Environmental sustainability conducts and corporate performance in extractive sector

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Abstract

The subject of environmental sustainability transcends geographical zones, it attracts attention at the top-most business, governmental and civil society levels because of its current visible impacts. Despite the growing concern for a sustainable ecosystem, few applied studies have been conducted to establish the relationship between environmental sustainability and corporate performance in the extractive sector (one of the most profitable of all business sectors, yet arguably the worst culprit in environmental degradation). Therefore, this research seeks to explore the relationship between environmental sustainability and corporate performance in the extractive sector. This relationship was investigated using data from 68 companies within the extractive sector in both Europe and the Americas by the technique of multiple linear regression and event studies by one-way ANOVA. Our results show a negative relationship between environmental sustainability and profit while mixed results were obtained for relationship between environmental sustainability and firm value. In the short horizon, there is a positive relationship between environmental sustainability and firm value while a negative result was obtained in a long-horizon. The pattern of the results is most likely due to the unique nature of the sector where the demand for product exceeds supply. There is monopoly power in the form of cartels, and substitutes for the sector's products (e.g. oil, gas, and cement) are either unavailable or inadequate. Therefore, poor attention to environmental responsibilities may not necessarily affect the profit but impact negatively on corporate value of the companies within the sector in a short-term. However, in the long-term, poor sensitivity to the environment may not be sustainable.

Keywords: Environmental sustainability, Corporate performance, Extractive sector.

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1. Introduction

An issue that has captured the attention of national and international political and business leaders across the globe and the developed world is environmental sustainability. Yet the need for our environment to be a healthy and comfortable place to live was long been regarded as unrelated to the economic system (Diaz, 1996; Ludevid, 2000). Businesses for many decades could ignore the impact of their activities on the natural and social environment in which they operated, unless it had direct repercussions on the profit and loss account.

However, various environmental abuses by companies have led to stakeholders developing negative attitudes and behaviours towards businesses. Rodriguez and Cruz (2007) argued that customers are gradually altering their purchasing attitudes towards behaviours that are more sensitive to the natural and social environment. This then generates an image problem for those firms that do not respect the environment. The politico-legal system is also undergoing drastic transformation, directed at limiting the environmental degradation caused by business activities. For example, many world leaders have made specific commitments towards a phased reduction in carbon dioxide emissions. The United States is committed to cutting emission by 17 per cent in 2020, 30 per cent by 2025, 42 per cent by 2030 and 83 per cent by 2050. The United Kingdom is on target to meet its pledge to cut carbon dioxide level by 34 per cent by 2020 and 2050 target of an 80 per cent cut in greenhouse gases (Worthington, 2009). The concern for a clean environment equally culminated in the United Nations conference held in Copenhagen, Denmark in December 2009 (Goldenberg, 2009).

Despite the rising interest in the issues of environmental sustainability, few applied studies have been conducted with a notable lack in those focusing on environmental sustainability and corporate performance in the extractive sector. Some studies purport to find a negative relationship between environmental protection and economic performance (Williams et al., 1993; Worrell et al., 1995; Cordeiro and Sarkis, 1997; Thornton et al.,

2003). Similar studies find a positive relationship (Cormier et al., 1993; Hart and Ahuja, 1996; Klassen and McLaughlin, 1996; Russo and Fouts, 1997; Judge and Douglas, 1998; Rodriguez and Cruz, 2006) while others show either inconclusive results or no effect (Khanna and Damon, 1999; Levy 1995; Rockness et al., 1986 and Fogler and Nutt, 1975). A review of previous studies and analyses in this area was conducted which demonstrated clear research gap in this field, and this is shown in Table1 below.

Table 1: Illustrates a summary of previous research on correlations between environmental protection/management and corporate performance

Year	Subject Title	Authors	relationship
2008	Do environmental management systems improve business performance in an international setting?	Darnall, N., Henriques, I. and Sardorsky, P. (2008). Journal of International Management.	+ve
2007	Relation between social-environmental responsibility and performance in hotels firms	Rodriguez, F.J.G. and Cruz, Y.M.A. (2007) Hospitality Management	+ve
2006	Environmental management and firm performance: A case study	Claver, E., Lopez, M.D., Molina, J.F. and Tarı, J.J. Journal of Environmental Management.	+ve
2003	Sources of corporate environmental performance	Thornton, D., Kagan, R.A. and Gunningham, N. (2003). California Management Review	-ve
2002	Assessing a voluntary environmental initiative in the developing world: the Costa Rican certification for sustainable tourism	Rivera, J. (2002) Policy Sciences	+ve
2001	CEO compensation: does it pay to be green?	Stanwick, P.A. and Stanwick, S.D. (2001). Business Strategy and the Environment.	+ve
1999	EPA's voluntary 33/50 program: impact on toxic releases and economic performance of firms.	Khanna, M. and Damon, L.A. (1999). Journal of Environmental Economics and Management.	***
1998	Performance implications of incorporating natural environmental issues into the strategic planning process: an empirical assessment.	Judge, W.Q. and Douglas, Y.T.J., (1998). Journal of Management Studies	+ve
1997	A resource-based perspective on corporate environmental performance and profitability.	Russo, M.V. and Fouts, P.A. (1997). Academy of Management	+ve
1997	An empirical evaluation of environmental	Sarkis, J. and Cordeiro, J.J.	-ve

