to some extent. Thus, the ability to possess resources and capabilities can influence a firm’s competitive advantage once it interacted with the natural environment (Almarri and Gardiner, 2014; Ghapanchi, Wohlin, and Aurum, 2014; Killen, Jugdev, Drouin, and Petit, 2012; Wu, 2010). The competitive advantage and firm performance are strongly influenced by the firm’s resources. Therefore, there is a strong link between resources and a firm’s performance and competitive advantage (Ghapanchi, Wohlin and Aurum, 2014).

 Barney (1991) indicates that resources must be specific to a firm and difficult to transfer between firms, and should not be widely available to the industry. Similarly, Hart (1995) contends that the most important characteristics of the resources for sustained competitive advantage should be difficult to replicate. These resources include tacit, complex, skilled-based and people-intensive, invisible and are achieved upon learning by doing, developed through experience and refined through practice (Hart, 1995).

 Hart and Dowell (2011) argue that while pollution prevention has a lower cost implication, product stewardship which involves entire stakeholder integration ensures that stakeholders’ position on the environment can be effectively integrated into product design and development process. Sustainable development, on the other hand, does not only ensure less damage to the environment but rather ensure that production is economically undertaken that improves environmental sustainability. Emphasising on pollution prevention as a catalyst for improving financial performance, Earnhart and Lizal (2007) aver that, firms that can invest in riskier environmental management programmes that alter or install new production process to prevent rather than treat pollution may be effectively reducing pollution and at the same time lowering costs. In line with the arguments put forward by Filbeck and Gorman (2004), investment in pollution reduction measures, through prevention rather than end-of-pipe treatment, allows firms to establish a competitive edge through the marketing of sustainable environmental products.

 Ramanathan (2016) also observed that NRBV supports environmental and financial performance relationship. The study indicated that environmental and financial performance require deployment and utilisation of firm resources and economic performance is expected since both require the use of vital resources necessary for competition. In congruence with Hart (1995), Ramanathan (2016) explained how proper stakeholder management could enhance sustainable environmental policies and financial performance relationships. The positive correlation between sustainable environmental practices and financial performance could be attributed to the deployment of an important resource like proper stakeholder engagement. Good environmental practices make the firm attractive to important stakeholders like quality employees and management as this could lead to positive operational efficiency and cost reduction (Hart and Ahuja, 1996; Ramanathan, 2016).

 However, SMEs lack resources such as cash to develop sustainable environmental policies that enhance sustainable environmental practices that can improve financial performance (Aragón-Correa *et al.*, 2008; Hillary and Burr, 2011; Leonidou, Christodoulides and Thwaites, 2016). Christmann (2000), for instance, emphasised that competencies for process innovation and implementation are complementary assets that moderate the relationship between environmental best practices and cost advantage; and SMEs lack the resources to undertake such activities (environmental best practices). Hence, the inability to engage in continuous improvements, stakeholder integration that can impact positively economic position of the firm.

 However, disputing the fact that the natural resource-based view may not be relevant for smaller companies due to resource constraints, Aragón-Correa et al. (2008) observed that SMEs possess unique characteristics such as shorter lines of communication. The closer interlinks with other SMEs which enable them to develop and deploy certain organisational capabilities that influence the environmental practices and financial performance relationships. This has been emphasised by Christmann (2000) that firms do not have to develop these complementary assets in pursuance of their environmental strategies, but rather develop them during other general productive activities and can be leveraged into the firm’s environmental strategy. This implies that SMEs can leverage on the existing resources that are developed in the normal production process to create a unique and specific environmental strategy to gain a competitive advantage without necessarily requiring huge investment in environmental practice policy.

 Aside from the argument that the relationship between sustainable environmental practices and financial performance is underpinned by the natural resource-based view, strong theoretical predictions have been advanced from the stakeholder theory perspective. Stakeholder theory is based on the principle that the firm considers all individuals and groups that can affect or are affected by the achievement of the organisational objectives (Freeman, 1984). Polonsky (1995) asserted that the idea of an individual or a group having an interest in an organisation could be broadly defined. Polonsky (1995) emphasised that in one case, whereas a particular stakeholder group, which may have a legal claim to the firm, such as the owners may be expecting an improved performance, another stakeholder group such as the general public may be interested in how the firm impacts on the economic growth of the country. Thus, stakeholder importance can vary depending on the specific organisational issue. Therefore, applying stakeholder theory on sustainable environmental practices and financial performance relationships can be complex. In an article, “A Stakeholder theory approach to designing environmental marketing strategy”, Polonsky (1995) outlined how environmental issues are impacting on business-to-business issues. For instance, industrial marketers are now incorporating marketing attributes into their products and manufacturers of laser printers, for example, are developing printers that use less toner and energy, others are also emphasising the quality of their recycled paper. While these actions are likely to motivate environmentally conscious consumers to increase their patronage with the firm’s products and services, the likely increase in demand would also impact on financial performance and benefit stakeholders such as the shareholders and employees.

 Further, it has been argued that favourable social agenda, such as proactive environmental practices, create valuable goodwill that can protect the firm from unforeseen problems and bring new opportunities not available to less social and environmentally responsible firms (Fombrun, Gardberg & Barnett, 2000). From an instrumental stakeholder perspective, Endrikat, Guenther and Hoppe (2014) used meta-analysis to explain that as corporations exhibit responsible behaviour toward the natural environment, stakeholder’s expectations are met and this augur well for stakeholder support of the activities of the focal organisation. Endrikat, Guenther and Hoppe (2014) emphasised that firms that achieve superior environmental performance can also improve on their sales as consumers may willingly pay a premium price for environmentally responsible products – hence, impacting positively on the financial performance of such firms. Similarly, McGuire et al. (1988) assert that improved sustainable environmental policies of firms enhance the relationship between the local organisation and its investors, leading to market risks reduction and lowering of financial costs of firms. Like Mcguire, Sundgren, and Schneeweis (1988), Carter, Kale, and Grimm (2000) assert that revenue can be impacted positively when consumers have a preference for environmentally friendly products, which may result in increased market share. In this way, the firm may have a competitive edge over less environmentally conscious competitors. It has also been argued that proper stakeholder integration allows firms to capitalise on both tangible and intangible assets (such as good environmental practices) with an ultimate consequence on financial performance (Russo and Minto, 2012; Endrikat, Guenther and Hoppe, 2014).

 Fassanya and Onakoya (2013) contend that meeting the economic and legal responsibilities of shareholders may be anchored through corporate social and environmental responsibilities. Similarly, Freeman (1984), proclaimed that an organisation's commitment to operating in an economically and environmentally responsible way while at the same time acknowledging the interest of its stakeholders would, in the long run, enhance financial performance. The idea is that businesses that engage in proactive environmental practices which enhance the brand image are trusted by the stakeholders, achieve higher efficiency and to improve reputation which may result in improved financial performance (Fasanya and Onokoya, 2013). Freeman (1984) argues that externalities are usually generated by firms which affect both internal and external stakeholders. This exerts pressure on companies to reduce negative environmental impact and increase positive environmental impact. When the organisation responds to stakeholder pressure, it improves the relationship and establishes legitimacy with the stakeholders, which enhances the firm’s reputation and helps gain a competitive advantage with a consequence of improved financial performance. Therefore, we argue that responding to stakeholder needs like adopting sustainable environmental practices will impact positively on the firm’s financial performance.

**2.2 Hypothesis Development**

***2.2.1 Energy Efficiency Practises and Financial Performance***

Various arguments have been put forward on how energy efficiency practices are expected to impact on financial performance (Conlon & Glavas, 2012; Lartey et al., 2020). Lartey et al.(2020), for instance, indicated that the energy efficiency of a building could improve financial performance through various transmission mechanisms. They argue that less energy consumption saves tenants’ costs and therefore, they are likely to pay lower rents. Occupation of an energy-efficient building is also good for the firm’s image. It helps to build a relationship with different stakeholders such as investors, employees, and the public in general.

 This argument reflects the basis of stakeholder theory which is based on the principle that the firm considers all individuals and groups that can affect or be affected by the achievement of the organisational objectives (Freeman, 1984). Cagno and Trianni (2013) arguing from the perspective of stakeholder theory, were of the view that energy efficiency helps firms avoid future external stakeholder’s’ pressure which may distract management and negatively impact performance. The other argument put forward by Lartey *et al. (*2020) is that the global warming debate and the societal responsibility to conserve energy implies that in future, non-energy saving buildings are likely to be avoided by investors and tenants. This situation suggests that energy-efficient buildings are going to be more valuable than non-energy efficient buildings, and therefore, energy-efficient buildings should have higher returns and market value. Empirical evidence also suggests that energy savings potentially should be beneficial whenever the financial benefits surpass the lost investment opportunities (Cajias & Piazolo, 2013).

