



## CAPITAL STRUCTURE AND CORPORATE ENVIRONMENTAL RESPONSIBILITY OF INDUSTRIAL GOODS FIRMS LISTED ON NIGERIAN EXCHANGE GROUP

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### ABSTRACT:

*The study examined the effect of capital structure on the environmental responsibility of listed industrial goods firms in Nigeria. The study specifically examined the effect of debt to equity ratio, debt to asset ratio, long-term debt to equity ratio and short-term debt to asset ratio on environmental disclosure index of listed industrial firms in Nigeria. The ex-post facto research design was used in this research alongside a sample size of eleven (11) companies purposively selected from a population of thirteen (13) industrial goods firms listed on the Nigerian Exchange Group. Secondary data was retrieved from the corporate annual reports of the sampled firms for the period 2012-2021 financial years. Pooled Ordinary Least Square variant of panel regression was conducted at 5% level of significance. The findings revealed that: debt to asset ratio significantly and positively affects the environmental disclosure index of industrial goods firms listed on the Nigerian Exchange Group ( $\beta = 0.147697$ ,  $p$ -value = 0.0090); debt to equity ratio does not significantly affect the environmental disclosure index of industrial goods firms listed on the Nigerian Exchange Group ( $\beta = -0.000390$ ,  $p$ -value = 0.8946); long-term debt to equity ratio does not significantly affect the environmental disclosure index of industrial goods firms listed on the Nigerian Exchange Group ( $\beta = 0.000872$ ,  $p$ -value = 0.9012); short-term debt to asset ratio significantly and negatively affects the environmental disclosure index of industrial goods firms listed on the Nigerian Exchange Group ( $\beta = -0.113424$ ,  $p$ -value = 0.0353). It was concluded that involvement in environmental responsibility shapes the external perceptions of a firm by helping relevant stakeholders assess whether the firm is a good corporate citizen, and thus justifies the firm's continued existence even to lenders as well as shareholders. It was recommended that government should encourage companies to engage in environmental initiatives through the development of incentives and subsidies for environmentally responsible firms, as well as through increased public awareness about the importance of environmental sustainability.*



## **1. INTRODUCTION**

For decades now, global concerns have been directed towards issues of environmental sustainability, calling the attention of corporate entities to be environmentally-conscious of the impacts which their activities have on the environment. Researchers, policy makers and other stakeholders never cease to raise concerns for firms to increase their level of responsibility (Onyali, Okafor & Onodi, 2015) towards the environment with respect to issues such as climate change, environmental degradation, pollution, and a host of other hazards that make the environment inhabitable (Ezekwesili & Ezejiofor, 2022a; Moshud, Olanrewaju & Abu, 2021). Ever since call for environmental sustainability has been increasing, enormous research interest has been devoted to examine those firm structural attributes that either encourage or discourage involvement in environmental performance (Onyali & Okafor, 2018). A group of studies have examined the joint effect of firm attributes on the level of environmental performance of firms, whereas other strand of literature singled out the attribute. The present study focuses on how capital structure influences the environmental responsibility of firms in Nigeria.

Capital structure entails the proportion of debt-equity mix with which a firm finances its operation (Ezekwesili & Ezejiofor, 2022a). It is a combination of debt instrument and shareholders' fund which form a pool of resource that is used for the purposes of investment and operation (Shaibu, 2020). On the other hand, environmental responsibility refers to variety of firm's practices done to reduce their harmful impacts on the environment. Other researchers term this environmental sustainability, environmental disclosure, environmental performance, environmental management, environmental investment, environmental information disclosure, et cetera (Oranefo, 2022; Salawu, Mamman, Dahiru, Ado & Yunusa, 2021; Nguyen, 2020; Ardi & Yulianto, 2020; Elshabasy, 2017; Abubakar, 2017). The nexus between capital structure and environmental responsibility is hinged on the fact that highly-levered firms attract more monitoring than lowly-levered firms. It is argued that firms that have more debts in their capital structure are likelier to engage in environmental protection activities and so disclose more information such as environmental responsibility in order to reduce information asymmetry (Chang, Kangkang, Lewis & Tam, 2021). In other words, increasing corporate debts is more like increasing environmental disclosure in firms (Ardi & Yulianto, 2020). This is because environmental disclosure is a proof to shareholders that firm engaging in it is not only accountable but also legitimate. On the other hand, Serafeim (2014) submitted that corporate originations utilize environmental responsibility disclosure as a means of communicating to capital markets, in order to attract investors and make their borrowing capacity high since it increases their credit-worthiness. This argument stems from the fact that firms with higher environmental disclosure index stand higher



chance of attracting more capital from the capital market. This makes issues like environmental responsibility a salient one that cannot be ignored. Therefore, for the sake of corporate survival, expansion and sustainability of firm growth (Ihimekpen, 2021), businesses of the world, including industrial goods firms in Nigeria, are necessarily required to channel their resources and policies towards environmental management.

The studies conducted by Okafor, Egbunike and Amahalu (2022); Kalash (2020); Kouloukoui, Sant'Anna and Gomes (2019); and Rover, Murcia and Murcia (2015) contended that highly indebted firms have the tendency to disclose more environmental information because of the need to satisfy debt holders and gain their confidence. The essence of this is to provide evidence that firm's projects are not so risky. However, it is still a practical argument that huge debt in capital structure dissuade firms from environmental responsibility practices because the firms may devote more of their resources to debt servicing and repayment. That aside, today, corporate environmental responsibility has definitely turned into more important issue for stakeholders primarily because of the harmful impact of firm's operations on the environment (Ezekwesili & Ezejiofor, 2022b). As to this, government and society are pressurizing firms to disclose more environmental information index as well as to adopt production strategies which can improve the environmental performance (Kalash, 2020). In addition to the above, pressure for environmental concern also calls for provision of low-carbon products and by extension reduces greenhouse gas emissions and environmental pollution (Onyebuenyi & Ofoegbu, 2022; Moshud, Olanrewaju & Abu, 2021; Balarabe, 2017). Firm reputation is protected when the policies and strategies of the firm are formulated and implemented in such a way as to reduce the extent of environmental hazards culminating from the firms' activities (Obiora, Onuora & Ezeogidi, 2022; Ardi & Yulianto, 2020).

In all, environmental responsibility is more pronounced now that organizations, body corporate, host communities, policy makers and business men have realized the need to make profit now and still protect the environment so that profit will be made in the future (Ezeagba, John-Akamelu & Umeoduagu, 2017). Failure of firms to engage in environmental responsibility will definitely tantamount to environmental degradation, pollution, climate change and ozone layer depletion. In essence, involvement in environmental responsibility costs some fortune (Obiora, Onuora & Ezeogidi, 2022). Most firms thus still shy away from such more because of the financial wherewithal that is required. Often, instead of devoting resources to environmental responsibility, some industrial goods firms will prefer to use such funds for investment purposes or for distribution to shareholders. Worse still, firms that have unpaid debt in their capital structure may be battling with financing the cost of



debt instead of engaging in environmental practices that incur additional costs to the firm. It then becomes a major determinant of environmental responsibility and perhaps one of the reasons there is high rate of non-compliance of firms to environmental acts and regulations (Okafor, 2018). It is against this background that this study examines the effect of capital structure on the environmental responsibility of industrial goods firms quoted on the Nigerian Exchange. Involvement in environmental responsibility assists in shaping the external perceptions of a firm by helping relevant stakeholders assess whether the firm is a good corporate citizen, and thus justifies the firm's continued existence even to lenders as well as shareholders (Dibia & Onwuchekwa, 2015; Chaklader & Gulati, 2016). The necessity for environmental consciousness in firms is that environmental responsibility enables firms enjoy increased patronage from shareholders and creditors which will result in increased revenue in the long-run (Onyali & Okafor, 2018). However, a number of firms are somewhat discouraged to re-structure their overall performance indicators to include environmental challenges as a relevant part of the firm's usual strategic purpose (Ezekwesili & Ezejiolor, 2022a). This is because of several antecedents such as firm capital structure which in some occasions either inspire or demotivate a firm's environmental consciousness and duty (Kiswanto, Woro & Ulupui, 2020; Ahmed & Moses, 2020; Indah & Arum, 2020; Lamidi, Adesola & Tariro, 2020).