	efficiency and firm performance: Pollution prevention versus end-of –pipe practice	(1997). Business Strategy and the Environment	
1996	Does it pay to be green? An empirical examination of the relationship between emission reduction and firm performance.	Hart, S. and Ahuja, G. (1996). Business Strategy and the Environment.	+ve
1996	The impact of environmental management on firm performance.	Klassen, R.D. and McLaughlin, C.P. (1996). Management Science	+ve
1995	The environmental practices and performance of transnational corporations.	Levy, D.L. 1995.	***
1995	When green turns to red: stock market reaction to announced greening activities. Paper presented at the academy of management meeting, Vancouver, Canada	Worrell, D., Gilley, K.M., Davidson III, W.D. and El-jely, A. (1995). Academy of Management Meeting held in Vancouver, Canada	-ve
1993	The impact of corporate pollution on market valuation: some empirical evidence.	Cormier, D., Magnan, M. and Morard, B. (1993) Ecological Economics.	+ve
1993	Environmental Strategies for Industry: International Perspectives on Research Needs and Policy Implications.	Williams, H.E., Medhurst, J. and Drew, K. (1993) Environmental Strategies for Industry	-ve
1986	Hazardouswaste disposal, corporate disclosure, and financial performance in the chemical industry. .	Rockness, J., Schlachter, P. and Rockness, H.O. (1986) Advances in Public Interest Accounting.	***
1975	A note on social responsibility and stock evaluation.	Fogler, H.R. and Nutt, F. (1975). Academy of Management Journal	***

+ve   positive correlation
-ve   negative correlation
***   inconclusive/ no effect

The purpose of this study, therefore, is to investigate the relationship between environmental sustainability and corporate performance in the extractive sector by the use of multiple linear regression and event studies by one-way ANOVA. There is a growing need to formulate extractive industry performance models on the basis of environmental sustainability criteria.

The findings arising from this study shall provide strategic insight into the impact of environmental sustainability on firm's value and profit level and further propound a model for environmental decision making. This work can thereby contribute to existing

literature in environmental management, sustainable development corporate social responsibility (CSR) and ethics.

2. Relevant Literature

Many theories in ethics, corporate social responsibility (CSR), environmental studies, natural science, business and society shaped the development of environmental sustainability. This section will look at conceptual meanings of sustainability, and examine two significant theories that offer potential insight into the actions of decision makers: the theory of reasoned action (TRA) and stakeholder theory.

2.1. Sustainability

Production has led to various environmental impacts like depletion of non-renewable resources, global warming, diminution of land resources, acidification, and reduction of water resources and potential threats to health and safety of employees (Singh et al., 2007). The issue of environmental abuses and degradation has led various sectors, governments and Non-Governmental Organisations (NGOs) to engage with sustainability debates and initiate strategies for responding to the challenges of sustainable development. It is also in response to this that the academic world has dedicated various groups to the issues of environment and sustainable development, including Brunel Research in Enterprise, Innovation Sustainability and Ethics (BRESE), Royal Holloway's Centre for Research into Sustainability and the International Centre for Corporate Social Responsibility at Nottingham University in the United Kingdom.

According to Ortega et al. (2008) the term "sustainability" was introduced as an international issue by the book entitled "The World Conservation Strategy" in 1980. The term became used with increased frequency along with its economic, social and environmental dimensions. The term "sustainability" also gained more momentum

following the publication of the Brundtland report for the World Commission on the Environment and Development (WCED, 1987). The Brundtland report defines the sustainable development as "development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs'' (WCED, 1987. p.24). Schaltegger and Burritt (2005) stated that corporate social responsibility (CSR) management is very similar to corporate sustainability management, which aims to integrate the economic, environmental, and social aspect of business management. "True corporate sustainability requires an integration of all three sustainability dimensions into business management , which can even lead to business model transformation to secure sustainable operations in the long-term" (Weber, 2008 pp. 258).

The major challenge that the above definition poses is how to balance the quest for shareholders' wealth maximisation objective with the need to be socially responsible and environmentally friendly in a way that meets both present needs and those of tomorrow. To address the issue of environmental sustainability, many authors have suggested management systems that fully integrates environmental concerns as part of entire business system (Coglianese and Nash, 2001; Peglau, 2005; King et al, 2005); these are referred to as an environmental management systems (EMS). EMS consists of a collection of internal policies, assessments, plans and implementation actions affecting the entire organization unit and its relationships with the natural environment (Coglianese and Nash, 2001). Equally, Elkington's (1994) triple bottom line (TBL) theory provides basic performance areas for business, which include environmental performance, societal performance and economic performance (often summarised as planet, people and profit).

In the world at large, the global financial crisis alongside continued concerns over climate change which proved irresolvable at the Copenhagen summit provide the context in which social and environmental analysts express concerns over firms' ability to cope with these challenges. There is a fear that the economic shock may likely be deployed as an excuse for companies' inability to meet their environmental and social obligations.

Interestingly, Elkington's TBL places the three performance criteria on the same platform and companies' performance is expected to be evaluated on these criteria equally. Also, EMS looks at environmental sustainability as an integral part of the firm's daily operation irrespective of the economic conditions. In practice, keeping the social and environmental obligations of business on a level playing field with the economic and financial obligations continues to be something of a holy grail.

2.2. The Theory of Reasoned Action

The theory of reasoned action (TRA) is a popular theory in decision making research. The theory has been used to explain communication perspectives (Miller, 2005), ethical or unethical behaviour (Flannery and May, 2000), environmental decision making (Cordano and Frieze, 2000), and green consumerism (Sparks and Sheperd, 1992) among many others. According to Ajzen and Fishbein (1975 and 1980), the core components of TRA are three general constructs: behavioral intention (BI), attitude (A), and subjective norm (SN). TRA suggests that a person's behavioural intention depends on the person's attitude towards the behaviour and subjective norms (BI = A + SN). A person's intentions are themselves guided by two things: the person's attitude towards the behaviour and the subjective norm. Subjective norm is a combination of perceived expectation from relevant individuals, groups or stakeholders along with intention to comply with these expectations. It is the individual's perception that most people who are important to him or her think he should or should not perform the behaviour in question (Ajzen and Fishbein, 1980). Ajzen (1991) noted that subjective norms are often measured directly by asking respondents to indicate whether "important others" would approve or disapprove of a particular behaviour.