 Similarly, organisations that pride themselves with energy-efficient products attract customers and improve financial performance (Cajias & Piazolo, 2013). Research carried out by US Department of Energy (2015) on a sample of buildings nationwide indicated that buildings with LEED and energy star certifications have higher rental rates, higher occupancy rate, lower utility bills, increased sales prices and lower construction premiums. As explained by Sahu & Sharma (2016), the consumer's decision regarding the level of energy consumption and investment in energy-saving technology is largely influenced by the energy market and its prices. In situations where there is a persistent increase in energy prices, it significantly affects energy efficiency practices of firms as firms are likely to replace old equipment and develop new efficient energy products and services. De Groot, Verhoef, & Nijkamp (2001) also highlighted the cost-saving that could be achieved by decreased energy usage and adoption of efficient energy policies. Based on the evidence from Indian firms, Sahu & Sharma (2016) found that energy intensity is positively correlated with financial performance. Many studies have also found that SMEs can reduce their energy costs by 40% by following recommended maintenance practices such as changing filters, cleaning and sealing ducts as well as cleaning coils (Strandberg & Robinson, 2009). Pham (2015), in contrast, documented a negative association between energy efficiency (ISO 50001) and financial performance for sampled listed firms. We argue that as firms pursue sustainable environmental practices such as energy efficiency practices, they attain a favourable image with various stakeholders such as customers, investors, pressure groups and other stakeholders and this should significantly reflect on their financial performance.

Therefore, we hypothesise that:

*H1: There is a significant relationship between energy efficiency practices and financial performance.*

***2.2.2 Environmental Regulations/Compliance and Financial Performance***

 Available evidence indicates that innovative environmental regulations could be beneficial to organisations when they invest in management systems that reduce accidental environmental releases and liability (Carter et al., 2000). Carter et al. (2000) assert that proactive management of environmental regulations may create barriers which provide first-mover advantages difficult to imitate by competitors. Drawing on ISO 14001 or IRRC compliance index as a proxy of environmental performance (Aiyub et al., 2009; Hillary & Burr, 2011; Konar & Cohen, 2001) observed a significant positive relationship between environmental practices and financial performance of firms.

 Extant literature suggests that where firms fail to properly communicate with stakeholders like environmental regulators who have the authority to create environmental standards and inspect firm’s compliance, they risk incurring non-compliance penalties (Darnall, Henriques, & Sadorsky, 2010). Apart from the direct negative impact which financial penalties have on the bottom-line, it may also damage the reputation of the company, reduce the demand of the firm’s products and services by environmentally conscious customers, and impact on financial performance negatively.

Further, where sustainable environmental practices focus on waste reduction and emission from existing operations, it results in a decrease in regulatory costs, minimised liabilities and consequently improves financial performance (Sarkis & Cordeiro, 2001). Ramanathan, Ramanathan, & Bentley (2018) observed that the mechanism through which regulations can enhance efficiency is based on the notion that green regulations provide adequate flexibility to the firm to develop new processes and products that firms have innovative capabilities to take advantage of. Porter & Linde (1995) argue that environmental regulations can enhance efficiency through the introduction of innovative processes and consequently impact positively on financial performance. Studies conducted in the UK revealed that both SMEs and larger firms that adhered to environmental compliance measures (ISO 14001) obtain a positive impact on their financial performance (Aiyub et al., 2009; Hillary & Burr, 2011). Drawing on Porter & Linde (1995) and in agreement with the above discussions, we hypothesize that:

*H2: The relationship between compliance with environmental regulations and financial performance is expected to be significant.*

 ***2.2.3 Waste control and Financial Performance***

 Waste control and its impact on financial performance have received much attention from theoretical and empirical perspectives. Much of this evidence supports the view that environmental waste significantly affects the firm's financial performance (Sroufe, 2003; Trumpp & Guenther, 2017). Bartolacci & Zigiotti (2015) arguing from the natural resource-based view, indicated that where waste is used as a differential resource through recycling and reuse, it significantly saves costs, which impacts positively on financial performance. Extant literature also shows that waste reduction ensures that resources and energy used in the production process are minimised and significantly impact on costs and financial performance (Ochiri, Wario, Odhiambo, & Arasa, 2015; Sroufe, 2003). Based on the natural resource-based view, Ochiri et al. (2015) aver that waste management is a strategic resource which provides an opportunity for minimising costs through the lowering of waste management fees, hazardous materials management fees, reduces reporting time and costs; and consequently, impact positively on financial performance. Empirical evidence also confirms the environmental practices and financial performance relationships (Ochiri et al., 2015; Sroufe, 2003). For instance, Sroufe (2003) empirically studied the relationship between waste reduction and financial performance of firms and observed that the more a firm is involved in waste practices; the more it enjoys, the stronger and positive financial performance. Strandberg & Robinson (2009), for instance, proposed that SMEs are likely to gain a market share and stay ahead of competitors if they green their operations such as reducing waste from their product packaging. On the other hand, King and Lenox (2002) found that although waste prevention impacts positively on financial performance, they did not discover that other measures of waste reduction also positively impact on the bottom line. This may be due to the suggestion that product quality and reliability may suffer as a result of usage of recycled materials and re-utilisation of components which eventually reduces firm performance (González-Benito and González-Benito, 2005).

Based on the above arguments on the financial implications of waste control, it is hypothesised that:

*H3: The relationship between waste management practices and financial performance is expected to be significant.*

 ***2.2.4 Pollution Control and Financial Performance***

Extensive studies show a link between pollution control (greenhouse gases) and financial performance. Earnhart and Lizal (2007) found that lower emissions and cost reduction were achieved by Czech firms that invested in efficient and environmentally friendly machinery. They further observed that the new production process required less use of materials, generated less waste and demanded fewer toxic inputs. Thus, apart from the companies saving the environment through pollution reduction, the companies also benefited financially; and in effect, provided stronger support to the Porter "win-win” hypothesis (Porter & Linde, 1995). In explaining how companies benefit financially by investing in pollution control practices and policies, Ramanathan (2016) buttressed the position of Earnhart & Lizal (2007) and explained that firms which redesign their production process or service delivery would achieve possible efficiency through an accumulation of valuable know-how on pollution prevention; which is inimitable and that becomes a source of competitive advantage.

The strategic benefit of pollution control which creates opportunities for firms to modify the production process to translate into competitive advantage has resulted in firms lowering their pollution levels below the legal levels (Konar & Cohen, 2001). As shown by Earnhart Lizal (2010), firms are embracing riskier pollution prevention strategies by modifying their production process instead of treating it. Earnhart & Lizal (2010) recognise that while pollution prevention initiative strategies are riskier, proactive pollution abatement strategies may reduce pollution and reduce costs, thereby impacting positively on the financial performance of the firm. Pollution is also considered as a sign of inefficient and ineffective use of resources (Albertini, 2013), and as such prevention and controlling strategies are likely to impact on financial performance through cost savings positively. Drawing on the Natural-Resource-Based View of Hart (1995), Albertini (2013) indicated that product stewardship and the incorporation of environmental concerns into product design and the production process could result in competitive advantage through first-mover strategy in emerging environmental sustainability product markets.

 Similarly, Hart and Dowell (2011) using both the natural resource-based view and stakeholder theory, posited that pollution prevention has a lower cost implication, product stewardship involving stakeholders integration. They further argue that stakeholder integration ensures that stakeholders’ position on the environment can be effectively integrated into the product design and development process. Sustainable development, on the other hand, does not only ensure less damage to the environment but also ensure that production is economically undertaken while at the same time improving environmental sustainability.