Inadequate capital structure puts industrial goods firms in financial risk, erodes their financial health and impends their competitiveness. A firm with these challenges would think twice before using its resources to carry-out environmental responsibility practices since increasing firm's debt also increases cost of capital. As a consequence of the above failure, there has been a humongous increase in air pollution, water pollution, ozone layer depletion, climate change and other environmental hazards that threaten life. Our current era continues to be marked by a swing of environmental issues such as climate change, global warming, pollution, and et cetera. The problem is even worse more because almost every industrial goods firms in Nigeria aggressively use natural resources in their operations which often results in a number of environmental issues including resource depletion, pollution, and a slew of other environmental risks. Worse still, environmentally-irresponsible firms stand a chance of losing their customer loyalty, patronage, goodwill and investors' confidence. This ultimately threaten firm survival and even profitability and growth. Firms that cannot meet up with attractive environmental responsibility as a result of inadequate debt-to-equity ratio, debt-to-asset ratio, short-term debt-to-asset ratio or long-term debt to equity ratio find it hard to win the patronage of investors who prefer to invest in companies with high environmental responsibility disclosure. This anomaly daunts customers' patronage as well as consumers and customers evaluate companies' performance before making decisions to deal with them (Al Amosh & Mansor, 2021).



Researchers such as Al Amosh et al. (2022); Nworie, Obi, Anaike and Uchechkwu-Obi (2022); Dimitropoulos and Koronios (2021); Chang, Kangkang, Lewis and Tam (2021); Moshud, Olanrewaju and Abu (2021); Nguyen, Tran and Nguyen (2018); Kipnetich, Tenai and Bonuke (2019); Uyagu, Okpanachi, Nyor and Muhammad (2017); Chaklader and Gulati (2016); Ohidoa, Omokhudu and Oserogho (2016) and Monteiro and Aibar-Guzmán (2010) have profusely examined the influence of capital structure on the environmental responsibility of firms. However, to the best of the researcher's knowledge, related studies carried out in Nigeria failed to use multiple proxies for capital structure. Al Amosh et al. (2022) that conducted similar study in Jordan suggested for multiple proxies of capital structure in order to avoid omitted variable bias. This has left enormous gap in literature which the present study fills.

### 1.1 Objectives of the Study

The broad objective of the study is to examine the effect of capital structure on environmental responsibility of industrial goods firms quoted on the Nigerian Exchange. To realize the above objective, the study specifically investigates the extent to which:

- i. Debt to asset ratio affects the environmental disclosure index of industrial goods firms listed on the Nigerian Exchange Group.
- ii. Debt to equity ratio affects the environmental disclosure index of industrial goods firms listed on the Nigerian Exchange Group.
- iii. Long-term debt to equity ratio affects the environmental disclosure index of industrial goods firms listed on the Nigerian Exchange Group.
- iv. Short-term debt to asset ratio affects the environmental disclosure index of industrial goods firms listed on the Nigerian Exchange Group.

### 1.2 Hypotheses

The study is guided by the following hypotheses stated in the null form:

H<sub>01</sub>: Debt to asset ratio does not significantly affect the environmental disclosure index of industrial goods firms listed on the Nigerian Exchange Group.

H<sub>02</sub>: Debt to equity ratio does not significantly affect the environmental disclosure index of industrial goods firms listed on the Nigerian Exchange Group.

H<sub>03</sub>: Long-term debt to equity ratio does not significantly affect the environmental disclosure index of industrial goods firms listed on the Nigerian Exchange Group.



H<sub>04</sub>: Short-term debt to asset ratio does not significantly affect the environmental disclosure index of industrial goods firms listed on the Nigerian Exchange Group.

## **2. LITERATURE REVIEW**

### **2.1 Conceptual review**

#### **2.1.1 Concept of Capital Structure**

Capital structure entails a combination of debt and equity that a firm utilises to finance its investments. Debt and/or equity can be used to fund a company's investments (Orichom & Omeke, 2021) and preference capital may also be used by the corporation. Capital structure is described as the components of debts and equity, used by a firm in its investment activities, and which usually consist of ordinary share capital, preference share capital and debt capital (Nenu, Vintila, & Stefan, 2018). These definitions are not specific as to the nature of debts that constitute part of the capital structure since debts could be short term or long term. Ubesie (2016) opines that, capital structure is the proportionate relationship between debt and equity financing of firms. In the views of Yimka, Oguntodu and Adalakun (2017), capital structure refers to the question of what happens to the total valuation of the firm and its cost of capital when the ratio of debt to equity or degree of leverage is varied. In simplest words, capital structure is a mix of equity and debt. Capital structure is the combination or mixture of company's equity and debt, which ensures financial stability, profit generation, growth, and expansion. Uremadu and Onuegbu (2018) viewed the capital structure of a company as the precise mixture of debt and equity used in financing the firm's operations. Capital structure means the approach a firm uses in financing their assets through the mixture of debt, equity or hybrid securities (Aggreh, Nworie & Abiahu, 2022). Hybrid securities in this context mean a group of securities that combine the elements of both debt and equity, which have fixed or floating rate of return, and the holder has the option of converting it into the underlying company's share. Capital structure is a mixture of a company's debts (long-term and short-term), common equity and preferred equity. Capital structure is summarily explained as the proportion of debt-equity mix with which a firm finances its operation. It is a combination debt instrument and shareholders' fund which form a pull of resource that is used for the purposes of investment and operation.

The connect between capital structure and environmental responsibility was summarized by Kipngetich, Tenai and Bonuke (2019) in two arguments. The first argument is that disclosure of environmental responsibility tells creditors about how the firm utilises extra-contractually employed resources (such as the environment, in the firm's manufacturing phase) which is funded by the combination of debt and equity capital. The second argument is that firms with many debts in their



capital structure may not have the required resources available for voluntary disclosure causes, such as environmental responsibility. The present study builds on these argument to conduct an empirical examination of the effect of capital structure on the environmental responsibility of listed industrial goods firms in Nigeria.

### 2.1.2 Debt to Asset Ratio

Debt to asset ratio is the amount of equity debt a firm uses to finance its assets ((Ezekwesili & Ezejiofor, 2022a). Debt to asset ratio calculates the amount of asset financing that comes from debt (Ardi & Yulianto, 2020). Debt to asset ratio serves as a financial ratio that is used to determine the association between the external financing of a firm and its assets (Egbunike & Tarilaye, 2017). The average expectation is that increasing debt to asset ratio of the firm will improve the market price of the firm's shares as well as the worth of the firm (Shaibu, 2020). In this study, debt to asset ratio is measured as the ratio of total liabilities to total assets of the firm in an accounting period. The formula is expressed thus:

$$\frac{\text{Total Liabilities}}{\text{Total Assets}}$$

### 2.1.3 Debt to Equity Ratio

The debt to equity ratio of a firm basically refers to the ratio between a company's debt and equity (Idam, 2019). It denotes the presence of debt in a company's capital composition. Debt to equity ratio is the ratio of the total value of a company's debt capital to total market value of its equity (Msomi & Nyide, 2021; Lumby & Jones 2011). A levered or geared firm essentially has some elements of debt in its capital structure but unlevered firms are considered thus because they are all-equity firms. In this study, debt to equity ratio is measured as the ratio of total liabilities to total equity of the firm in an accounting period. The formula is expressed thus:

$$\frac{\text{Total Liabilities}}{\text{Total Equity}}$$

### 2.1.4 Long-Term Debt to Equity Ratio

Long-term debt to equity ratio is the ratio of long-term liabilities to the total equity funds of a firm (Liyao, Jiabin & Wanyue, 2021). In addition, long-term debt to equity ratio indicates the proportion of long-term debt per N1 of equity in a firm's capital structure. When funds are obtained from long-term creditors in addition to the funds contributed to the equity holder, the resultant ratio of the two is termed long-term debt to equity ratio (Liyao, Jiabin & Wanyue, 2021). The credit ratings of firms can be determined using this ratio. The use of long-term debt serves as a tax relief to the firm because the finance cost or interest payments on loans are tax allowable, but the interest payment on equity (dividend) are not tax allowable (Ingumba, 2017). The implication of a comparatively high long-term



debt to equity ratio is that a firm is at greater risk of bankruptcy, in that it may not be able to pay for the interest expense on the noncurrent debt if its cash flows decline. The formula for long-term debt to equity ratio used in the study is given below:

$$\frac{\text{Noncurrent Liabilities}}{\text{Total Equity}}$$

### 2.1.5 Short-Term Debt to Asset Ratio

Short-term debt to asset ratio indicates the amount of current liabilities that are used to acquire more assets (Adenugba, Ige & Kesinro, 2016). More also, short-term debt to asset ratio indicates the proportion of short-term debt per N1 of a firm's assets. This metric shows the amount of assets that are financed using current liabilities. This can be a good financial leverage tool that is deployed to increase the firm's return on equity (Salawu, Mamman, Dahiru, Ado & Yunusa, 2021). Nevertheless, when the ratio of short-term debt to asset is excessively high, the risk of business failure in the firm increases. The formula for short-term debt to asset ratio used in the study is given below:

$$\frac{\text{Current Liabilities}}{\text{Total Assets}}$$

### 2.1.6 Environmental Responsibility

Corporate environmental responsibility demonstrates how much a firm carries out its activities to contribute to the global aim of environmental protection and preservation (Ezekwesili & Ezejiofor, 2022a). Environmental responsibility reports the impacts of the firm's activities on natural environment which could be waste management, carbon management, recycling, emission control, wetland conservation, pollution, and wildlife conservation (Ahmed & Moses, 2020; Gatimbu & Wabwire, 2016). The study conducted by Eduardo, Igor and Ainhoa (2016) conceptualized environmental responsibility as a measure of a company's impact on living and non-living natural systems, including the air, land, and water, as well as complete ecosystems. The concept of corporate environmental responsibility therefore reflects the extent to which a company uses its management practices to develop ways of avoiding environmental risks and capitalize on environmental opportunities (Nworie, Obi, Anaike & Uchechkwu-Obi, 2022). Furthermore, environmental responsibility refers to variety of firm's practices done to reduce their harmful impacts on the environment (Ardi & Yulianto, 2020). Other researchers term this environmental sustainability, environmental disclosure, environmental performance, environmental management, environmental investment, environmental information disclosure, et cetera (Oranefo, 2022; Salawu, Mamman, Dahiru, Ado & Yunusa, 2021; Nguyen, 2020; Ardi & Yulianto, 2020; Elshabasy, 2018; Abubakar, 2017). Environmental responsibility refers to a set firm's commitments to ensuring that the firm operates in an environment that is sustainable and that a balance is maintained in respect of diverse stakeholders' interests (Moshud, Olanrewaju & Abu, 2021). Disclosure of environmental





responsibility is a result of policies undertaken by firms to ensure that the effect of the firms' operations on the environment in which it operates is communicated to different stakeholders in their annual reports.

Corporate environmental responsibility serves as a contemporary management tool used by firms to provide information to external stakeholders and find opportunities to improve internal processes, gain benefits and ensure its own sustainability. The Global Reporting Initiative (2011) documented that some of the main motives for the reporting were: (a) to show commitment and be transparent; (b) to demonstrate the ability to participate in competitive markets; (c) to plan activities, become more sustainable and position the company; and (d) to comply with regulations. The demand for corporate organizations to integrate environmental responsibility issues into their annual reports has increased worldwide as users of the information become more attentive (Ihimekpen, 2021). The increasing demands for clear facts about the corporate environmental performance of firms by an increasingly well-informed breed of stakeholders have made corporate environmental responsibility disclosure an essential issue of debate (Balarabe, 2017). The rationale behind such disclosure is to ensure accountability and transparency from the part of the management who are charged with the responsibility of preparing financial statements. But in most cases, disclosure does not serve the need of the users because of the information asymmetry where managers prioritize their own interest in exercising their managerial judgment and thereby, leading to social and environmental disclosure gap. Industrial goods firms disclose information about their operations and activities to enhance their reputation, and to decrease information asymmetry, agency costs and the cost of capital (Kalash, 2020).

#### **2.1.6.1 Environmental Disclosure Index**

Environmental disclosure index is a collection of items that serve as an indicator for corporate consciousness through a moral disclosure on environmental issues (Chaklader & Gulati, 2016). Environmental disclosure index is used to examine whether firms engage in disclosure practices of environmental information in annual reports (Altoé, Panhoca & Espejo, 2017). The disclosure practices that show how accountable and responsible a firm is towards the environment is observed through environmental disclosure index. Among the different indices used to measure environmental responsibility, the study opts to deploy the environmental disclosure index developed by Ragini (2012). The above index was chosen because it uses unweighted index to reduce subjectivity that is involved in determining the weights of each item (Galani, Gravas & Stavropoulos, 2011; Uwuigbe, 2013). The nine items that are summed to arrive at environmental reporting index are: Environmental



Activities, Environmental Philosophy, Environmental Programmes and Policies, Environmental Initiatives, Environmental Commitments, Environmental Management Framework, Environmental Matters, Environmental Expenditure, Products and Technologies Contributing to Environment (Ragini, 2012). The disclosure item is scored as one (1) if it is disclosed in the annual report or zero (0) if it is not disclosed in the annual report. The total disclosure score is determined in terms of number of items being disclosed. Ragini (2012) gave a formula for converting total disclosure score in terms of percentage thus:

$$\frac{\text{Total number of items appearing in the annual report}}{\text{Maximum number of items which should appear in annual reports}} \times 100$$

## 2.2 Theoretical Review

The motives of environmental disclosure have been discussed according to many theories: legitimacy theory, stakeholder theory, and information cost theory (Michelon & Parbonetti, 2012). We examined two theories in the study, viz: legitimacy theory and stakeholder theory. However, the study is theoretically anchored on stakeholder theory because it explained how provision of capital is associated with environmental responsibility.

### 2.2.1 Legitimacy Theory

Legitimacy theory as was propounded by Dowling and Pfeffer in 1975 posits that organizations continually seek to ensure that they operate within the bounds and norms of their respective societies (Ihimekpen, 2021). It is in line with this theory that external stakeholders require firms to take actions that will increase the transparency of its operations. The basic assumption of the theory is that accounting for environmental responsibility is a communication mechanism used to inform and/or manipulate the perception of the firm's actions (Mistry, Sharma & Low, 2014). The objectives of this theory are: to describe the relationship between a firm and the community; to explain firms' motivations for environmental disclosures by presenting how firms use legitimacy strategies (Manini & Abdillah, 2019).

Legitimacy is a generalized perception that the action of an entity are desirable, proper or appropriate within some socially constructed systems of norms, value, benefits and definition (Suchman, 1995). Legitimacy theory is derived from the idea of social contract that every company operates in a society through an expressed or implied social contract (Elmogla, 2009). The term social contract reflects the expectation of society about how an organization should conduct its operation. Legitimacy theory comprises two basic ideas: companies need to legitimize their activities and this legitimacy process



provides some benefits for companies. The first element is in line with the argument that corporate environmental responsibility is linked to the presence of social pressure. In this context, the need for legitimacy is not equal for all firms because of the differences in both the degree of social pressure facing firms and the level of response to this pressure. There are a number of factors which determine the degree of social pressure facing the firm and the response to this pressure. These factors are the potential determinants of corporate environmental responsibility (Kipngetich, 2020).

This theory is related to present study because the focal emphasis of legitimacy theory is that firms disclose environmental information to legitimize their activities and operations within society (Kalash, 2020). In this context, firms attempt to satisfy the requirements and expectations of society because the primary focus of legitimacy theory is on the expectations of society in its entirety, not stakeholder groups as was posited by stakeholder theory.

### **2.2.2 Stakeholders' Theory**

Edward R. Freeman developed stakeholder theory in 1984 (Okafor, Egbunike & Amahalu, 2022). Stakeholder theory basically promote the notion that firm's success depends on the successful management of all the associations that the firm has with its stakeholders. The stakeholders include employees, customers, shareholders (owners), host community and managers (directors) (Onyali, Okafor & Onodi, 2015). These are a group of people that are affected by or that affect the policies and activities of the firm (Friedman & Miles, 2006). Stakeholder theory maintain that firms attain their corporate objectives primarily by identifying, recognizing and satisfying the interest of various stakeholder groups (Ayoib, Elaigwu & Salau, 2020; Balarabe, 2017).

Stakeholder theory posits that disclosure on environmental responsibility by firms is as a result of the pressure from various stakeholders such as shareholders, customers, employees, communities and suppliers (Onyali & Okafor, 2018). The basic assumption behind stakeholder theory is that a firm survival is dependent upon the successful management of all the relationship that a firm has with its stakeholders (Uwuigbe, 2012). Firm survival call for the support of various stakeholder groups which means that their approval must be sought. More importantly, the activities of the industrial goods firms therefore should be adjusted to gain that approval and goodwill of the stakeholders. The behaviour of different stakeholder groups can turn as a constraint on corporate strategy since some stakeholder groups may be hostile where their interest is not identified, recognized and protected (Obiora, Onuora & Ezeogidi, 2022). It is then the primary role of the firm leadership to evaluate the demands of different stakeholder group and make them coincide with the companies objectives. It is an advantage in a way that stakeholder theory provides a means of dealing with multiple stakeholders with multiple conflicting interests (Aburaya, 2012).