Miller (2005) defines each of the three components and uses the example of embarking on a new exercise program to illustrate the theory as follows:
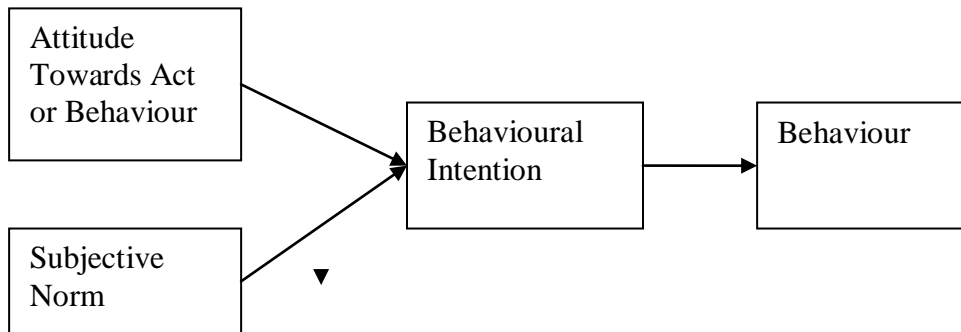
- Attitudes: the sum of beliefs about a particular behaviour weighted by evaluations of these beliefs. You might have the beliefs that exercise is good for your health, that exercise makes you look good, that exercise takes too much time, and that exercise is uncomfortable. Each of these beliefs can be weighted (e.g. health issues might be more important to you than issues of time and comfort).

- Subjective norms: looks at the influence of people in one's social environment on a person's behaviour intentions. The beliefs of people, weighted by the importance one attributes to each of their opinions, will influence one's behavioural intention. You might have some friends who are avid exercisers and constantly encourage you to join them. However, your spouse might prefer a more sedentary lifestyle and scoff at those who work out. The beliefs of these people, weighted by the importance you attribute to each of their opinions, will impact your subjective norms. This will influence your behavioural intention to exercise, which leads to your behaviour to choose to exercise or not to exercise.

- Behavioural Intention: a function of both attitudes towards behaviour and subjective norms towards that behaviour, which has been found to predict actual behaviour. The attitudes towards exercise combined with the subjective norms about exercise, each with their own weighting, will lead to intention to exercise (or not), which will then lead to actual behaviour.

Flannery and May (2000) examined the influence of managers' attitudes and norms on their environmental decision-making and concluded that attitudes and norms significantly influence managers' decision. Similarly, Cordano and Frieze (2000) find a positive relationship between environmental managers' assessment of subjective norms about environmental regulation and their preference to implement source reduction activities. While these studies indicate the relevance of TRA to environmental management and environmental sustainability the theory fails to explicitly note legally imposed duties of managers that may override attitude and subjective norms that determine managers'

response to environmental challenges. Such legal claims are captured by the stakeholder theory that considers all claims irrespective of legal or social.

Figure 1: TRA Schematic

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┌─────────────────┐
│ Attitude        │
│ Towards Act     │─────┐
│ or Behaviour    │     │        ┌──────────────┐        ┌──────────────┐
└─────────────────┘     └───────▶│ Behavioural  │───────▶│ Behaviour    │
                                 │ Intention    │        │              │
┌─────────────────┐     ┌───────▶└──────────────┘        └──────────────┘
│ Subjective      │     │   ▼
│ Norm            │─────┘
└─────────────────┘
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Source: Fishbein and Ajzen (1975).

2.3. Stakeholder Theory

2.3.1. General Stakeholder Theories

Many studies in the areas of ethics, CSR, business and society are underpinned by the concept of stakeholder analysis to address the interests of various individuals and groups that have stake in a business. Stakeholder analysis has been widely applied, among others, to describing and explaining the factors that encourage managers to identify certain groups as stakeholders, describing and explaining the effects of management decisions on different groups of affected actors, identifying which actors have valid claims upon the firm, explaining how employing stakeholder analysis can help firms to achieve traditional goals and so on (Donaldson and Preston, 1995; Mitchell et al., 1997; Wheeler and Sillanpaa, 1998). A key question arises as to how the stakeholder approach is to be identified and managed by business. Equally there is the issue of how the different uses of stakeholder analysis link to one another and whether some uses of stakeholders' analysis should take precedence over others (Reed, 1999).

In addressing the foregoing, Donaldson and Preston (1995) differentiated between descriptive, instrumental and normative uses of stakeholder analysis. Descriptive stakeholders comprise of groups who can affect the firm and could be affected by the firm; instrumental stakeholders can be defined in terms of groups that can affect the ability of management to achieve their goals and normative stakeholders comprise of groups that have valid normative claims on the firm. The normative stakeholder theory looks at business obligations from the perspective of ethics, morality and legitimacy (Reed, 1999). Donaldson and Preston phrased the normative approach as follows ". . . managers should acknowledge the validity of diverse stakeholder interests and should attempt to respond to them within a mutually supportive framework, because that is a moral requirement for the managerial function" (Donaldson and Preston, 1995, p. 87)

Freeman (1984) distinguished between strategic and normative stakeholders, defining strategic stakeholders as limited groups that affect the strategic aims of the organisation. The strategic groups such as shareholders and customers are those that are critical and can affect the very survival or existence of the organisation with legitimate claims. According to Freeman, normative stakeholders encompass more claims and include a wider range of entities or interest groups.