It is asserted that SMEs that demonstrate that they are managing their pollution impact is likely to save costs on insurance bills as insurance companies perceive them as having a lower risk profile (Strandberg & Anderson, 2009). Similarly, Filbeck and Gorman (2004) argue that investment in pollution reduction measures, through prevention, allow firms to establish a competitive edge through the marketing of sustainable environmental products. A positive association between pollution control and financial management has been documented by several studies (Smale et al., 2006; Earnhart & Lizal 2010; Qian & Xing, 2016). Earnhart & Lizal (2007) and Hart & Ahuja (1996) however, found negative association when examining the pollution control-financial performance link. Therefore, in line with the arguments, we hypothesise:

*H4: There is a significant relationship between pollution control (GHG) and financial performance.*

***2.2.5 Material and Resources Efficiency and Financial Performance***

 Material and resource efficiency constitute another area of environmental sustainability practice in which firms can benefit financially. Packaging and the use of lightweight materials are considered an efficient way of managing resources. Lightweight packaging does not only reduce material cost, but it can also reduce the transportation cost by increasing the volume of products which can be shipped (Gray & Guthrie, 1990). Modi and Mishra (2011) explained that a focus on resource efficiency permits organisational stability and affords them lower overall costs. A study by Gilley et al. (2000) also supports the argument that material and resource efficiency could be pursued through process-driven initiative or product-driven green initiatives through recycle or environmentally friendly inputs to production and reduction of costs. Again, as firms move toward pollution prevention strategies which may involve redesigning of production processes to the use of less raw materials and minimisation of waste, they ensure that fewer waste products are available for recycling. Stradberg & Anderson (2009) indicated that green practices reduce operating costs through a reduction in material and resource costs. They aver that efficient use of materials such as using less water, paper and toner, energy and sewage reduces utility and maintenance costs and consequently impact on financial performance.

 Capkun et al. (2009) analysing the effect of material efficiency on the financial performance of US-based firms over 26 years from 1980 to 2005, concluded that material efficiency is positively correlated with financial performance. Therefore, it is expected that efficient use of materials such as lightweight packaging, recycling of waste materials, and reduction in the use of transport for material supply etc. can lead to significant cost savings and therefore, we hypothesise that:

*H5: There is a significant relationship between material/resource efficiency and financial performance.*

 ***2.2.6 Stakeholder Engagement and Financial Performance***

 Firms can use various means to manage their relationship with stakeholders to enhance their environmental practices and consequently improve financial performance (Carter et al., 2000; Hart, 1995). Internal stakeholders, such as management and employees, are critical to the success or failure of any strategy that may be pursued by the firm (Freeman, 1984). Where employees, both management and non-management, are in support of the firm’s environmental practices, they are more likely to seek work within it and continue their employment (Darnall et al., 2010). Darnall et al. (2010) aver that stakeholders are likely to express satisfaction or dissatisfaction with the firm executives and dissatisfaction can be voiced through employment termination. Similarly, Henriques and Sadorsky (1996) pointed out that where there is poor engagement with relevant stakeholders like employees or not, in extreme cases, employees can engage in public whistleblowing, thereby exposing potentially poor environmental practices.

 Further, extant literature suggests that effective stakeholder management on sustainable environmental practices improves the stakeholders’ perception of the firms, and this positively impacts on the firm’s commitment to the sustainable environmental investment initiatives (Hart, 1995). Ramanathan (2016) aver that such an action would help improve employees’ motivation, improve customers’ and investors’ patronage, thereby leading to an improvement in financial performance. Aside from the impact of stakeholders’ engagement on environmental practices and their impact on primary stakeholders, secondary stakeholders such as the societal stakeholders could also significantly impact on the development of sustainable environmental management practices. Thus, societal stakeholders such as environmental and community organisations, labour unions, environmental pressure groups and industry associations can win public opinion in favour or against the firm (Darnall et al., 2010). Further, such groups could form stakeholder coalitions to influence sustainable environmental practices initiative. Therefore, effective stakeholder engagement is paramount to sustainable environmental practices and their impact on the financial performance of the firm. Thus, we argue that proper stakeholder engagement on sustainable environmental practices is likely to improve the firm’s relationship with both internal and external stakeholders, which is a unique resource that can help the firm improve on its financial performance. Hence, we hypothesise that:

*H6: There is a significant positive relationship between stakeholder engagement and financial performance.*

1. **Methodology**

**3.1 Definition of SMEs**

 Although many definitions of SMEs have been proposed for this study, we adopt one of the most widely applicable ones in line with Hoejmose et al. (2012). We, therefore, define small businesses as firms that have less than 100 employees, and medium firms as those with employee between 100–250 employees. In addition to the number of employees as outlined above, the European Commision (2015) also indicated that smaller firms should have either annual turnover of ≤€10 million or annual balance sheet total of ≤€10 million. For medium-sized firms, in addition to the number of employees, they should also have an annual turnover of ≤€50 million or an annual balance sheet total of ≤€43 million. Thus, aside the number of employees, turnover or balance sheet totals are also used in selecting SMEs from the Alternative Investment Market in the UK.

**3.2 Sample Selection**

 The sample was based on 201 SMEs selected from 1049 companies listed on the AIM from 2011 to 2016 that disclosed their environmental policies. During the selected period, many environmental initiatives were undertaken by the UK (DEFRA 2010) and the EU. For instance, the EU Directive 2012/27/EU was issued in October 2012 to guide firms to improve on their environmental performance at the discussion stage, prior to its adoption and implementation by the companies. Moreover, during this period (specifically in 2013), the Department of Environment, Food and Rural Agency (DEFRA) compiled a comprehensive report on environmental practices of both SMEs and larger firms. Among other things, the Department recommended environmental practices that could positively impact on the performance of both SMEs and larger firms. The above measures also influenced the provision of sustainable data which was an important consideration for the chosen period (Gonenc & Scholtens (2017). The firms come from 26 different industries. Those which are presumed to have very minimal pollution levels, such as banks, financial services, real estate investment trusts, and real estate investment services were excluded (Konar & Cohen, 2001). It has also been emphasised that such firms should be excluded as they are subject to different disclosure and regulatory requirements (Ntim & Soobaroyen, 2013).

**3.3 Variables**

***4.3.1 Dependent Variables (Corporate Financial Performance)***

 Prior studies on sustainable environmental practices and financial performance relationships have used different measures to assess financial performance with no consensus on these measures (Cochran & Wood, 1984). The measures that are usually adopted fall into two categories; accounting returns, and investor returns (market-based measures). Based on the accounting-based measure of performance, ROA is employed in the study as the main dependent variable as it is considered to be the most effective, and also a broader measure of performance (Hagel, Brown, Samoylova, & Lui, 2013). It has also been suggested by Afrifa & Tauringana (2015) that ROA is widely used as a measure of profitability because it provides a strong indication of management performance about a given resource. However, to capture the other side of financial performance, which also reflects in shareholder value analysis, a market-based measure of financial performance, specifically Tobin’s q, is employed in the present study as a robustness test of the main dependent variable (ROA). The market-based measure (Tobin’s q) has the benefit of providing additional information relating to the risk faced by shareholders. As a result, it has also been employed by many existing studies on sustainable environmental policies and financial performance relationships (e.g. Trumpp & Guenther, 2017).

***3.3.2 Independent Variables (Sustainable Environmental Policies)***

 It is opined that a well-defined sustainable environmental policy helps businesses to implement strategies by linking the various levels of the organisation’s business to clearly defined targets and benchmarks. Based on DEFRA (2013) guidelines, sustainable environmental policies (independent variables) used in the study are Energy, Waste Management, Pollution Control (GHG), Material and Resource Efficiency, Compliance, and Stakeholder Engagement. Content analysis was adopted to obtain sustainable environmental practices from company annual reports. The detailed construction of the independent variables using content analysis is shown in appendix 1.

***3.3.3 The Control Variables***

 The control variables that have been selected for the study consist of both company-specific factors and corporate governance variables. First, we control firm size due to the possible existence of economies of scale inherent in socially and environmentally oriented investment (Elsayed & Paton, 2009). Firm size, which was based on the number of employees, was selected from Amadeus and Fame database. The second control variable is the nature of the industry. The nature of the industry impacts on profitability and therefore needs to be controlled (e.g. Hart & Ahuja, 1996; Horváthová, 2012; Russo & Fouts, 1997). Third, there is the need to control risk tolerance which is represented by leverage as the degree of financial leverage impact on earnings (Cordeiro & Sarkis, 1997). In the case of liquidity, it is argued that shortening the cash conversion cycle can impact on financial performance (Martínez-Ferrero & García-Sánchez, 2017). Current ratios were used as a measure of liquidity, and like the leverage and the number of employees, they were obtained from the Amadeus and Fame database. Corporate governance variables, namely Board size (total members of the board), the number of non-executive directors and CEO remuneration, were also employed. This information was handpicked from the annual reports of the selected firms. It has been argued that a large board size affects coordination and negatively affect performance (Shakir, 2008). However, outside non-executive directors assist with an objective evaluation of management and help control and monitor opportunistic behaviour, which also impacts on performance. Mura (2007) has also demonstrated that a large proportion of non-executive directors has a positive impact on financial performance. Finally, it has also been realized that executives are motivated most when their compensation is closely tied to performance indicators (Walker, 2010).