The relevance of stakeholder theory to the present study is borrowed from the fact that stakeholder theory offered a new perspective in the context of corporate environmental responsibility research by positing that the need of capital providers cannot be met without satisfying the need of other stakeholder groups. Providers of capital are more concerned with financial stability and performance of the firms. The motive for managers of industrial goods firms to show the firms' environmental performance through environmental disclosure index can be to reduce cost of capital, agency costs of debt and information asymmetry (Chang, Kangkang, Lewis & Tam, 2021). Be that as it may, a different argument was raised by Suhardjanto (2010) that stakeholder theory supposes that firms with more debts in their capital structure are forced to use the available sources of funds to pay off or service debt instead of carrying out environmental responsibility practices. Firms in the above category have greater responsibility to creditors and so avoid environmental responsibility practices to reduce their operational costs and financial burden (Antara, Putri, Ratnadi & Wirawati, 2020).

### **2.3 Empirical Review**

Al Amosh et al. (2022) explored the impact of capital structure including total debts, short-term debt, long-term debt and total shareholder equity, on environmental, social and governance (ESG) performance in the context of Jordan. The study deployed the longitudinal data generated from the annual reports of 51 industrial companies listed on the Amman Stock Exchange for the period 2012–2020. Correlation and regression analysis were used to analyse the data. The findings showed that debt financing enhances ESG performance in all dimensions, while financing by equity did not affect ESG. Nworie, Obi, Anaike and Uchechkwu-Obi (2022) examined the effect of financial leverage on corporate environmental performance of industrial goods companies that are listed on the floor of the Nigerian Exchange Group. Ex-post facto research design was adopted in the study. A population of thirteen listed industrial goods firms in Nigeria were purposively sampled to obtain eight (8) industrial goods firms used as sample size of the study. Secondary data were obtained from the annual reports and accounts of the sampled companies for a period of 10 years which spanned from 2011 - 2020. The simple regression result revealed that firm leverage significantly affects the environmental performance of industrial goods companies in Nigeria ( $F = 21.539$ ,  $p\text{-value} = 0.000$ ).

Ezekwesili and Ezejiofor (2022a) examined the effect of firm characteristics on the environmental performance of quoted conglomerates firms in Nigeria. Ex-post facto research design was adopted for this study on a population and sample size five (5) conglomerate firms listed on the Nigerian Exchange Group. Data were derived from the financial statements of the selected firms as from 2011 to 2020. Ordinary Least Square regression analysis was used at 5% level of significance. The findings revealed



that firm size and firm leverage does not significantly affects waste management expenditure of quoted conglomerates firms in Nigeria. It was recommended that conglomerate firms with larger firm size should be more conscious of the need for preservation and protection of the environment against damages occasioned by firm operations.

Okafor, Egbunike and Amahalu (2022) examined the effect of Leverage, Firm Size and Audit Committee Size on environmental disclosure (Effluent Disclosure) of eleven (11) quoted Oil and Gas firms in Nigeria for a period of thirteen (13) years spanning from 2008 to 2020. Longitudinal research design guided the conduct of the study since panel data were used in this study. Panel Least Square regression analysis revealed that leverage and Audit Committee Size positively affect Effluent Disposal but Firm Size negatively affects Effluent Disposal of the firms.

Oranefo (2022) examined the effect of firm profitability on the environmental performance of quoted conglomerates firms in Nigeria. The sample size involved all the five (5) conglomerate firms listed on the Nigerian Exchange. Secondary data were derived from the financial statements of the selected firms from 2011 to 2020. The Ordinary Least Square regression analysis found that firm profitability significantly affects waste management expenses of quoted conglomerates firms in Nigeria.

Obiora, Onuora and Ezeogidi (2022) assessed how environmental accounting disclosure is associated with profitability of quoted firms in Nigeria from 2017 to 2021. The study deployed ex post facto research design on a sample of five (5) firms from different sectors of the economy. Secondary data used in this study were sourced from annual reports of the selected firms. The Ordinary least Square regression results revealed that environmental accounting disclosure has a significant effect on return on assets and return on equity of quoted firms in Nigeria.

Chang, Kangkang, Lewis and Tam (2021) investigated the relationship between capital structure and corporate environmental liabilities. The study measured environmental liabilities using the amount of toxic production-related waste produced by firms. Longitudinal research design guided the study. An unbalanced panel that consists of 18,070 firm-year observations from a sample of 1,698 firms was obtained from 1992-2013. Regression analysis conducted revealed that there is a negative and significant relationship between environmental liabilities and debt-to-assets ratios.

Moshud, Olanrewaju and Abu (2021) focused on assessing the impact of leverage on environmental disclosure of quoted firms in Nigeria. The study adopted a causal-comparative research design. The



study used a sample of 82 firms from the total population of 176 firms listed on the Nigeria Stock Exchange for a period of 5 years ranging from 2012 to 2016. The result of the Binary regression Logistic techniques showed a non-significant relationship between leverage and environmental disclosures at 5% level of significance.

The study carried out by Salawu, Mamman, Dahiru, Ado and Yunusa (2021) explored how financial leverage, board composition, financial performance, existence of foreign directors on the board and firms' age relate to Environmental Disclosures (ED). Data were collected from the published annual reports of nine (9) listed oil and gas firms quoted on the floor of the Nigerian Exchange Group (NSE) as at 2018, for a period of seven years (2012-2018). The results of the Generalized Least Square (GLS) established a positive and significant relationship between board composition, financial leverage, existence of foreign directors on the board and ED. However, firm age and financial performance was found not to have significant relationship with ED. The study recommended that NSE should pursue actualization of the standard for disclosing ED by listed Oil and Gas firms.

Campos-Rasera, Passos and Colauto (2021) examined the influence of capital structure on the performance of CSR practices. The study formulated three hypotheses about the relationship between CSR and: the capital structure (H1); the debt financing (H1a); and the shareholder's equity (H1b). A sample of 1,642 publicly traded companies on the 10 highest GDP countries was used from 2010-2018. Using GMM 2SLS estimator, the results revealed positive and significant relationship between shareholders' equity and CSR, while for the relationship between debt financing and CSR shown a negative and significant correlation.

Olurankinse and Mamidu (2021) investigated the relationship between corporate characteristics and quality of environmental disclosures in pre and post IFRS adoption among eleven (11) Nigerian Oil and gas companies from 2004 to 2019. Ex-post facto guided the conduct of the study. The findings of the Ordinary Least Square were that during pre IFRS period, leverage ratio has significant positive relationship with environmental disclosure quality; firm size, return on asset, and firm age have no significant relationship with environmental disclosure quality. On the other hand, in post IFRS adoption, Firm size and firm age have positive and significant relationship with environmental disclosure quality; while leverage ratio and return on asset have no significant relationship with environmental disclosure quality.



Ndlovu and Dzomira (2021) ascertained the level of adoption and disclosure of environmental information among companies listed on the Zimbabwe Stock Exchange in 2015 – 2016. With the use of purposive sampling technique, twenty (20) companies were sampled from the sixty five companies listed on the Zimbabwe Stock Exchange. Content analysis was used to obtain the secondary data from the companies' annual reports. The research study adopted an exploratory design. QDA Miner was used to analyze the data. It was found in the study that companies in medium impact sectors are disposed to disclose environmental information as much as the companies in the high impact sector although that is contradictory to the legitimacy theory.

Ardi and Yulianto (2020) appraised the effect of profitability, leverage, and company size on environmental disclosure of 61 agricultural and mining sector companies listed on the Indonesia Stock Exchange in 2014-2018. Regression analysis was used to test the hypotheses of the study. The results show that profitability does not influence environmental disclosure. Leverage has a negative effect on environmental disclosure. Company size has a positive effect on environmental disclosure.

Chowdhury, Dey and Abedin (2020) examined the quality of environmental reporting and its association with company characteristics of firms in Bangladesh. Ex-post facto research design was adopted. Secondary data were collected from various parts of the annual reports of 70 firms from 2017-2017. Level of environmental disclosure (*LED*) was regressed on size, profitability, leverage and industry type using Ordinary Least Square (OLS). The findings showed that the level of environmental disclosures (*LED-1*) is significantly associated with firm size, unlike the profitability, leverage and production attributes.

Kalash (2020) investigated the determinants of public disclosure of environmental information by firms and its effect on their financial performance. The study adopted ex-post facto research design. The researcher used a sample of 66 firms listed on Istanbul Stock Exchange during the period of 2014-2018. Secondary data were sourced from the annual reports of the sampled firms. The binary logistic regression model was used to test the hypothesis of the study. The study found that highly leveraged and larger firms, and firms with higher equity agency costs are more likely to disclose environmental information. However, the results indicated that profitability, industry type, information asymmetry, investment opportunities and business risk do not affect the probability that the firm will disclose environmental information.