In further classifications of stakeholders, Evans and Freeman (1988) classified stakeholders into narrow and wider stakeholders. According to them, narrow stakeholders are those that are the most affected by the organisation's policies and will usually include shareholders, management, employees, suppliers, and customers who are dependent upon the organisation's output. Wider stakeholders are those less affected and may typically include government, less-dependent customers, the wider community (as opposed to the local community) and other peripheral groups. Clarkson (1995) classified stakeholder into primary and secondary stakeholder groups. Primary stakeholder is one without whose continued existence of a firm as going concern is threatened while the secondary stakeholders are those that the organisation does not directly depend upon for its immediate survival. Mahoney (1994) classified stakeholders into active and passive
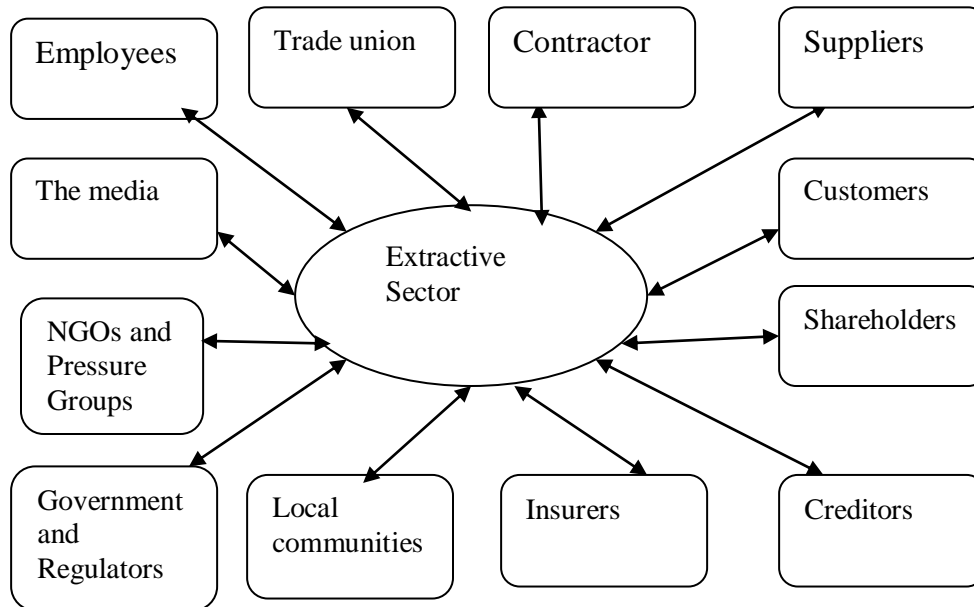
groups. Active stakeholders are those who seek to participate in the organisation's activities. These stakeholders may or may not be a part of the organisation's formal structure. Management and employees fall into this active category, including some parties from outside an organisation, such as regulators and environmental pressure groups. Passive stakeholders, in contrast, are those who do not normally seek to participate in an organisation's policy and decision making. This is not to say that passive stakeholders are any less interested or less powerful, but they do not seek to take an active part in the organisation's strategy. This will normally include most shareholders, government, and local communities.

2.3.2. Environmental Stakeholder Theories

Freeman's definition of stakeholders provided the basis for Banerjee, Lyer, and Kashyap (2003, p.107) definition of 'environmental stakeholders' as "individuals or groups that can affect or be affected by the achievement of a firm's environmental goals". Clement (2005) declares that Freeman was the first management author to so clearly identify the strategic importance of groups and individuals beyond not only the firm's stockholders, but also its employees, customers and suppliers. He saw such widely disparate groups as local community organisations, environmentalists, consumer advocates, governments, special interest groups, and even competitors and the media as legitimate stakeholders. Hilman and Keim (2001) were of the view that effective management of "true" stakeholder issues, such as employee relations and environmental protection, can lead to improved financial performance, as measured by market-value added. In contrast, they found that merely participating in social issues without a focus on the needs of specific stakeholder group leads to diminished financial outcomes. Azapagic (2003) similarly stated that identifying relevant stakeholders and their interests is a prerequisite for the development of meaningful sustainability indicators. He categorised stakeholders in mining and the mineral industry to include employees, trade union, contractors and suppliers, customers, shareholders, creditors, insurers, local communities and authorities,

government and NGOs. The figure 2 below provides a grid showing the environmental stakeholders for the purpose of this study.

Figure 2: Environmental Stakeholder Grid

Employees

Trade union

Contractor

Suppliers

The media

Customers

NGOs and Pressure Groups

Extractive Sector

Shareholders

Government and Regulators

Local communities

Insurers

Creditors

2.3.3. Stakeholder Theory and the Theory of Reasoned Action

According to Marshall, et al (2009), stakeholder theory can be used to complement the TRA when examining managerial attitudes and norms in a way that takes into account the influence of stakeholder pressures. They further stated that a stakeholder may not be adversarial but nonetheless constrain managerial discretion, such as the employees, owners, customers, public groups and suppliers. Additional stakeholders may include groups who maintain adversarial positions to the firm, including regulatory and special interest groups concerned with environmental issues. Nonetheless, there is a relationship between TRA and stakeholder theory. The decisions as to how important a stakeholder is, depends on the manager's behavioural intention towards such a stakeholder which is a function of individual's attitudes and influence or respect such a group commands.

3. Methodology

3.1. Method

This paper intends to establish the relationship that exists between environmental sustainability and corporate performance in the extractive sector. Therefore, the following hypotheses shall be tested:

Hypothesis 1 (H1). There is a relationship between environmental sustainability and profit level.

Hypothesis 2 (H2). There is a relationship between environmental sustainability and firm value.