**3.4 Empirical Approach**

***3.4.1 Empirical model***

The empirical model used in the study is given below:

Where FP: Financial performance (ROA and Tobin’s q), SEP: Sustainable Environmental Policies) which are Energy Efficiency, Waste Control, Pollution Control (GHG), Material and Resource Efficiency, and Stakeholder/Supply Chain Relationship. SEP2 denotes the square term of SEP. Controls denote control variables: (Firm Size (Size), Liquidity (Liquidity), Financial Leverage (Gearing), Board Size (Board Size), Board Independence (NEDS), and CEO Remuneration (CEORem). The subscript i denotes the nth company (i = 1... 201), and the subscript t denotes the year (t=1...6). μi is the unobservable heterogeneity (individual effects) which is specific for each firm, λt is the parameters of time dummy variables and is the error term*.*

1. **Data Presentation and Discussion**

**4.1 Descriptive statistics**

 This section presents descriptive statistics. The summary of statistics for the period 2011 to 2016 for all sampled companies listed on the Alternative Investment Market (AIM) in the UK is reported in Table 1. The data reveal a mean ROA of 0.07 (7%) and a standard deviation of 0.16 (16%). The minimum ROA of -0.92 (-92%) and a maximum of 0.84 (84%) indicates that there is a wide variation in the accounting profit of AIM-listed companies, which is in line with previous studies by Afrifa (2013). Similarly, the data show firms to have an average Tobin’s q of 1.83, with a maximum of 40.58 and minimum of 0.12.

Regarding the independent variables (sustainable environmental practices), the mean value for all the environmental management measures is found to be low, except environmental compliance where a mean of 3.2 and a median of 3 out of a maximum of 5, were recorded. This result suggests that about 64% of the companies listed on AIM are likely to put in place measures or policies to comply with environmental regulations. The 64% for environmental compliance is particularly high compared with the overall environmental management quality average of 25%. This finding is also supported by Afagachie (2013), where environmental compliance is ranked highest among all the sustainable environmental policies. On the other hand, all the other environmental policies tend to be low, as shown in Table 1.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 1: Summary Statistics for All Continuous Variables** This table reports descriptive statistics for all continuous variables adopted in estimating the relationship between sustainable environmental policies and financial performance on a sample of 201 listed companies on the Alternative Investment Market in the period 2011-2016. It presents the dependent variables; return on assets (ROA), and Tobin’s q. This is followed by explanatory variables which are made up of the sustainable environmental policies in order of Energy, Greenhouse Gases (GHG), Waste, Materials and Resource Efficiency (Materials), compliance to environmental regulations (Compliance) and stakeholder engagement (Stake). Finally, the control variables are also presented in order of Size, Liquidity, Gearing, Board Size, number of non-executive directors (NEDS) and CEO Remuneration (CEORem).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **Observation** | **Mean** | **Std Dev** | **Min** | **Max** | **Median** | **Skewness** | **Kurtosis** |
| **Dependent** |  |  |  |  |  |  |  |   |
| ROA | 1044 | 0.07 | 0.16 | -0.92 | 0.84 | 0.03 | -0.86 | 5.47 |
| Tobin Q | 897 | 1.83 | 2.82 | 0.12 | 40.58 | 0.96 | 7.27 | 79.52 |
| **Independent** |   |   |   |   |   |   |   |   |
| Energy | 1184 | 0.83 | 1.41 | 0.00 | 5.00 | 0.00 | 1.79 | 5.14 |
| GHG | 1184 | 0.87 | 1.43 | 0.00 | 5.00 | 0.00 | 1.73 | 5.06 |
| Waste | 1182 | 0.74 | 1.18 | 0.00 | 5.00 | 0.00 | 1.85 | 6.21 |
| Materials | 1183 | 1.14 | 1.55 | 0.00 | 5.00 | 0.00 | 1.17 | 3.16 |
| Compliance | 1183 | 3.17 | 1.48 | 0.00 | 5.00 | 3.00 | -0.37 | 2.31 |
| Stakeholders | 1183 | 0.55 | 0.88 | 0.00 | 5.00 | 0.00 | 1.17 | 3.16 |
| Size | 1090 | 460.00 | 795.00 | 1.00 | 5611.00 | 138.00 | 3.03 | 13.53 |
| Liquidity | 1147 | 3.70 | 8.91 | 0.01 | 170.26 | 1.33 | 8.97 | 129.04 |
| Gearing | 1122 | 47.29 | 70.42 | 0.00 | 844.34 | 25.85 | 4.57 | 35.68 |
| Board Size | 1107 | 6.03 | 1.94 | 0.00 | 13.00 | 6.00 | 0.33 | 3.44 |
| NEDS | 1107 | 3.33 | 1.49 | 0.00 | 11.00 | 3.00 | 0.75 | 4.20 |
| CEO Rem | 1064 | 336710 | 280220 | 12000 | 3731302 | 254447 | 3.77 | 31.78 |

 |

**4.2. Correlation Matrix**

 Table 2 shows the detail correlation matrix of the dependent, independence and control variables. The financial performance measure ROA shows a significant positive correlation with all the sustainable environmental policies: energy efficiency, greenhouse gas, waste management, material and resource efficiency, environmental policy, and stakeholder/supply chain. The correlation matrix also confirms the fact that multicollinearity is not a problem, in line with the suggestion by Field (2013) that correlation among the predictors is not considered problematic unless it exceeds 90.

**Table 2: Correlation Matrix**

This table reports the correlation coefficients for all continuous variables adopted in estimating the relationship between environmental management performance and financial performance. Variables are defined as follows: return on assets (ROA), Tobin’s q (TBQ), Sustainable Environmental Policies (SEP), Energy Efficiency Practices (Energy), Greenhouse Gases (GHG), Waste Management (Waste), Stakeholder Engagement (Stake), Material and Resource Efficiency (Mat), Compliance to environmental regulations (COMP), Firm Size (Size), Liquidity (Liquidity) Board Size (B Size), Number on non-executive directors (NEDs) CEO Remuneration (CEO Rem).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | ROA |  TBQ |  SEP | Energy | GHG | Waste | Stake |  Mat | Comp |  Size | Liquidity | Gearing | B Size | NEDS  | CEO Rem |
| ROA | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| TBQ | 0.116\* | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| SEP | 0.493\* | -0.036 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |
| Energy | 0.372\* | -0.032 | 0.748\* | 1 |  |  |  |  |  |  |  |  |  |  |  |
| GHG | 0.396\* | -0.017 | 0.797\* | 0.585\* | 1 |  |  |  |  |  |  |  |  |  |  |
| Waste | 0.354\* | -0.023 | 0.719\* | 0.443\* | 0.516\* | 1 |  |  |  |  |  |  |  |  |  |
| Stake | 0.303\* | 0.019 | 0.546\* | 0.269\* | 0.534\* | 0.293\* | 1 |  |  |  |  |  |  |  |  |
| Mat | 0.379\* | 0.009 | 0.780\* | 0.552\* | 0.537\* | 0.544\* | 0.285\* | 1 |  |  |  |  |  |  |  |
| Comp | 0.240\* | -0.09\* | 0.544\* | 0.190\* | 0.276\* | 0.214\* | 0.291\* | 0.227\* | 1 |  |  |  |  |  |  |
| Size | 0.253\* | -0.048 | 0.335\* | 0.242\* | 0.283\* | 0.223\* | 0.210\* | 0.212 | 0.184\* | 1 |  |  |  |  |  |
| Liquidity | -0.137 | 0.115\* | -0.117 | -0.14\* | -0.11\* | -0.11\* | -0.003 | -0.13\* | 0.018 | -0.180\* | 1 |  |  |  |  |
| Gearing | 0.050 | 0.046 | 0.054 | 0.054 | 0.047 | 0.001 | -0.001 | 0.059\* | 0.044 | 0.163\* | -0.140\* | 1 |  |  |  |
| B Size | 0.167\* | -0.026 | 0.138\* | 0.132\* | 0.119\* | 0.071\* | 0.148\* | 0.073\* | 0.044 | 0.125\* | -0.120\* | 0.053\* | 1 |  |  |
| NEDS | 0.092\* | 0.016 | 0.088\* | 0.047 | 0.026 | 0.061\* | 0.069\* | 0.034 | 0.129\* | 0.076\* | 0.03 | -0.008 | 0.697\* | 1 |  |
| CEO Rem | 0.175\* | -0.026 | 0.222\* | 0.208\* | 0.259\* | 0.0970\* | 0.117\* | 0.168\* | 0.048 | 0.334\* | -0.07\* | 0.059 | 0.270\* | 0.196\* | 1 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Significance levels (\*) are designated between 1% and 10

**4.3 Baseline regression**

 The study adopts the fixed effect model to investigate the relationship between sustainable environmental practices and financial performance. The advantage of using the fixed-effect model is that whatever effects omitted variables have on the subject at one time, they will also have the same impact at the later time. Therefore, the effects will be constant or fixed throughout.