Kipnetich (2020) examined the effect of firm-specific attributes on environmental accounting disclosure in Kenya. The study was driven by legitimacy theory and a longitudinal research design was adopted. The study targeted 27 listed firms at Nairobi securities Exchange from 2008 to 2017. Panel data regression technique was used to test the hypotheses of the study. The findings showed that asset tangibility ( $\beta = .10, p < .05$ ) and capital intensity ( $\beta = .42, p < .05$ ) had a positive and significant effect on environmental accounting disclosure. The study concluded that asset tangibility, capital intensity, and ownership concentration are key predictors of environmental accounting disclosure.

Nguyen (2020) evaluated the factors that affect the degree of environmental accounting information disclosure in 87 companies listed on the Vietnamese stock market from 2009 to 2019. The study specifically examined how Firm size, Profitability, Leverage, Firm age, and Independent auditors influence environmental accounting information disclosure. Longitudinal research design was deployed for the study. The pooled OLS, the fixed effects model, and the random effects model were deployed in validating the hypotheses of the study. The Feasible Generalized Least Squares (FGLS) method was used to analyze the image factors that affect environmental accounting information disclosure. The results show that firm size, uptime and independent audit positively affect the level of environmental accounting information disclosure but firm leverage negatively and insignificantly affects environmental accounting information disclosure.

Shuaibu (2020) examined how firm characteristics influence environmental disclosure quality of listed cement companies in Nigeria. Ex-post fact research design guided the conduct of the study. Secondary data were sourced from the annual report of the three (3) listed cement companies for the period of 2013-2017. Correlation and multiple regression technique were used to test the hypotheses. Findings from the study revealed that firm age, firm size and leverage have significant impact on quality of environmental disclosure.

Thomas, Aryusmar and Lely (2020) analyzed the effect of company size, profitability, and leverage on the sustainability report disclosure of firms in Indonesia. Secondary data was taken from the annual sustainability report presented by a sample of ten firms listed on the Indonesia Stock Exchange in 2015-2018. Panel data obtained were processed using Fixed Effect regression equation. The result of the research revealed that there was a positive effect of profitability and leverage on sustainability report disclosure, but the effect of company size was not significant.





Antara, Putri, Ratnadi and Wirawati (2020) determined the effect of company size, leverage, and environmental performance on the area of sustainability reporting of companies listed in the LQ45 index. A sample of 8 firms was used and secondary data were sourced from the firms' annual reports and sustainability reports for the 2015-2018 periods. Multiple linear regression analysis was used to test the hypotheses. The findings showed that firm size and environmental performance positively affect the area of sustainability reporting, while leverage does not directly influence the sustainability reporting.

Akinlade (2020) investigated the relationship between firm behaviour and the extent of the environmental disclosures of Nigerian listed firms. Secondary data were obtained from a sample size of 33 non-financial firms listed on the Nigerian Exchange Group (NSE) from 2010 to 2019. Ordinary least square (OLS) regression conducted showed that firm size and industry membership are positively related to the extent of environmental disclosure, while profitability is negatively related. Neither leverage nor age has a statistically significant relationship with the extent of disclosure.

Kipngetch, Tenai and Bonuke (2019) examined the effect of leverage on environmental accounting disclosure among the firms listed in the Nairobi Securities Exchange, Kenya. The study utilised longitudinal research design. A sample size of 27 listed firms consistently operating from 2008 to 2017 was used. The hypotheses of the study were tested using random-effects model, fixed-effect model, and thereafter a Hausman test. It was found that leverage significantly and negatively affects environmental disclosure in Kenyan listed firms.

Aluwong and Fodio (2019) investigated the influence of corporate attributes on environmental disclosure by oil companies in Nigeria. The study used secondary data collected from the annual reports and accounts of 9 randomly selected oil companies for the period 2011 to 2017. The study analysed the data using the logistic regression technique. The findings of the study showed that corporate attributes such as financial leverage, profitability and firm size have a significant positive effect on environmental accounting disclosure.

Manini and Abdillah (2019) examined the extent of corporate environmental disclosures made by selected listed firms in Kenya within the legitimacy theory framework. Annual report environmental disclosures were collected from a sample size of 19 firms for the financial period 2016 – 2017. The extent of corporate annual report environmental disclosures was measured by number of sentences and classified into their forms of disclosure (qualitative, financial and physical) and type of news



(positive, neutral and negative) to give an average measure by industry. Content analysis was used to measure the extent and nature of disclosure in 19 companies across three industries in the form of environmental themes. The findings of the thematic analysis carried out revealed that maximum disclosure across all the industries can be seen for the themes —training/education for environmental protection, —conservation of natural resources and —solid waste disposal.

Egolum, Amahalu and Obi (2019) determined the effect of firms' characteristics on environmental performance of listed industrial goods firms in Nigeria from 2008-2017. The study used ex-post facto research design. Secondary data were obtained from a sample size of eleven (11) industrial goods firms listed on the Nigerian Exchange Group. Hypotheses of the study were tested using multiple regression analysis. The study found that firm size, profitability and firm age have a significantly and positively affect environmental performance (measured by waste management cost) at 5% significant level.

Onyali and Okafor (2018) examined the effect of firm characteristics on environmental performance of quoted industrial goods firms in Nigeria. The study focused on the effect of firm size, profitability and firm age on waste management cost of the industrial goods firms. Ex-post facto research design was adopted on a population and sample size of eleven (11) industrial goods firms listed on the Nigerian Exchange Group as at the year, 2017. Secondary data were sourced from annual reports and accounts of the sampled firms for the study period, 2008-2017. Data analysis was done using Pearson correlation coefficient and Multivariate regression analysis. The study found that firm size, profitability and firm age positively affect environmental performance (measured by waste management cost) at 5% significant level.

Nguyen, Tran and Nguyen (2018) conducted a study to assess the factors affecting disclosure levels of environmental accounting information of firms in Vietnam. The data was collected from 85 firms listed on Vietnam Stock Exchange from 2013 to 2017. Multivariate linear regression was used in testing the hypotheses of the study. The results indicate that the level of disclosure is influenced by factors of size of firms, profitability, financial leverage, number of years listed and independent auditing, the number person in Management Board, Chair of management Board cum General Director.

Balarabe (2017) examined the effect of corporate characteristics on social and environmental disclosure of listed industrial goods firms in Nigeria. Specifically, the study examined the extent to



which social and environmental accounting disclosure of the firms is influenced by firm size, firm leverage, firm profitability, firm age, board size, board composition and managerial ownership. The population of the study consisted of all the 25 firms that are listed on the Nigerian Exchange Group (NSE), under industrial goods sector of the economy. After applying two filters, eight (8) firms were studied based on census approach. Data were collected from the annual reports and accounts of the firms for the period 2004-2015. The study employed correlation research design. The results of the robust fixed effect models indicated that firm leverage, firm profitability and board composition are negatively and significantly related to environmental disclosure. Based on the findings, the study recommended the need for Accounting Standard setting bodies and other regulatory agencies to set up a framework for social and environmental reporting in order to improve the level of social and environmental disclosure and transparency among listed firms in Nigeria.

Abubakar (2017) examined the influence of firm attributes on environmental disclosure of listed breweries companies in Nigeria. The population of the study consisted of five breweries companies listed on the floor of Nigerian Exchange Group. The sample size of the study was four (4) companies. The sample was drawn based on data accessibility. Data were collected from annual reports of the selected companies for the period of five years that is from 2012 to 2016. Multiple regression technique was employed to analyse the data. Profitability (PROF), firm size (FRMS), leverage (LEV) and board size (BDS) were used as proxies to measure the firm attributes. Panel least square regression and correlational matrix were used to test the hypotheses. The study found that board size has negative but significant influence on environmental disclosure, leverage has negative and insignificant influence on environmental disclosure with value 0.8229. Firm size has positive insignificant influence on environmental disclosure with value 0.1951, profitability has positive significant influence on environmental disclosure of listed breweries companies in Nigeria.

Elshabasy (2017) examined the effect of corporate characteristics on environmental information disclosure (EID) of the listed firms in Egypt. It selected the 50 most active firms in the Egyptian stock exchange. Secondary data was derived from the annual reports and the financial statements from the disclosure book for the period 2007-2011. The final count for the firms is 45, after excluding banks and insurance companies, for having different disclosure requirements and different corporate governance code. The tests for this research were done using the multiple regression model applied using the SPSS. Findings of the study revealed that there is an insignificant relationship between two factors of firms' characteristics (Firm Size and Firm Financial Leverage) and EID, while Firm's age



showed a negative significant relationship with EID and finally Firm's Profitability showed a positive significant relationship with EID.