Figure 3: CONCEPTUAL FRAMEWORK
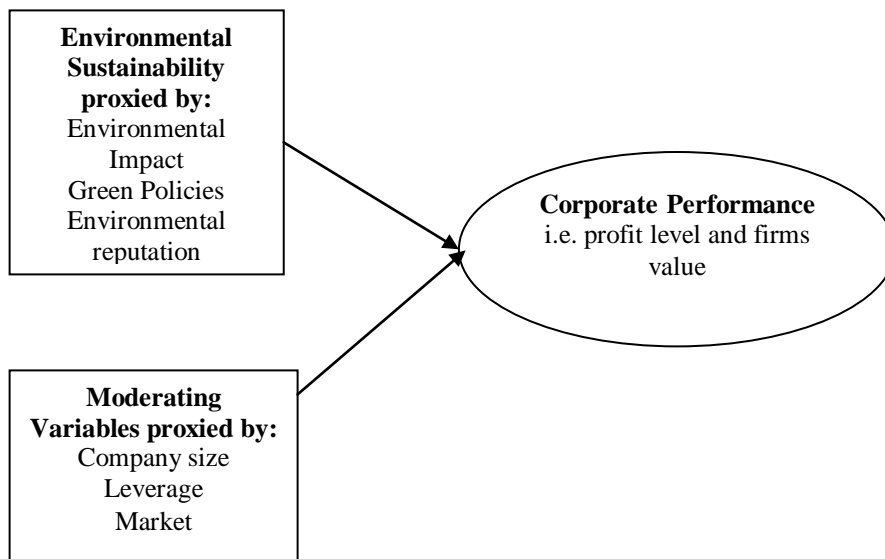
The study uses a multiple linear regression analysis and event studies by one-way ANOVA. A multiple regression is an extension of simple regression but used in cases where there are many independent variables (Koop, 2000). The inclusion of event studies is informed by the need to find out the effect of published environmental unsustainable

conducts on firm's value in a short-term. The choice of these designs is informed by the need to find out the contribution of environmental sustainability activities of companies to corporate performance in the extractive sector. The independent variable is environmental sustainability while corporate performance is the dependent variable. The use of these methods is supported by similar quantitative studies that relied on the application of multiple regression and event studies to environmental issues (Darnall, Henriques and Sardorsky, 2008; Rodriguez and Cruz, 2007; Rao, 1996; Russo and Fouts, 1997). This study recognises Weber's (2008) view that empirical research in sustainability, CSR and financial performance can take the form of both qualitative and quantitative research. He notes that qualitative research in this area mainly uses case studies or best practice examples to investigate the influence of CSR competitiveness. The quantitative empirical research in this area draws on three main areas: portfolio studies comparing e.g., portfolios of environmentally and socially proactive and reactive companies, event studies investigating e.g., market responses after CSR related events, and multiple regression studies (Darnall et al. 2008; Riveral, 2002).

3.2. Population and Sample Size

The research population for this study comprises the extractive industries in the world at large, while the sample for the purpose of this study comprises of the 68 largest extractive companies in the Americas and Europe listed on Standard & Poor's (S&P) 500. Liebental, Michelitsch and Tarazona (2005), in their review of the extractive industry for sustainable development for the World Bank defined the extractive sector to include oil, gas, and mining of minerals and metals. This definition served as the guide for defining the companies that fall within the extractive industry for the purpose of this study. S&P 500 is a free-float capitalization –weighted index published since 1957 on the prices of 500 large-capital common stock activity traded in the United States. The stocks included in the S&P 500 are those of large publicly held companies that trade on either of the two largest American stock market companies; the NYSE Euronext and the NASDAQ OMX.

3.3. Model

In order to test the hypotheses stated earlier and accomplish the purpose of this study, the following quantitative models have been formulated. The two models are meant to mathematically define the first and second hypotheses respectively.

Model 1:

$ROE = \alpha + \beta_1 EIS + \beta_2 GPS + \beta_3 RS + \beta_4 COMPANYSIZE + \beta_5 LEVERAGE + \beta_6 MARKET + \mu$

Model 2:

$M/B = \alpha + \beta_1 EIS + \beta_2 GPS + \beta_3 RS + \beta_4 COMPANYSIZE + \beta_5 LEVERAGE + \beta_6 MARKET + \mu$

Notation of Key to Variables

ROE = Return on Equity; M/B = Ratio of market value to book value; α = Intercept ; β_{1-6} = Coefficient of independent variable ; GPS = Green Policies Score; EIS = Environmental Impact Score; RS = Reputational Survey Score ; COMPANYSIZE = Total Asset ; Leverage = Debt –to-asset ratio ; MARKET represented by average monthly Standard & Poor's (S&P) 500 index; μ = disturbance term. All these variables have been properly defined in sections 3.4.1 to 3.4.3

3.4. Definition of Variables

3.4.1. Independent Variable (or interest variable)

The research independent variable is environmental sustainability and the data relating to it is obtained from Green Ranking 2009 (Newsweek, 2009). The ranking was carried out by Newsweek (the second largest news weekly magazine in the U.S) in collaboration with three research partners: KLD Research Analytics, which tracks environmental, social and governance data on companies worldwide; Trustcost, which specialises in quantitative environmental performance measurement, and Corporate Register.com, the world's largest online directory of social responsibility and environmental reporting. The

independent variable, therefore, was proxied by the following three environmental ranking components: environmental impact score (EIS), green policies score (GPS), and reputation score (RS).

The environmental ranking components have been operationally defined by the collaborating research partners as follow:

EIS: is the overall score taken from key elements which include greenhouse gas emissions (including nine gases in total, with carbon dioxide the most important in many cases), water use (including direct, purchased and cooling), solid waste disposed, and acid rain emission (sulphur dioxide, nitrogen oxide and ammonia) , all normalised by revenue.

GPS: defines the main elements here to include climate change policies and performance, pollution and performance, product impact, environmental stewardship and environmental management.

RS: this was a survey asking respondents (CEOs and high ranking officials) to rate companies as "leader" or "laggard" in five key "green" areas: green performance, commitment, communications, track record and ambassadors.

3.4.2. Control Variables

The study uses three control variables in the multiple linear regression model stated above, these include company size, leverage and market. These have been included in the model to take care of all other factors that can affect the dependent variables. Waddock and Graves (1997) controlled for effect of industry size, managerial attitude towards risk, and industry type when examining the link between corporate social performance and financial performance. In a similar study, Kang et al (2009) used size, leverage and market size as control variables.

COMPANYSIZE: this represents the total assets of the company. Chauvin and Hirschey (1993) argued that on economies of scale, the large firms perform better than small ones, thereby proposing a positive relationship between the firm size and profitability.