 The regression model presented in Table 3 revealed a significant positive relationship or significant non-linear relationship between all the sustainable environmental policies (Energy, GHG, Waste, Materials and Resource Efficiency, and Stakeholder engagement) and ROA, except compliance. In the case of compliance, the relationship with ROA is negative, but not significant. Specifically, energy efficiency practices, GHG, and material and resource efficiency reveal a significant and inverted u-shaped relationship with ROA. While confirming the study’s hypothesis 1, it is also in line with evidence from Sahu & Sharma (2016), who also found that efficient energy intensity practices are positively correlated with the financial performance of a sample of Indian firms. Conlon & Glavas (2012) also discovered that energy-efficient building is associated with lower costs and that the cost of utilities of building with energy-saving facilities was $675.26 lower per annum than those with non-energy savings facilities. Trianni, Cagno, & Farnè, (2014) based on a study on 71 Italian manufacturing SMEs also found increased financial benefits and competitive advantage as important drivers for SMEs to invest in sustainable energy-efficient practices. Sahu & Sharma (2016) found that companies that use natural gas obtain more financial benefits than those that use coal and petrol. Sahu & Sharma (2016) findings also attest to Porter’s “win-win” hypothesis as using natural gas; there is the possibility of reducing Co2 emissions and at the same time improving profitability. The inverted U-shaped relationship also suggests that energy efficient practices initially impact on ROA positively until it reaches the maximum point where any further addition would decrease profitability.

 In the case of GHG and material resources efficiency, a significant association with ROA was discovered in line with the study’s hypotheses 4 and 5. Specifically, an inverted U-shaped relationship was identified. The finding is in line with suggestions offered by Vijfvinkel, Bouman, & Hessels (2011) that excessive environmental sustainability practices involve huge costs. Therefore, different degrees of sustainability might be preferred for SMEs to a fully sustainable firm. The result is also in line with our initial argument that as firms move toward more pollution prevention strategies, it is expected that less raw materials would be used, and less waste would be generated for recycle. Hence, the moderate level of material and resource efficiency practices is expected to have a positive impact on financial performance. Hart (1995), under the natural resource-based view (NRBV), explained many instances in which pollution prevention may improve a firm’s competitive advantage in order to achieve superior performance. He argued that aside pollution prevention saving costs that may be incurred in installing and operating end-of-pipes technologies, it may also improve production processes and efficiency. Hart (1995) reiterated the idea that pollution prevention reduces cycle times as unnecessary steps in the production process are eliminated. Pollution prevention measures are essential in helping firms reduce emission below legal requirements, and as a result, minimise a firm’s compliance and liability costs. Therefore, the present study takes the position that whereas pollution prevention may lead to sustain competitive advantage and help the firm to achieve increasing returns, simply end-of-pipe environmental technologies may be quickly competed away and reach their maximum benefit thereby resulting in decreasing returns. Similarly, King & Lenox (2002) found that a proactive approach to environmental issues is more likely to result in superior financial performance than end-of-pipe technologies. Furthermore, excessive investment in environmental practices is expected to reduce efficiency, and negatively impact on performance and thereby causing decreasing returns.

 Regarding environmental compliance and financial performance, no significant relationship was identified, and therefore hypothesis 2 is rejected. A recent empirical study by (Ramanathan et al., 2018) found that flexible environmental regulations can improve financial performance, inflexible or less flexible environmental regulations may not be effective in exploiting innovative capabilities associated with environmental regulations. For instance, REACH (EC1907/2006) is unfavourable for SMEs as it is considered too demanding and less flexible for SMEs to innovate (Arfaoui, 2017). Such regulation that is deemed to be burdensome is likely to impact on financial performance negatively.

 In the case of waste, whereas we discovered a significantly positive relationship with ROA, the square term of waste management practices was not significant and therefore rejected the non-linear relationship argument. The significantly positive relationship between waste management practices and financial performance is in line with Ochiri *et al.* (2015) who argued that waste reduction ensures that resources and energy used in the production process are minimised and significantly impact on costs and performance. In line with the findings of the study, it is suggested that waste reduction practices play an essential role in reducing pollution and at the same time, saving costs. Therefore, industrial waste prevention practices, including reuse and recycle that allows new products to be made out of used papers and plastics, significantly impact on costs and boosts sales, since such products attract environmentally sensitive customers (Cucchiella, D’Adamo, & Gastaldi, 2014). Creation of waste depletes natural resources, utilises water and energy, exert pressure on land, pollutes the environment and generates the additional cost of managing waste (Zaman & Lehmann, 2013). Therefore, when corporations effectively manage waste, they are not only protecting the environment from ozone layer depletion but also avoiding economic costs and improving the bottom-line.

 Data from stakeholder engagement also reveal results similar to the waste management practices where a significant positive relationship with ROA is established. However, a non-linear relationship could not be found. The findings support the assertion of Hart (1995) that sustainable environmental practices in terms of stakeholder management improve the perception of stakeholders such as employees, customers and investors (Hart, 1995). This line of thinking has also been emphasised by Ramanathan (2016) that such action will help improve employee motivation, improve patronage by customers and investors, thereby leading to an improvement in financial performance as discovered in the study. In line with stakeholder theory, Klassen & McLaughlin (1996) also asserted that pollution prevention measures and end-of-pipe treatment provide avenues for corporations to enhance their sales through marketing environmentally friendly products. Mcguire et al. (1988) linked pollution with lending costs. They maintain that sustainable environmental practices may reduce financing costs because investors and lenders connect lower financial risk with better environmental management practices. Reduction in financial cost is also expected to influence financial performance positively.

**Table 3: OLS Results of Sustainable Environmental Policies and Financial Performance (ROA)**

This table presents the results of the following panel data regression on the relationship between Sustainable Environmental Policies (SEP) and financial performance (FP): Where FPit is the dependent variable which is measured using returns on assets. The independent variables are Energy, GHG, Waste, Compliance, Materials and Resource Efficiency and Stakeholder. SEP2 represents the square term of the independent variables Control variables indicated by Controls are firm size (Size), Liquidity, Gearing, Board Size, Number on non-executive directors (NEDs), CEO Remuneration (CEO Rem), Industry Effect and Year Effect. β1 and β2 are the regression coefficients. The subscript i denotes the nth company (i = 1... 201), and the subscript t denotes the year (t=1,..6). μi is the unobservable heterogeneity (individual effects) which is specific for each firm, λt is the parameters of time dummy variables, and εit is the error term. Regressions are estimated with robust fixed effects