Uyagu, Okpanachi, Nyor and Muhammad (2017) examined the effect of firm size, leverage, return on assets and firm age on environmental reporting practices of listed manufacturing firms in Nigeria. Ex-post facto research design was used on a population of sixty-one (61) manufacturing firms with a sample size of 29 firms drawn using judgmental sampling technique. Secondary data were gathered using annual reports of the sampled firms from 2000-2015 and analysed using multiple regression technique. The study found that firm size, leverage, return on assets and firm age have significant and positive effect on environmental reporting practices of listed manufacturing firms in Nigeria.

Ntalamia (2017) establish whether the financial status of a company influences adoption of Environmental management accounting practices among manufacturing firms in Kenya. A mixed research design approach of both quantitative and qualitative research design was adopted for the study. Primary data were obtained from 2017 to 2017 using structured questionnaire from a sample size of thirty-four (34). Regression analysis was used to validate the hypotheses. The results showed that Financial Status positively affects adoption of Environmental management accounting practices.

Ohidoa, Omokhudu and Oserogho (2016) investigated the effect of industry type, leverage and firm size on environmental disclosure in Nigeria. Secondary data were obtained from the annual reports of fifty (50) firms in the manufacturing and financial sectors listed in the Nigeria Stock Exchange from 2012 to 2015. Binary logistic panel data regression was used to validate the hypotheses of the study. The findings showed that industry type and firm size has positive relationship, while leverage has no significant effect on environmental disclosure.

Onyali, Okafor and Onodi (2015) evaluated the rate at which the practice of triple by corporations in Nigeria is effective by observing the point of view of corporate stakeholders. The research design which was used to obtain the necessary data was the descriptive survey method, having the target population as three different groups: accountants, investors and customers/consumers. Being that the form of data was primary collected from a sample size of 267 from 2015-2015, it was summarized with tables while analysis of the hypotheses was done using a one-sample z test method. The results showed discontent of the investors and consumers with the TBL disclosure practices of companies in Nigeria.



Monteiro and Aibar-Guzmán (2010) explored the determinants of environmental disclosures made in the annual reports by a sample of 109 large firms operating in Portugal during the period 2002–2004. The regression analysis conducted revealed that the firm size and stock exchange listing positively affect the extent of environmental disclosure but industry membership, profitability, foreign ownership and environmental certification do not.

### **3. MATERIAL AND METHOD**

This study adopted ex-post facto research design. It is suitable when the events or phenomenon examined had already occurred and the data cannot be manipulated. Therefore, since the present study was based on the secondary data collated from annual reports of selected listed industrial goods firms in Nigeria from 2012 to 2021, ex-post facto research design is considered appropriate for the study. The population of the study comprised all thirteen (13) industrial goods firms that are listed on the floor of the Nigerian Exchange Group (NGX) as at 31st December, 2021. The constituents of the population are enlisted below: Austin Laz & Company Plc., Berger Paints Plc., Beta Glass Plc., BUA Cement, Cap Plc., Cutix Plc., Dangote Cement Plc., Greif Nigeria Plc., Lafarge Africa Plc., Meyer Plc., Notore Chemical Ind Plc., Premier Paints Plc. and Tripple Gee & Company Plc.

Purposive sampling technique was used to determine the sample size for the study. Purposive sampling, also known as judgmental, selective, or subjective sampling, is a form of non-probability sampling in which researchers rely on a criterion or on a set of criteria when choosing members of the population to participate in the sample. Firms that are not yet quoted as at 2012 accounting year were removed. BUA Cement which was listed in 2020 and Notore Chemical Ind Plc. which was listed in 2018 will be removed from the sample size of the study. Thus, on the basis of availability of complete financial statements form 2012-2021, the following eleven (11) companies were selected as the sample participants: Austin Laz & Company Plc., Berger Paints Plc., Beta Glass Plc., Cap Plc., Cutix Plc., Dangote Cement Plc., Greif Nigeria Plc., Lafarge Africa Plc, Meyer Plc., Premier Paints Plc. and Tripple Gee & Company Plc. This study employed the secondary source of data. Annual reports and accounts of the sampled firms was used to obtain information on the variables of capital structure: debt to equity ratio, debt to asset ratio, long-term debt to equity ratio and short-term debt to asset ratio. Also, measure of firm environmental responsibility which is environmental disclosure index was collated from related companies' annual financial reports and accounts. The data instrument was by means of documentation where data from annual reports and accounts of the selected companies were extracted.

The data set were first subjected to pre-regression analyses which included descriptive statistics analyses. The descriptive statistics was employed to examine the characteristics of the data: mean maximum, minimum, and standard deviation. The panel regression analysis technique as a method of data analysis was employed to establish the effect of capital structure on environmental responsibility, and identify the direction of the effect, if any. However, the regression analysis was subjected to diagnostic checks involving the tests for heteroscedasticity, serial correlation, and linearity. The Pooled Ordinary Least Square variant of panel regression was conducted at 5% level of significance. Summary of the independent variables and control variables and means of measurement are reported in Table 1 as follows:

Table 1 Independent Variable Description and Measurements

Variable	Type of Variable	Measurement	Source
1. Debt to equity ratio	Independent	$\frac{\text{Total Liabilities}}{\text{Total Equity}}$	Chowdhury, Dey and Abedin (2020)
2. Debt to asset ratio	Independent	$\frac{\text{Total Liabilities}}{\text{Total Assets}}$	Shuaibu (2020)
3. Long-term debt to equity ratio	Independent	$\frac{\text{Noncurrent Liabilities}}{\text{Total Equity}}$	Liyao, Jiaxin & Wanyue (2021)
4. Short-term debt to asset ratio	Independent	$\frac{\text{Current Liabilities}}{\text{Total Assets}}$	Olurankinse and Mamidu (2021); Nguyen, Tran and Nguyen (2018)
5. Firm Size	Control	Natural Log of Total Assets	Onyali and Okafor (2018)

Source: Researcher’s Compilation, (2022)

The proxy for dependent variable, Environmental Disclosure Index, is measured thus:

Table 2 Dependent Variable Description and Measurements

Items	Measurement
1. Environmental Activities	1 or 0
2. Environmental Philosophy	1 or 0
3. Environmental Programmes and Policies	1 or 0
4. Environmental Initiatives	1 or 0



5. Environmental Commitments	1 or 0
6. Environmental Management Framework	1 or 0
7. Environmental Matters	1 or 0
8. Environmental Expenditure	1 or 0
9. Products and Technologies Contributing to Environment Responsibleness	1 or 0

Source: Ragini (2012)

The nine items that will be summed to arrive at environmental reporting index are: Environmental Activities, Environmental Philosophy, Environmental Programmes and Policies, Environmental Initiatives, Environmental Commitments, Environmental Management Framework, Environmental Matters, Environmental Expenditure, Products and Technologies Contributing to Environment (Ragini, 2012). The disclosure item is scored as one (1) if it is disclosed in the annual report or zero (0) if it is not disclosed in the annual report. The total disclosure score is determined in terms of number of items being disclosed. Ragini (2012) gave a formula for converting total disclosure score in terms of percentage thus:

$$\frac{\text{Total number of items appearing in the annual report}}{\text{Maximum number of items which should appear in annual reports}} \times 100$$

The researcher adapted the model used by Moshud, Olanrewaju and Abu (2021). The model adopted is:

$$ENVD = B_0 + \beta_1 LEV + U_t$$

Where, Where: ENVD = Environmental Disclosure

LEV = leverage

The above model was adjusted to accommodate the specific proxies of capital structure and the control variable used in the study. Thus, we have a modified version of the model above as:

$$EDI_{it} = \beta_0 + \beta_1 DAR_{it} + \beta_2 DER_{it} + \beta_3 LDE_{it} + \beta_4 SDA_{it} + \beta_5 FSZ_{it} + e_{it} \dots \dots \dots (1)$$

Where:

B<sub>0</sub> = Intercept

β<sub>1</sub> – β<sub>6</sub> = are the parameters to be estimated in the model

EDI = Environmental Disclosure Index

DAR = Debt to Asset Ratio

DER = Debt to Equity Ratio



LDE = Long-term Debt to Equity Ratio

SDA = Short-term Debt to Asset Ratio

FSZ = Firm Size

i = Firm intercept

t = time intercept

e = Error term

#### **4. RESULT AND DISCUSSIONS**

##### **4.1 Data Analysis**

##### **4.1.1 Descriptive Analysis of Data**

The data set were first subjected to pre-regression analyses which included descriptive statistics analyses. The descriptive statistics was employed to examine the characteristics of the data: mean maximum, minimum, standard deviation, skewness, kurtosis and Jarque-Bera statistics.