LEVERAGE: this represents the debt-to-assets ratio (total debt divided by total assets) which controls for the effect of capital structure on company's profitability. For instance a firm can leverage on debt finance in order to take tax advantages while dividends paid on equity are not allowed (McConnell and Servaes, 1990). On the other hand, when a firm increases its debt excessively, the firm's equity value may dwindle, because the market perceives the firm as too risky (Brealey and Myers, 2003).

MARKET: this represents the average monthly S&P500 index per respective year. This is included to control for the effect of general economic conditions in a specific year. It is a universal concept that during different economic conditions (boom or recession) a company either performs better or worse. Such a correlation may cofound the relationship between firm corporate performance and environmental sustainability activities, so it is therefore controlled in the model (Kang, et al., 2009).

μ: is meant to represent the host of factors that help determine the dependent variable, including the effect of unconsidered independent variables and possible error in measurement of dependent variable (Mirer, 1995).

3.4.3. Dependent Variables

The study shall examine corporate performance using one of the accounting methods of determining profitability known as Return on Equity (ROE) and a market based method of firm valuation known as Market- to-Book (M/B) value.

ROE: It is the ratio of net income (after interest and taxes) to shareholders' fund (Ross, Westerfield and Jaffe, 2005). This is used to proxy profit level stated as a dependent variable in the first model.

M/B: According to Ross, Westerfield and Jaffe (2005) market-to-book value is a ratio comparing the market value per share of a company's stock with the book value per share. The book value is total equity or shareholders' fund. This has been used as a proxy for firm value in the second model.

3.4.4. Event Studies

The use of event studies by one-way ANOVA has been considered to be a complementary method in the study. In order to reinforce our method of testing H2 by multiple regression, it is equally considered necessary to verify the effect of published negative environmental abuses on firm's value (for the purpose of this approach, stock price is used to represent firm value) in the extractive sector. In finance parlance, the concept of Efficient Market Hypothesis (EMH) maintains that the markets are very efficient in interpreting information and arriving at equilibrium security prices. Rao (1996) argued that most empirical studies have found that stock prices reflect publicly available information. In this study, published environmental abuse is an independent variable and a categorical data while stock price is a dependent variable.

4. Data Analysis

Data were collected for the 68 largest extractive companies in oil, gas, and mining of minerals and metal. The data relating to environmental sustainability variables (independent variables) are obtained from Green Ranking 2009 (Newsweek, 2009). The data relating to the dependent variables and other financial information used as control variables are obtained from Osiris database (this database keeps financial data on more than 57,000 listed international companies in 190 countries across the world).

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The analysis of the cross-sectional data was conducted with the application of ordinary least square (OLS) multiple regression. The application of OLS requires that some basic assumptions must not be violated before a regression equation is accepted as fit for estimation of a model (Gujarati, 2003). This warranted a check for the normality of the equation, heteroscedasticity in standard error, autocorrelation between residuals, multicollinearity among independent variables and functional form or linearity between dependent and independent variables. The results of these tests demonstrated that the assumptions for OLS regression were not violated.

For event studies, we reviewed 67 cases of environmental pollution in Europe and America in the oil and gas sub-sector of extractive industries published by Newsweek between 1989 and 2010. We were able to arrive at a sample of 5 companies that fulfill the condition for use of event studies. In use of event studies, all other factors that may likely affect the stock price aside from published environmental abuses are observed and where such are present the company involved becomes unqualified for the study. Therefore we filtered other influencing factors on stock price to ensure that our samples are insulated from other major events that may likely affect stock prices (such as announcement of merger, acquisition, fraud, management change, criminality and major changes in the business environment) within an event window of 6 months. In the study, average closing stock prices of the 5 companies were obtained for 3 months before the announcement or publication of environmental abuse, the average closing stock price in the month of announcement and 2 months post announcement average closing stock price.

5. Results

In order to establish the relationship between environmental sustainability and corporate performance, the study states two hypotheses H1 and H2 summarised into estimated regression models 1 and 2 (see section 3.3) respectively. The results have been summarised in tables 3 and 4 below:

Table 3: Shows a summary of multiple regression result for H1 and H2.

Variable	H1 Coefficient	T-ratio	H2 Coefficient	T-ratio
EIS	0.017	0.129	-0.084	-0.802
GPS	-0.160	-1.343	-0.056	-0.611
RS	-0.226	-1.833*	-0.213	-2.236**
SIZE	-0.404	-2.605*	-0.573	-4.793***
LEVERAGE	0.075	0.585	0.504	5.062***
MARKET	0.529	3.405***	0.469	3.915***
Constant (α)	2.674	3.798***	5.096	6.581***
R- Square	0.236		0.545	
Adjusted R Sq	0.161		0.501	
F Value		3.14**		12.19***
N=68 companies				

Table 4: Shows a summary of one-way ANOVA results for H2.

Source of variation	Sum of squares	d. f	Mean squares	F- ratio
between	1.2608	4	3.1520	178.7***
error	4.4098	25	1764	
total	1.3049	29		

* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level. Note: All tests are two-tailed.

H1: There is a relationship between environmental sustainability and profit level

The result for model 1 as stated in Table 3 shows a goodness of fit of the model considering F-value which is statistically significant at the 5% level. The coefficients of the independent variables indicate the impact of each variable on the dependent variable. In model 1, the results indicate that RS, COMPANYSIZE and MARKET are statistically

significant at 10%, 5% and 1% respectively. RS and COMPANYSIZE are showing negative impacts on the dependent variable (ROE). The result shows that only MARKET significantly accounts for profit with insignificant impact created by one of our interest variables (i.e. EIS). The insignificant positive relationship exhibited by EIS is a promising sign that environmental sustainability may be one of the determinants of profit in the extractive sector in the nearest future.