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) | (6) |
| VARIABLES | ROA | ROA | ROA | ROA | ROA | ROA |
|  |  |  |  |  |  |  |
| Energy | 0.0660\*\*\* |  |  |  |  |  |
|  | (5.85) |  |  |  |  |  |
| Energy2 | -0.0080\*\*\* |  |  |  |  |  |
|  | (-3.18) |  |  |  |  |  |
| Compliance |  | -0.0063 |  |  |  |  |
|  |  | (-0.49) |  |  |  |  |
| Compliance2 |  | 0.0053\*\*(2.45) |  |  |  |  |
| Waste |  |  |  0.0495\*\*\* |  |  |  |
|  |  |  | (4.56) |  |  |  |
| Waste2 |  |  | -0.0032 |  |  |  |
| GHG |  |  | (-1.18) |  0.1000\*\*\*(10.34) |  |  |
| GHG2 |  |  |  | -0.0149\*\*\* |  |  |
|  |  |  |  | (-6.95) |  |  |
| Materials |  |  |  |  | 0.0531\*\*\* |  |
|  |  |  |  |  | (5.23) |  |
| Materials2 |  |  |  |  | -0.0054\*\* |  |
|  |  |  |  |  | (-2.33) |  |
| Stake |  |  |  |  |  | 0.0591\*\*\* |
|  |  |  |  |  |  | (4.96) |
| Stake2 |  |  |  |  |  | -0.0051 |
| Size | 0.0161\*\*\*  (3.87) | 0.0110\*\*(2.54) | 0.0137\*\*\*(3.26) | 0.0091\*\*(2.25) | 0.0130\*\*\*(3.12) | (-1.41)0.0147\*\*\*(3.48) |
| Liquidity | -0.0005 | -0.0011 | -0.0008 | -0.0010 | -0.0010 | -0.0014 |
|  | (-0.55) | (-1.30) | (-0.92) | (-1.26) | (-1.08) | (-1.59) |
| Gearing1 | -0.0148\*\*\* | -0.0154\*\*\* | -0.0135\*\*\* | -0.01400\*\*\* | -0.0147\*\*\* | -0.0121\*\*\* |
|  | (-4.21) | (-4.25) | (-3.81) | (-4.14) | (-4.16) | (-3.36) |
| Board Size | 0.0062\* | 0.0093\*\* | 0.0108\*\*\* | 0.0088\*\* | 0.0113\*\*\* | 0.0054 |
|  | (1.68) | (2.47) | (2.91) | (2.46) | (3.05) | (1.42) |
| NEDS | -0.0057 | -0.0107\*\* | -0.00945\*\* | -0.0068 | -0.0085\* | -0.0041 |
|  | (-1.23) | (-2.20) | (-2.02) | (-1.50) | (-1.82) | (-0.36) |
| CEORem1 | 0.0248\*\*\* | 0.0351\*\*\* | 0.0264\*\*\* | 0.02460\*\*\* | 0.0210\*\* | 0.0262\*\*\* |
|  | (2.97) | (4.09) | (3.13) | (3.03) | (2.49) | (3.17) |
| Industry EffectYear Effect ObservationAdjusted R Squared | YesYes8220.2171 | YesYes8220.1725 | YesYes8210.2042 | YesYes8210.2758 | YesYes8220.2121 | YesYes8210.1871 |
| F Statistics | 14.39 | 822 | 821 | 19.37 | 14.00 | 821 |
| P Value | 0.000 | 0.000 | 0.000 | 0.073 | 0.000 | 0.000 |

Robust t test in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**4.4 Further Analysis and Robustness Test**

***4.4.1 Endogeneity concerns***

 In order to address the possibility of endogeneity affecting the results of the study, in table 4, we employed two-stage least square to regress sustainable environmental policies and financial performance (ROA). Endogeneity is the occurrence of interrelationships among dependent and independent variables that can be found in a model. It is the existence of a correlation between the explanatory variable and the error term due to the existence of causality among the dependent and independent variables (Martínez-Ferrero & García-Sánchez, 2017; Wooldridge, 2010). The problem of endogeneity is likely to occur in this study as the explanatory variable; sustainable environmental practices, and the dependent variable; financial performance, are determined simultaneously. To address the problem of endogeneity, we employed two-stage least square. The two-stage least square is an extension of the OLS model, which is used when the dependent variable error term is correlated with the independent variables. Following the suggestions of Russo & Fouts (1997), Earnhart & Lizal (2007), we employed lagged values of the independent variables (sustainable environmental policies) as instrumental variables in the two-stage least square. According to Konar & Cohen (2001), Earnhart & Lizal (2007), lagging of environmental variables avoid endogeneity problem as one would expect a lag between any environmental reduction measure and alteration to financial performance. Martínez-Ferrero and García-Sánchez (2017) indicated that adequate instruments are the closest lags, as furthest lags cannot contain information on the current value of the variables. Pindado and Requejo (2015) asserted that the closest lag is t-1, and therefore one-year lag of the independent variables was instrumented. The result, based on the two-stage least square was similar to that of OLS where all the sustainable environmental policies revealed a significant positive relationship with financial performance, except environmental compliance where the relationship was negative, but not significant.

**Table 4: 2SLS Results of Sustainable Environmental Policies and Financial Performance (ROA)**

This table presents the results of the following panel data regression on the relationship between Sustainable Environmental Policies (SEP) and financial performance (FP): Where FPit is the dependent variable which is measured using returns on assets. SEP represents the instrumental variables – where one-year lag of the independent variables (Energy, Compliance, Waste, GHG, Materials and Stakeholder) were instrumented. SEP2 represents the square term SEP. Control variables indicated by Controls are firm size (Size), Liquidity, Gearing, Board Size, Number on non-executive directors (NEDs), CEO Remuneration (CEO Rem), Industry Effect and Year Effect. β1 and β2 are the regression coefficients. The subscript i denotes the nth company (i = 1... 201), and the subscript t denotes the year (t=1,..6). μi is the unobservable heterogeneity (individual effects) which is specific for each firm, λt is the parameters of time dummy variables, and εit is the error term. Regressions are estimated with robust fixed effects



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | (ROA) | (ROA) | (ROA) | (ROA) | (ROA) | (ROA) |
| VARIABLES | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|  |  |  |  |  |  |  |
| Energy | 2.0900\*\*\* |  |  |  |  |  |
|  |  (6.10) |  |  |  |  |  |
| Energyt2 | -0.1880\*\*\* |  |  |  |  |  |
|  |  (-3.55) |  |  |  |  |  |
| Compliance |  | -0.2570 |  |  |  |  |
|  |  | (-0.49) |  |  |  |  |
| Compliance2 |  | 1.0750\*\* |  |  |  |  |
|  |  | (2.45) |  |  |  |  |
| Waste |  |  |  0.8600\*\*\* |  |  |  |
|  |  |  | (4.56) |  |  |  |
| Waste2 |  |  | -0.240 |  |  |  |
|  |  |  | (-1.18) |  |  |  |
| GHG |  |  |  | 2.9380\*\*\* |  |  |
|  |  |  |  | (10.34) |  |  |
| GHG2 |  |  |  | -0.3400\*\*\* |  |  |
|  |  |  |  | (-6.95) |  |  |
| Materials |  |  |  |  | 1.5500\*\*\* |  |
|  |  |  |  |  | (5.23) |  |
| Materials2 |  |  |  |  | -0.8010\*\* |  |
|  |  |  |  |  | (-2.33) |  |
| Stake |  |  |  |  |  | 1.4410\*\*\* |
|  |  |  |  |  |  | (4.96) |
| Stake2 |  |  |  |  |  | -0.3850 |
|  |  |  |  |  |  | (-1.48) |
| Size | 0.00901\*\* | 0.0084\* | 0.0101\*\* | 0.0225\*\*\* | 0.0993\*\* | 0.0055 |
|  | (2.15) | (1.88) | (2.34) | (4.84) | (2.32) | (1.25) |
| Liquidity | -0.0003 | -0.0007 | -0.0004 | -0.0012 | -0.0005 | -0.0004 |
|  | (-0.36) | (-0.79) | (-0.53) | (-1.42) | (-1.42) | (-0.49) |
| Gearing | -0.0133\*\*\* | -0.0059 | -0.0068\* | -0.0918\*\*\* | -0.0066\* | -0.0001 |
|  | (-3.78) | (-1.48) | (-1.87) | (-4.43) | (-1.77) | (-0.03) |
| Board Size | 0.0034 | 0.0051 | 0.0053 | 0.0079\*\* | 0.0051 | 0.0024 |
|  | (1.91) | (1.33) | (1.41) | (2.09) | (1.37) | (0.61) |
| NEDS | -0.0033 | -0.0566 | -0.0040 | -0.0058 | -0.0034 | 0.0003 |
|  | (-0.71) | (-1.17) | (-0.86) | (-1.23) | (-0.72) | (0.06) |
| CEO Rem | 0.0195\*\* | 0.0172\* | 0.0187\*\* | 0.0359\*\*\* | 0.0137 | 0.0090 |
|  | (2.31) | (1.90) | (2.18) | (3.80) | (1.56) | (1.00) |
| Industry Effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Effect  | Yes | Yes | Yes | Yes | Yes | Yes |
| Observation | 822 | 822 | 821 | 821 | 822 | 821 |
| Adjusted R Squared | 0.2193 | 0.1897 | 0.2207 |  0.2758 | 0.2284 | 0.2040 |
|  F Statistics |  14.57 |  11.07 |  13.38 |  19.37 |  14.00 |  12.72 |
|  P-Value |  0.005 |  0.013 |  0.005 |  0.000 |  0.029 |  0.095 |

Robust t test in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

***4.4.2 Robustness Test***

 We employ a robustness test to check the validity of our results. The study showed the impact of sustainable environmental practices on a market-based measure of performance represented by Tobin’s q by employing OLS regression models. Unlike in Table 3 where almost all the sustainable environmental practices revealed a significant positive relationship or significant non-linear relationship with the ROA, based on Tobin's q, only three environmental variables showed a significant association with sustainable environmental practices. Whereas waste, material and resource efficiency, and stakeholder relationship recorded significant relationship, there was no significant relationship between energy-efficient practices and Tobin’s q, compliance and Tobin’s q as well as GHG and Tobin’s q. The negative or no significant relationship between environmental compliance and Tobin's q could be explained from the point of view of the signal theory. Many studies (e.g. Aiyub et al., 2009; Hillary & Burr, 2011; Mensah, 2014; Zhu, Sarkis, Lai, & Geng, 2008) have shown that positive correlation between environmental compliance and financial performance is enhanced when environmental management systems such as ISO and EMAS certification are in place.