Table 3 Descriptive Analysis of Data

	<b>EDI</b>	<b>DAR</b>	<b>DER</b>	<b>LDE</b>	<b>SDA</b>	<b>FSZ</b>
Mean	0.866667	0.527110	-1.894543	-0.814375	0.402131	6.812659
Median	0.888889	0.439643	0.653967	0.136527	0.293635	6.454658
Maximum	1.000000	2.229656	23.52308	8.611770	2.229656	9.412006
Minimum	0.666667	0.032253	-253.8276	-107.0989	0.004452	5.239405
Std. Dev.	0.063499	0.365535	24.94634	10.37482	0.368377	1.117915
Skewness	-1.173188	2.275388	-9.535614	-9.914605	2.666053	0.927332
Kurtosis	5.231284	9.762724	96.40282	101.9973	11.84241	2.799788
Jarque-Bera	48.05218	304.5350	41652.41	46720.97	488.6727	15.94938
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000344
Sum	95.33333	57.98213	-208.3998	-89.58123	44.23443	749.3925
Sum Sq. Dev.	0.439506	14.56412	67832.85	11732.43	14.79146	136.2211
Observations	110	110	110	110	110	110

*Source: Analysis Output of Eviews 12 (2023)*

Table 3 provides a summary of the characteristics of the six variables: Environmental Disclosure Index (EDI), Debt to Asset Ratio (DAR), Debt to Equity Ratio (DER), Long-term Debt to Equity Ratio (LDE), Short-Term Debt to Asset Ratio (SDA) and Firm Size (FSZ). Based on the mean values, EDI has a mean value of 0.87 which implies that on average the sampled firms disclosed 87% of the





nine environmental indices in view. The average value of DAR is 0.53 which suggests that about 53% of the firms' total assets were financed using debts. The mean value of DER is -1.89, which first indicates that the liabilities of the firms exceeded the total assets and that total liabilities are by 89% more than the firms' equity. Same applied to LDE but LDE is by 81% higher than the firms' equity. The average value of SDA is 0.40 indicating that about 40% of the firms' total assets were funded using current debts. The median values of EDI, DAR, and FSZ are higher than their corresponding means, while the median values of DER, LDE, and SDA are lower than their means. The median values of EDI, DAR, and FSZ are close to 0.89, 0.44, and 6.45, respectively. The standard deviations of EDI, DAR, and SDA are relatively low, with values around 0.06, 0.37, and 0.37, respectively. The standard deviations of DER, LDE, and FSZ are higher, with values around 24.95, 10.37, and 1.12, respectively.

The skewness values for all six variables are negative, indicating that the distributions are negatively skewed, or that the tail on the left side of the distributions is longer than the right side. The skewness values for DAR and SDA are the highest, with values of 2.28 and 2.67, respectively. The kurtosis values for all six variables are high, indicating that the distributions have a sharp peak and heavy tails. The kurtosis values for DAR, DER, LDE, and SDA are particularly high, with values around 9.76, 96.40, 101.99, and 11.84, respectively.

The Jarque-Bera test results indicate that none of the six variables come from a normal distribution, as the probability values are all zero. This means that the sample data are significantly different from a normal distribution. Overall, the figures show that the six variables have different distributions, with varying levels of central tendency, dispersion, skewness, kurtosis, and deviation from normality.

#### **4.1.2 Model Diagnostics**

The regression analysis was subjected to diagnostic checks involving the tests for heteroscedasticity, serial correlation, and linearity.

##### **4.1.2.1 Linearity Test**

The Ramsey RESET test was used to check for linearity in the relationship between the independent variables and the dependent variable in the model. The test assesses whether the omitted variables, which are the squares and cross-products of the independent variables, are significant. If the test finds that the omitted variables are not significant, it provides evidence for linearity in the relationship between the independent variables and the dependent variable.



for linearity in the relationship between the independent variables and the dependent variable.

Table 4 Linearity Test

Ramsey RESET Test

Equation: EDI

Specification: EDI C DAR DER LDE SDA FSZ

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.475374	103	0.6355
F-statistic	0.225980	(1, 103)	0.6355
Likelihood ratio	0.241074	1	0.6234

Source: Analysis Output of Eviews 12 (2023)

The Ramsey RESET test is a statistical test used to assess the specification of an econometric model. The test is based on the equation "EDI" and is performed with the specification "EDI C DAR DER LDE SDA FSZ." The omitted variables in the test are the squares of the fitted values. The t-statistic for the test is 0.475374 with 103 degrees of freedom and a probability of 0.6355. The F-statistic is 0.225980 with (1,103) degrees of freedom and a probability of 0.6355. The likelihood ratio is 0.241074 with 1 degree of freedom and a probability of 0.6234. The decision rule is that if the probability value is greater than a certain significance level (example, 0.05), then the null hypothesis cannot be rejected, which means that the omitted variables are not significant and do not need to be included in the model. In this case, with a probability value of 0.6355 for both the t-statistic and F-statistic, and 0.6234 for the likelihood ratio, the null hypothesis cannot be rejected, indicating that the squares of fitted values are not significant and do not need to be included in the model. Thus, there is an evidence for linearity in the relationship between the independent variables and the dependent variable since the test found that the omitted variables are not significant.



#### 4.1.3 Heteroskedasticity Test

Breusch-Pagan-Godfrey test was carried out to examine whether the variance of the residuals in a regression model is constant. The presence of heteroskedasticity in a regression model affects the validity of statistical inferences, such as confidence intervals and hypothesis tests. The test output is presented in Table 5 below.

Table 5 Heteroskedasticity Test

F-statistic	1.128625	Prob. F(5,104)	0.3499
Obs*R-squared	5.661493	Prob. Chi-Square(5)	0.3406
Scaled explained SS	10.47875	Prob. Chi-Square(5)	0.0628

*Source: Analysis Output of Eviews 12 (2023)*

Table 5 presents the results from a heteroskedasticity test, which is a statistical test used to assess whether the variance of the residuals in a regression model is constant or not. The F-statistic is 1.128625 with 5 degrees of freedom and a probability value of 0.3499, obtained from an F-test. The Obs\*R-squared is 5.661493 with 5 degrees of freedom and a probability value of 0.3406, obtained from a chi-square test. The Scaled explained SS is 10.47875 with 5 degrees of freedom and a probability value of 0.0628, obtained from another chi-square test. If the probability value is greater than 0.05, then the null hypothesis cannot be rejected, which means that there is no evidence of heteroskedasticity in the residuals. In this case, with probability values of 0.3499, 0.3406, and 0.0628, it can be concluded that there is no evidence of heteroskedasticity in the residuals, indicating that the assumptions of constant variance was met.

#### 4.1.4 Serial Correlation LM Test

Breusch-Godfrey was used to assess whether the residuals suffer from serial or autocorrelation. Serial correlation occurs when the residuals of a regression model are correlated over time, which can affect the validity of statistical inferences, such as confidence intervals and hypothesis tests, in the model. The output of the test is presented in Table 6 below.



Table 6 Serial Correlation LM Test:

F-statistic	2.489203	Prob. F(2,102)	0.0880
Obs*R-squared	5.119020	Prob. Chi-Square(2)	0.0773

*Source: Analysis Output of Eviews 12 (2023)*

Table 6 presents the results from a serial correlation LM test, which is a statistical test used to assess the presence of serial correlation in the residuals of a regression model. The F-statistic is 2.489203 with 2 degrees of freedom and a probability value of 0.0880, obtained from an F-test. The Obs\*R-squared is 5.119020 with 2 degrees of freedom and a probability value of 0.0773, obtained from a chi-square test. The null hypothesis of no serial correlation cannot be rejected if the probability value is greater than 0.05. In this case, with probability values of 0.0880 and 0.0773, it can be concluded that there is no strong evidence of serial correlation in the residuals, indicating that the assumption of no serial correlation is met.

#### 4.2 Test of Hypotheses

For hypothesis testing, Pooled Ordinary Least Square variant of panel regression was conducted at 5% level of significance. Pooled Ordinary Least Squares (OLS) regression is a type of regression analysis that combines cross-sectional and time-series data into a single regression model. In a pooled OLS regression, the data from multiple time periods or cross-sectional units are combined into a single sample, and a regression is run on this combined sample to examine the relationship between the dependent variable and the independent variables. The output is presented in Table 7.