H2: There is a relationship between environmental sustainability and firm value

The model 2 results in Table 3 show a more robust form at F-value statistically significant at the 1% level and R Square of 0.545 demonstrates a stronger expression of measure of fitness of the model when compared to model 1. The multiple regression results show that all our interest variables which include EIS, GPS and RS are not the determinant of firm value. The determinants of firm value are LEVERAGE and MARKET which show positive relationship with the dependent variable and both are statistically significant at 1% level.

However, the H2 results in Table 4 using event studies by way of one-way ANOVA show a significant relationship between environmental pollution and stock price at 1% level. This shows that a negative announcement or publication of environmental pollution negatively affects the firm's value on the floor of stock exchange market.

The difference in test of H2 by use of multiple regression and one-way ANOVA is accounted for by time horizon. This suggests that within a short-horizon negative report on environmental sustainability reduces the firm's value while in a medium to long-horizon the announcement has no impact on firm's value. The medium to long-horizon can be interpreted as   6months upward.

6. Interpretation of Results

There results show that there is a negative relationship between environmental sustainability and profit level in the extractive sector. Although, in model 1, EIS (environmental impact) shows an insignificant positive relationship with ROE, this likely accounts for recent efforts of the companies in the area of environmental protection but it is still insignificant in its effect on profit**.** The promising sign is that environmental sustainability will probably be one of the determinants of profit in the extractive sector in the nearest future. However, a mixed relationship was experienced between environmental sustainability and firm value in model 2, the results show that in a short-horizon there is relationship between environmental sustainability and firm value while on a long-horizon there is a negative relationship between environmental sustainability and firm value.

The research results can be further supported by review of financial statements of few of the companies involved in environmental pollution which showed better performances after the publications of such events (Exxon 1989 audited financial statements, Occidental 1990 audited financial statements and Murphy 2005 audited financial statements) but the value of their stocks suffered momentary slump within average of 60 days window after the announcement of the environmental pollution. A fresh case in hand is the case of British Petroleum (BP) that experienced an explosion on the drilling rig (underwater well) on April 20, 2010 which then gushed oil into the gulf of Mexico in the United States of America (US). This incident immediately resulted in BP losing about one-third of its market value approximated to be around $67 billion and consequently facing criminal investigation. It is also interesting to note that immediately BP was able to partially contain the leakage on June 3, 2010 the market responded instantly from June 4, 2010 by a gradual increase in price of the company's stock (Bloomberg.com). However, the momentary loss in value in the sector may not necessarily affect the financial results (i.e. profit) because its products are often in high demand and may not likely face consumer boycott which may likely happen in other sectors or businesses. It is

noteworthy that the current case of BP and the US government's insistence on outright compensation of every stakeholder that might have suffered economic loss may be the beginning of a new era where insensitivity to the environment may lead to a monumental loss, and threaten the existence of any environmentally reckless company in the sector (as at the time of this study BP oil leakage case is still ongoing and the effect of this has not been fully captured in our study).

7. Findings and Conclusion

The results are not materially different from our expectation and the real life experience of the activities of companies in extractive sector. All the environmental sustainability variables which include EIS, GPS and RS are statistically insignificant and have negative impacts on both ROE and M/B except for EIS which shows an insignificant positive relationship with ROE in Model 1. A further analysis of the impact of a negative environmental pollution announcement on a firm's valuation shows a relationship between environmental sustainability and firm's value over a short time horizon. The results suggest that if the companies within the extractive sector refuse to pay attention to environmental issues, the consequence on profit might not be significant – ie the companies would lose value in the short-term immediately after the bad news is published by the media, but the market appears keen to support a quick recovery in share price. As stated above, the BP case is ongoing, and may uncover as yet undeveloped areas in environmental duties, such as compensation to a broad range of affected stakeholders that have the potential to put a very new complexion on environmental negligence in the extractive sector.

The results may be reflective of the nature of the extractive sector, characterised by chains of cartels that mostly operate like monopolists with little or no substitute for their products. The results have given an insight into the fact that most companies within the extractive sector may choose to be reckless in their environmental sustainability efforts,

yet the profit might not be significantly affected and value diminution is suffered for just a short-term. We await the outcome of the BP case to see if this changes things.

From the study we have ascribed two rationales to inadequate attention by the sector to issues of environmental sustainability. Firstly, the theoretical rationale for the inadequate attention of the sector to environmental sustainability could be illustrated by the theory of reasoned action and stakeholder theory. The poor attitude towards the environment and the extractive sector manager's perception of each stakeholder's influence (i.e. to create a subjective norm) in the accomplishment of their objectives are far below the expectations of the various interest groups; this was well personified by the appearance of BP chief Tony Hayward in front of a US Congressional Committee on June 17 2010, in which he was accused of a 'cavalier attitude' towards risk prior to the BP disaster (BP stock rose after his appearance). The imbalance in the manager's perception of the stakeholders' influence and the stakeholders' expectation is grossly indulged by the fact that the sector is not operating in a perfectly competitive market couple with its over pampering by government and regulatory authorities. The sector is often treated as "a goose that laid the golden egg" especially in most countries that depend on royalties and incomes from the sector.

Equally, the economic rationale may be that the extractive sector products shall continue to be consumed since there are no sufficient substitutes. Also, most of the products offered by the sector which include oil, gas, cement, metal and other minerals enjoy demands well above supply, therefore forcing the consumers and the society at large to a state of Hobson's choice (i.e. a state of taking the one option available or nothing). To corroborate this assertion, Royal Dutch/ Shell suffered a considerable dent on its corporate reputation arising from Brent Spar controversy and Ogoni crisis both in 1995. The emotive environmental protests conducted by the environmental pressure group like Greenpeace, international journalists, and other groups against the disposal of the redundant Brent Spar oil buoy deep in Atlantic water, alongside the Ogoni case in

Nigeria did not affect the corporate performance of the company (Royal Dutch/Shell Annual results 1995, 1996, 1997 and 1998).