However, most AIM-listed firms do not employ ISO 14001 or EMAS. Therefore, information asymmetry may exist as the market may not be aware of proactive environmental compliance measures that are employed by the firm; hence, no significant relationship between environmental compliance and Tobin’s q. The result may also imply that the market might not have observed sustainable environmental policies put in place by such companies; hence, the negative or no significant relationship between environmental compliance and Tobin's q.

 Regarding GHG, the lack of a significant relationship with the market value (Tobin's q) could be linked to the explanation offered by (King & Lenox, 2002). They contend that aside pollution prevention, pollution reduction through other means such as pollution/waste management does not enhance value. Klassen & Whybark (1999) have also argued that pollution prevention is underexploited because it provides hard to observe benefits. King & Lenox (2002) further explained that associated benefits of pollution prevention, such as the elevation of workers’ skills are usually overlooked. They indicated the contextual embeddedness related to pollution prevention and management makes it difficult for managers and other stakeholders to assess its full value. Similarly, there is no significant relationship between energy efficiency practices and market-based measure of performance, and this could result from a misperception of the stock market. Pavlinovic (2013) indicated that the benefits of sustainable environmental policies might be long-term. However, in case of short-term losses occur, the stock market normally react negatively.

***Table 5: OLS Results of Sustainable Environmental Policies and Financial Performance (Tobin’s q)***

This table presents the results of the following panel data regression on the relationship between Sustainable Environmental Policies (SEP) and financial performance (FP): Where FPit is the dependent variable which is measured using Tobin’s’ q. The independent variables are Energy, GHG, Waste, Compliance, Materials and Resource Efficiency and Stakeholder. Control variables indicated by Controls are firm size (Size), Liquidity, Gearing, Board Size, Number on non-executive directors (NEDs), CEO Remuneration (CEO Rem), Industry Effect and Year Effect. β1 and β2 are the regression coefficients. The subscript i denotes the nth company (i = 1... 201), and the subscript t denotes the year (t=1,..6). μi is the unobservable heterogeneity (individual effects) which is specific for each firm, λt is the parameters of time dummy variables, and εit is the error term. Regressions are estimated with robust fixed effects



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) | (6) |
| VARIABLES | Model | Model | Model | Model | Model | Model |
|  |  |  |  |  |  |  |
| Energy | -0.0330 |  |  |  |  |  |
|  | (0.54) |  |  |  |  |  |
| Energy2 | 0.0161 |  |  |  |  |  |
|  | (1.16) |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Compliance |  | 0.0544 |  |  |  |  |
|  |  | (0.68) |  |  |  |  |
| Compliance2 |  | -0.0103 |  |  |  |  |
|  |  | (-0.79) |  |  |  |  |
| Waste |  |  | 0.1820\*\*\* |  |  |  |
|  |  |  | (2.84) |  |  |  |
| Waste2 |  |  | -0.0379\*\* |  |  |  |
|  |  |  | (-2.51) |  |  |  |
| GHG |  |  |  | 0.0269 |  |  |
|  |  |  |  | (0.47) |  |  |
| GHG2 |  |  |  | 0.0103 |  |  |
|  |  |  |  | (0.79) |  |  |
| Materials |  |  |  |  | 0.0975\* |  |
|  |  |  |  |  | (1.66) |  |
| Materials2 |  |  |  |  | -0.0140 |  |
|  |  |  |  |  | (-1.03) |  |
| Stake |  |  |  |  |  | 0.2570\*\*\* |
|  |  |  |  |  |  | (4.11) |
| Stake2 |  |  |  |  |  | -0.0246\* |
|  |  |  |  |  |  | (-1.67) |
| Size | 0.0054 | 0.0125 | 0.0001 | 0.0017 | 0.0048 | -0.0064 |
|  | (0.22) | (0.49) | (0.01) | (0.07) | (0.20) | (-0.27) |
| Liquidity | 0.1550\*\*\* | 0.1430\*\*\* | 0.151\*\*\* | 0.1580\*\*\* | 0.150\*\*\* | 0.1560\*\*\* |
|  | (4.37) | (4.01) | (4.27) | (4.53) | (4.27) | (4.50) |
| Gearing | -0.0582\*\* | -0.0597\*\* | -0.0522\*\* | -0.0549\*\* | -0.0570\*\* | -0.0490\*\* |
|  | (-2.46) | (-2.50) | (-2.25) | (-2.34) | (-2.40) | (-2.07) |
| Board Size | -0.0390 | -0.0360 | -0.0277 | -0.0473\* | -0.0296 | -0.0438 |
|  | (-1.42) | (-1.30) | (-0.98) | (-1.67) | (-1.05) | (-1.60) |
| NEDS | 0.0381 | 0.0356 | 0.0250 | 0.0467 | 0.0276 | 0.0412 |
|  | (1.20) | (1.09) | (0.79) | (1.41) | (0.87) | (1.32) |
| CEO Rem | 0.0593 | 0.0628 | 0.0493 | 0.0426 | 0.0474 | 0.0628 |
|  | (1.18) | (1.247) | (0.98) | (0.86) | (0.94) | (1.36) |
| Industry Effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Effect  | Yes | Yes | Yes | Yes | Yes | Yes |
| Observation | 720 | 720 | 719 | 719 |  720 | 719 |
| Adjusted R Squared | 0.0651 | 0.0641 | 0.0720 |  0.0751 | 0.0682 | 0.169 |
| F Statistics | 3.89 |  3.80 | 3.99 | 4.43 | 3.75 | 6.67 |
| P Value | 0.240 | 0.170 | 0.257 | 0.437 | 0.7867 | 0.174 |
|  |  |  |  |  |  |  |

Robust t test in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**5.0 Conclusion, Implications and Limitations**

The analysis of sustainable environmental practices: energy efficiency practices, pollution prevention and control, waste management, compliance to environmental regulations, materials and resource efficiency, and stakeholder engagement and their impact on financial performance, indicates that all the sustainable environmental practices have a significant positive association with internal measures of performance (ROA), except environmental compliance. However, regarding the market-based measure of financial performance, while waste management, material and resource efficiency and stakeholder engagement on environmental issues reveal a significant positive relationship with the market-based measure of performance, the other sustainable environmental policies did not show any significant relationship. The trend of relationships for accounting and market-based measures of financial performance suggests that sustainable environmental policies for listed SMEs are more effective towards improving internal measures of performance than market-based measures of performance. The findings also point to the fact that shareholders and investors are more interested in product-driven environmental initiatives which directly enhance profitability, rather than process-based initiatives to attract environmentally conscious investors.

The study offers several practical implications for managers. First, as suggested by Nath & Ramanathan(2016), firms are often in a dilemma as to which sustainable environmental practices to adopt to improve their financial performance. Most managers are also not sure as to the areas of financial performance that could be improved with the adoption of sustainable environmental practices. The result from the study shows that whereas sustainable environmental practices; energy-efficient practices, pollution abatement (GHG), waste management, material and resource efficiency as well as stakeholder engagement significantly improve profitability, only waste, materials, and stakeholder engagement have a significant impact on the market values. This suggests that whereas operational environmental practices directed towards improving profitability is effective, a similar approach to enhance the market value is not effective. Therefore, it is recommended that managers of listed SMEs focus on environmental practices that improve profitability rather than attempting to attract investors through enhanced environmental practices. Similarly, the study points to the fact that shareholders and investors are more interested in product-driven environmental initiatives which directly enhance profitability, rather than process-based initiatives to attract environmentally conscious investors.

 The study also shows the level of environmental engagement that is expected to lead to optimal financial benefit. The inverted U-shaped relationship recorded between energy efficiency and FP, GHG, and FP, as well as material and resource efficiency and FP, implies that a moderate level of environmental engagement is required to establish optimum financial benefits in those areas. Therefore, excessive allocation of resources to become the most sustainable firm in the area of energy efficiency, GHG, and material and resource efficiency may not yield the expected financial benefits. As suggested by Vijfvinkel et al. (2011), the existence of a market for sustainable firms does not imply that the most sustainable firms will be better off financially. The findings of Ramanathan (2016), in line with that of Hart (1995) also pointed out that pollution prevention measures that necessitate redesigning of the manufacturing operation might involve less consumption of raw materials and energy and this is likely to have a significant financial impact than a simple-end-of-pipes strategy which is also available to third parties. Similarly, Endrikat, Guenther, & Hoppe (2014) explained that a strategic approach to environmental management practices is more closely linked with superior financial performance. Therefore, in terms of resource allocation, the study offers guidance on the extent to which resources should be allocated to environmental management practices to derive optimum financial benefits.