Table 7 Panel Least Squares

Dependent Variable: EDI

Method: Panel Least Squares

Date: 02/07/23 Time: 21:51

Sample: 2012 2021

Periods included: 10

Cross-sections included: 11

Total panel (balanced) observations: 110

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.673914	0.043633	15.44521	0.0000
DAR	0.147697	0.055449	2.663660	0.0090
DER	-0.000390	0.002937	-0.132806	0.8946
LDE	0.000872	0.007002	0.124501	0.9012
SDA	-0.113424	0.053187	-2.132574	0.0353
FSZ	0.023556	0.005615	4.195030	0.0001
R-squared	0.186531	Mean dependent var		0.866667
Adjusted R-squared	0.147421	S.D. dependent var		0.063499
S.E. of regression	0.058632	Akaike info criterion		-2.782063
Sum squared resid	0.357525	Schwarz criterion		-2.634764
Log likelihood	159.0135	Hannan-Quinn criter.		-2.722318
F-statistic	4.769490	Durbin-Watson stat		1.360110
Prob(F-statistic)	0.000578			

Source: Analysis Output of Eviews 12 (2023)

Table 7 presents the results of a panel least squares regression analysis, where the dependent variable is EDI. The regression model includes five independent variables: DAR, DER, LDE, SDA, and FSZ. The R-squared value is 0.186531, which implies that about 18.65% of variation in Environmental Disclosure Index were explained by the independent variables in the model. The adjusted R-squared value is 0.147421, which adjusts the R-squared for the number of independent variables in the model, taking into account the potential overfitting of the model. The F-statistic is 4.769490 with a probability value of 0.000578, which supports the overall significance of the independent variables in the model. The Durbin-Watson statistic is 1.360110, which implies an absence of serial correlation in the



residuals of the regression model. Firm size contributed significantly to the model since its  $p$ -value = 0.0001 is less than 0.05.

The coefficients of the independent variables represent the effect of each variable on the dependent variable (EDI). The direction of effect (positive or negative) and significance of the effect are determined by the  $t$ -statistic and the probability (Prob). A positive coefficient indicates a positive relationship between the independent variable and the dependent variable. A negative coefficient indicates a negative relationship between the independent variable and the dependent variable. If the Prob is less than 0.05, the relationship between the independent and dependent variables is considered statistically significant, and vice versa.

#### 4.2.1 Test of Hypothesis I

$H_{01}$ : Debt to asset ratio does not significantly affect the environmental disclosure index of industrial goods firms listed on the Nigerian Exchange Group.

Debt to Asset Ratio has a positive coefficient of 0.147697 and a  $t$ -statistic of 2.663660 with a probability of 0.0090. Thus, an increase in DAR by a margin increases EDI by 0.147697. This indicates a positive and statistically significant relationship between DAR and EDI. The null hypothesis was rejected because the  $p$ -value = 0.0090 is less than 0.05. Therefore, Debt to asset ratio significantly and positively affects the environmental disclosure index of industrial goods firms listed on the Nigerian Exchange Group ( $\beta = 0.147697$ ,  $p$ -value = 0.0090).

The reason for this result could be that firms with a higher debt to asset ratio are under greater pressure from stakeholders, including creditors and investors, to be transparent about their environmental performance. When a firm has a higher debt to asset ratio, it means that it has more debt compared to its assets. This increased leverage can put pressure on the firm to be more responsible in terms of environmental issues, as stakeholders are more likely to demand information about the firm's environmental performance. Al Amosh et al. (2022); Okafor, Egbunike and Amahalu (2022); and Kalash (2020) found similar results. However, the study conducted by Chang, Kangkang, Lewis and Tam (2021) found a different result that there is a negative and significant relationship between environmental liabilities and debt-to-assets ratios.



#### 4.2.2 Test of Hypothesis II

H<sub>02</sub>: Debt to equity ratio does not significantly affect the environmental disclosure index of industrial goods firms listed on the Nigerian Exchange Group.

Debt to Equity Ratio has a negative coefficient of -0.000390 and a t-statistic of -0.132806 with a probability of 0.8946. Thus, an increase in DER by a margin reduces EDI by 0.000390. This indicates a statistically insignificant negative relationship between DER and EDI. The null hypothesis was accepted because the *p*-value = 0.8946 is greater than 0.05. Therefore, Debt to equity ratio does not significantly affect the environmental disclosure index of industrial goods firms listed on the Nigerian Exchange Group ( $\beta = -0.000390$ , *p*-value = 0.8946).

The reason for this result could be that the debt to equity ratio measures the proportion of a firm's financing that comes from debt compared to equity. While it is an important metric for creditors, it may not be directly related to the firm's environmental performance and disclosure. This finding corroborates the studies carried out by Al Amosh et al. (2022); Ezekwesili and Ezejiolor (2022a); Nguyen (2020); but negates the results found by Nworie, Obi, Anaike and Uchechukwu-Obi (2022).

#### 4.2.3 Test of Hypotheses III

H<sub>03</sub>: Long-term debt to equity ratio does not significantly affect the environmental disclosure index of industrial goods firms listed on the Nigerian Exchange Group.

Long-term Debt to Equity ratio has a positive coefficient of 0.000872 and a t-statistic of 0.124501 with a probability of 0.9012. Thus, an increase in LDE by a margin increases EDI by 0.000872. This indicates a statistically insignificant positive relationship between LDE and EDI. The null hypothesis was accepted because the *p*-value = 0.9012 is greater than 0.05. Therefore, Long-term debt to equity ratio does not significantly affect the environmental disclosure index of industrial goods firms listed on the Nigerian Exchange Group ( $\beta = 0.000872$ , *p*-value = 0.9012).

The reason for this result could be that the long-term debt to equity ratio measures the proportion of a firm's long-term financing that comes from debt compared to equity. However, like the debt to equity ratio, this metric may not be directly related to the firm's environmental performance and disclosure. This finding is in agreement with the result found by Al Amosh et al. (2022); Chowdhury, Dey and Abedin (2021).



#### 4.2.4 Test of Hypotheses IV

H<sub>04</sub>: Short-term debt to asset ratio does not significantly affect the environmental disclosure index of industrial goods firms listed on the Nigerian Exchange Group.

Short-term Debt to Asset ratio has a negative coefficient of -0.113424 and a t-statistic of -2.132574 with a probability of 0.0353. Thus, an increase in SDA by a margin reduces EDI by 0.113424. This indicates a statistically significant negative relationship between SDA and EDI. The null hypothesis was rejected because the *p*-value = 0.0353 is less than 0.05. Therefore, Short-term debt to asset ratio significantly and negatively affects the environmental disclosure index of industrial goods firms listed on the Nigerian Exchange Group ( $\beta = -0.113424$ , *p*-value = 0.0353).

The reason for this result could be that firms with a higher short-term debt to asset ratio may have less financial stability, and may therefore be less likely to invest in environmental initiatives. When a firm has a higher short-term debt to asset ratio, it means that it has more short-term debt compared to its assets. This increased short-term leverage may lead the firm to prioritize other initiatives over environmental responsibility, as it tries to maintain its financial stability. Al Amosh et al. (2022) and Ardi and Yulianto (2021) found similar results.

#### CONCLUSION AND RECOMMENDATIONS

Involvement in environmental responsibility shapes the external perceptions of a firm by helping relevant stakeholders assess whether the firm is a good corporate citizen, and thus justifies the firm's continued existence even to lenders as well as shareholders. The necessity for environmental consciousness in firms is that environmental responsibility enables firms enjoy increased patronage from shareholders and creditors which will result in increased revenue in the long-run. However, the level of environmental responsibility of a firm is often determined by its financing structure. The study investigated the effect of capital structure on the environmental responsibility of industrial goods firms listed on the Nigerian Exchange Group. The findings suggest that the debt to asset ratio has a positive and significant effect on the environmental disclosure index, while the debt to equity ratio, long-term debt to equity ratio, and short-term debt to asset ratio do not have a significant effect.

The positive relationship between the debt to asset ratio and environmental disclosure index indicates that firms with a higher debt to asset ratio are more likely to be transparent about their environmental performance. This is likely due to increased pressure from stakeholders, such as creditors and investors, who demand greater accountability from firms with a higher debt to asset ratio. On the other hand, the lack of significant effect from the other capital structure metrics suggests that factors other





than the firm's financing structure may have a greater impact on its environmental responsibility. In conclusion, the study highlights the importance of debt to asset ratio as a factor that can influence the environmental responsibility of industrial goods firms listed on the Nigerian Exchange Group.

Based on the findings of the study, the following recommendations were made:

1. Managers of industrial goods firms with a higher debt to asset ratio should increase transparency about their environmental performance by disclosing their environmental programmes, initiatives, commitments and policies.
2. To further promote environmental responsibility among firms, it is recommended that stakeholders, such as investors and creditors, be empowered to exert pressure on firms to engage in environmental initiatives and be transparent about their environmental performance. This could be achieved through the development of environmental reporting standards and regulations, as well as increased public awareness about the importance of environmental sustainability.
3. Given the importance of debt to asset ratio in assessing a firm's environmental responsibility, it is recommended that investors incorporate environmental factors into their investment decisions.
4. Government should encourage companies to engage in environmental initiatives through the development of incentives and subsidies for environmentally responsible firms, as well as through increased public awareness about the importance of environmental sustainability.

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