Fundamentally, the characteristics of the extractive sector which include the essential nature of their products, scarcity or limited supply of their products and the politico-economic nature of the commodities may have been shielding the sector from the consequences of its environmental abuses. For instance, the greenhouse gases from oil and gas exploration (e.g. gas flaring and carbon dioxide) are dangerous pollutants that are believed to be partly responsible for increase in earth temperature yet various governments in the oil producing nations continue to tolerate the oil companies by politicising the deadline when gas flaring must be stopped. These gases flared into the air can actually be converted to both domestic and industrial gases by additional investment, but these companies prefer to pay a penalty on each cubic meter of gas flared rather than long-term investment in gas production.

Our findings from the study have led to development of a working model for the extractive sector and this has been titled A Stakeholder-Managerial Perception Model for the Extractive Sector in Figure 4 below. The model combines the theory of reasoned action, environmental stakeholder theory and business macro-environmental factors to provide a clearer understanding of the decision-making process underpinning environmental issues in the extractive sector. The model shows that the decision to be environmentally responsible comes from a manager who shows leadership, represents his/her company and whose behaviours have been shaped by his/her attitudes, understanding of business macro-environmental factors and the subjective norm as shown in the theory of reasoned action.

The model shows that the strength of attention given to environmental stakeholders depends on the managers' perceptions of each stakeholder's influence (i.e. subjective norm) in the accomplishment of their objectives. However, the model assumes a

normative stakeholder theory which allows for fairness and equality in the treatment of stakeholders' moral, ethical and legitimate claims. Equally, of importance to environmental behaviour is the managers' attitude which is often shaped by the managers' personality development, belief, and experience in life. In addition, the knowledge of the business macro-environmental factors which include social-cultural factors, technological factors, economic factors, political factors, international factors and ecological factors are germane to rational environmental behaviour or decision-making.

Previous results of similar studies have shown positive, negative and mixed results especially in the relationship between CSR and financial performance (Weber, 2008 and clement 2004). The results of this study add to the list of those showing a mixed relationship between environmental responsibility and corporate performance.

Figure 4: A Stakeholder-Managerial Perception Model
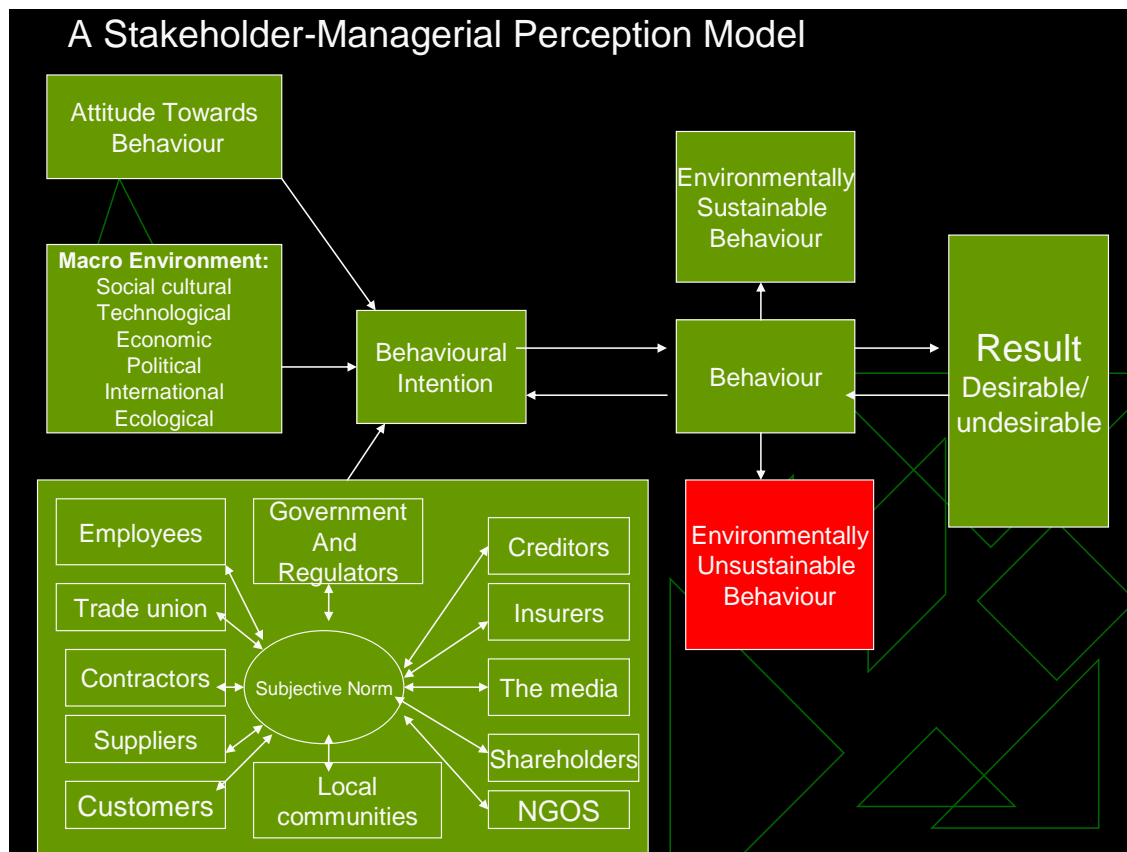
8. Limitation and Suggestions for Further Research

The study may not be free from generalisation problems considering the restricted sampling frame and sample size. The sample size of 68 companies used as a representative sample for the entire extractive sector is restricted to the Americas and Europe, and therefore might not provide a balanced view. Equally, the reliance of the study on only secondary data might have compromised objectivity or generated biases without detection by the researchers.

To enhance generalization, future studies may consider an increase in the sample size and expansion in the geographical spread of the study. The use of the primary data and qualitative research design can be employed to complement and enhance the quality of future research findings. Equally, there is a need for testing the conceptual framework and the model in a real-life environment.

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