 However, the study is only limited to content analysis of annual reports and other sustainability reports that are disclosed on the companies’ websites. This implies that the study did not capture other sustainable environmental policies that are not contained in the annual reports or the companies’ website. Zéghal & Ahmed (1990) also indicated that exclusive use of annual reports results in an incomplete representation of the quantum of environmental practices and there the need to consider other sources as well. However, Ntim (2009) strongly argued why the annual reports should be relied upon. Ntim (2009) explained that aside the exclusive use of the annual report is consistent with the prior studies and therefore offer a direct comparison, only company annual reports are consistently available where information could be drawn. Besides, Guthrie, Cuganesan, & Ward (2008) point out that it is impossible to identify all sustainable environmental activities of an organisation under one study and therefore, it is reasonable to use annual reports. Nevertheless, to ensure consistency with other environmental data, it will be appropriate if future studies are directed to include all other environmental information or projects that the firms are involved in so that other useful lessons could be drawn.

 Again, the study concentrated on only AIM-listed firms in the UK. The reliability of the research in generalising the effect of sustainable environmental practices and financial performance could be enhanced if a comparative analysis could be drawn with other AIM-listed firms outside the UK. Such initiative may be significant as it is argued that although environmental pollution is a global challenge, different experiences may be encountered by different countries (Chithambo, 2013; Kolk & Pinkse, 2010; Prado-Lorenzo & Garcia-Sanchez, 2010). Thus, in future, similar studies that will draw a comparison from different countries rather than concentrating on only one country can improve reliability and generalisation of the study results.

 Finally, the study relied on six-year panel data due to lack of information. However, for more robust results, it is expected that future studies can extend the panel period beyond the six years.

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**Appendix**

**Summary of Sustainable Environmental Practices for one AIM-listed firm**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Company: 600 Group** |  |  |  |  |  |  |  |
| **Case ID: 1 Size: Large Company** | **2016** | **2015** | **2014** | **2013** | **2012** | **2011** | Notes/Page No |
| **Energy Efficiency Measures (Energy)** |   |   |   |   |   |   |   |
| Reduction in energy use/savings | 0 | 0 | 0 | 0 | 0 | 0 |   |
| Cost savings in energy use (Gas and electricity) | 0 | 0 | 0 | 0 | 0 | 0 |   |
| Fuel savings for using light weight cars and plants | 0 | 0 | 0 | 0 | 0 | 0 |   |
| Efficient use of energy/energy saving devices | 0 | 0 | 0 | 0 | 0 | 0 |   |
| Improved use of alternative energy/Others | 0 | 0 | 0 | 0 | 0 | 0 |   |
| **Total** | 0 | 0 | 0 | 0 | 0 | 0 |   |
|  |  |  |  |  |  |  |  |
|  | **2016** | **2015** | **2014** | **2013** | **2012** | **2011** | Notes/Page No |
| **Greenhouse Gases (GHG)** |   |   |   |   |   |   |   |
| Reduction in emission | 0 | 0 | 0 | 0 | 0 | 0 |   |
| Reduction in the use of toxic materials in place of non-toxic and reduction of dust | 0 | 0 | 0 | 0 | 0 | 0 |   |
| Cost savings from reduced emissions | 0 | 0 | 0 | 0 | 0 | 0 |   |
| Procedure to monitor emissions | 0 | 0 | 0 | 0 | 0 | 0 |   |
| Others | 0 | 0 | 0 | 0 | 0 | 0 |   |
| **Total** | 0 | 0 | 0 | 0 | 0 | 0 |   |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  | **2016** | **2015** | **2014** | **2013** | **2012** | **2011** | Notes/Page No |
| **Compliance** |   |   |   |   |   |   |   |
| Existence of Environmental Policy | 1 | 1 | 1 | 1 | 1 | 1 | p13/9,13/p13/p13/p12 |
| Environmental Certification e.g. ISO, EMAS, Permits approval | 0 | 0 | 0 | 0 | 0 | 1 | p7 |
| Absence of fines/penalties, benchmark, improvements | 0 | 1 | 1 | 1 | 1 | 1 | p8,13/13/p13/p13/p12 |
| Identification of Environmental Risk | 1 | 1 | 1 | 1 | 1 |   | p13/9,13/13/p13/p12 |
| liaising with employees/other stakeholders on compliance issues/Others | 1 | 1 | 1 | 1 | 1 | 1 | p13/p13/p13/p13/p12 |
| **Total** | 3 | 4 | 4 | 4 | 4 | 4 |   |
|  |  |  |  |  |  |  |  |
|  | **2016** | **2015** | **2014** | **2013** | **2012** | **2011** | Notes/Page No |
| **Waste** |   |   |   |   |   |   |   |
| Reduction in waste generated | 0 | 0 | 0 | 0 | 0 | 0 |   |
| Cost savings in waste disposal | 0 | 0 | 0 | 0 | 0 | 0 |   |
| Proper waste disposal | 0 | 0 | 0 | 0 | 0 | 0 |   |
| Creating market or increase revenue for waste products | 0 | 0 | 0 | 0 | 0 | 0 |   |
| Reduction in disposal to landfills and/Others | 0 | 0 | 0 | 0 | 0 | 0 |   |
| **Total** | 0 | 0 | 0 | 0 | 0 | 0 |   |
|  |  |  |  |  |  |  |  |
|  | **2016** | **2015** | **2014** | **2013** | **2012** | **2011** | Notes/Page No |
| **Materials and Resource Efficiency** |   |   |   |   |   |   |   |
| Cost savings in material usage/resource efficiency/recycle | 0 | 1 | 1 | 1 | 1 | 1 | p5,13/p1/p1/p3/p3 |
| Reduce material input (light weighing) | 0 |   |   |   |   |   |   |
| Increased use of alternate raw material with lesser waste | 0 | 0 | 0 | 0 | 0 | 0 |   |
| Improved product quality, packaging/reuse/design | 0 | 1 | 1 | 1 | 1 | 1 | p3,13/p3/p13/p13/p3 |
| Improved raw material handling/shorter lead times Others | 0 | 1 | 1 | 1 | 1 | 1 | p3,13/p3/p1/p13/p3 |
| **Total** | 0 | 3 | 3 | 3 | 3 | 3 |   |
|  |  |  |  |  |  |  |  |
|  | **2016** | **2015** | **2014** | **2013** | **2012** | **2011** | Notes/Page No |
| **Stakeholder Engagement** |   |   |   |   |   |   |   |
| Increased alliances with other firms or stakeholders to jointly work on environmental projects | 0 | 0 | 0 | 0 | 0 | 0 |   |
| Improved communication of environmental quality with stakeholders including collection and use of feedbacks | 0 | 0 | 0 | 0 | 0 | 0 |   |
| Increased collaboration with suppliers in terms of new product design, environmental standards for suppliers and environment audit of suppliers | 0 | 0 | 0 | 0 | 0 | 0 |   |
| Collaborating with employees and customers on environmental issues | 0 | 0 | 0 | 0 | 0 | 0 |   |
| Others | 0 | 0 | 0 | 0 | 0 | 0 |   |
| **Total** | 0 | 0 | 0 | 0 | 0 | 0 |   |
|  |  |  |  |  |  |  |  |
| **Composite of GP (Energy + GHG + Waste + Compliance + Materials + Stakeholder)** | 3 | 7 | 7 | 7 | 7 | 7 |   |
|  |  |  |  |  |  |  |  |

**Coding Process and Unit of Coding**

As demonstrated in appendix 1 above using one of the selected firms, Sustainable Environmental Policies (SEP) were divided into six environmental performance variables made up of energy, greenhouse gases (GHG), waste, materials and resource efficiency, stakeholder relationship, and compliance. Within each sub-measure, five different performance variables constitute each sub-measure. The binary coding system is used to identify items under each sub-measure. 1 is recorded where an item in the sub-measure is disclosed, and 0 is also recorded where the item under the sub-measure is not disclosed. The number of items disclosed under each sub-measure is added together to obtain the value for the sub-measure.