

Environmental Sustainability Investment and Value Creation of Listed Non-Financial Firms in Nigeria.

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DOI: <https://doi.org/10.47772/IJRISS.2026.100601362>

Received: 03 July 2026; Accepted: 08 July 2026; Published: 20 July 2026

ABSTRACT

Environmental sustainability has become an increasingly critical concern for stakeholders, particularly in emerging economies that rely on natural resource exploitation for growth. This study therefore investigates the effect of environmental sustainability investment on value creation of listed non-financial firms in Nigeria. Using a longitudinal research design, the study examines a ten-year panel dataset from 2014 to 2023 drawn from a population size of 104 non-financial firms listed on the Nigerian Exchange Group as at 31st December 2023. A sample size of 35 firms was selected using a criterion sampling method. Data were extracted from annual reports and financial statements. Data collected were analysed using descriptive statistics and panel corrected standard error regression. The findings revealed that investment in renewable energy (INRE) showed a positive but insignificant effect on value creation. It, however, showed that expenditure on pollution control (EXPC) showed a positive and significant effect on value creation. Also, Green research and development expenditure (GRDE) showed a positive but insignificant effect on value creation. However, environmental certification and compliance cost (ECCC) had a significant but negative effect on value creation. It is concluded, therefore, that the investment of companies in environmental conservation and preventive measures can create firm value. The study therefore recommends that firms should not limit themselves only to pursuing strategies that will earn them environmental preservation certification alone, as it could have a diverse impact on their value creation, but invest more in activities that will lead to pollution reduction and environmental conservation to earn the trust of stakeholders.

Keywords: Environmental certification and compliance cost, Green R&D, Market value added, Renewable energy

INTRODUCTION

Value creation on a global scale encounters significant challenges, fuelled by rapid technological advancements, shifting stakeholder expectations, stricter regulatory requirements, and mounting environmental pressures (Brown & Parrino, 2023). These factors, taken together, complicate efforts to generate sustainable value across industries. Companies are increasingly expected to meet Environmental, Social, and Governance (ESG) standards as investors and consumers prioritise sustainability and ethical practices. Failure to invest in ESG initiatives not only jeopardises brand reputation but also limits access to capital as sustainable finance becomes mainstream, with many global fund investors avoiding firms lacking in ESG compliance (Unegbu & Amah, 2024; Moreno-Monslave et al., 2023). Geopolitical uncertainties further compound these challenges, impacting supply chains and exposing companies to fluctuating costs, making it difficult to maintain consistent value creation in a volatile market (Ali et al., 2021). These issues highlight the need for firms to develop adaptive strategies that balance short-term profitability with long-term value in a complex, interconnected global economy.

In developing countries like Nigeria, value creation is limited by economic, infrastructural, and regulatory challenges, including high capital costs and restricted financing options, which constrain business growth and innovation (World Bank, 2022). Infrastructural deficits, such as unreliable energy and poor transportation, elevate operational costs and reduce productivity, particularly in energy-intensive sectors like manufacturing (Agboola & Adekoya, 2023). Regulatory inconsistencies, corruption, and weak policy enforcement further

complicate the business environment, limiting sustainable practices, investor confidence, and lack of skilled labour necessary for digital and sustainable growth (Ajayi & Balogun, 2023; Oluwole & Nwachukwu, 2022; PwC, 2023). These challenges impact both local and global business landscapes, as firms in developed nations face stringent ESG requirements, while those in developing countries struggle with limited capital, power, innovations and infrastructural deficiencies, leading to high operational costs and lower productivity (Deloitte, 2023; Akinwale, 2023). In Nigeria, inconsistent regulations, infrastructural issues, and bureaucratic inefficiencies fuel economic volatility and hinder diversification, discouraging foreign investment essential for growth, ultimately reducing competitiveness and financial resilience (Ibrahim & Ojo, 2023; Agboola & Adekoya, 2023; PwC, 2024).

Policymakers, international institutions, and researchers have made significant progress in addressing the complexities of value creation, particularly through sustainable development, financial accessibility, and regulatory reform. A key reform strategy is the reinforcement of environmental, social, and governance (ESG) frameworks to institutionalise sustainable business practices, exemplified by the European Union's Green Deal, which enforces stringent environmental standards to drive green value creation across industries (European Commission, 2022). International institutions, including the World Bank and the International Monetary Fund (IMF), have expanded their support for developing economies by providing green financing and resources to facilitate sustainable infrastructure and energy projects that contribute to long-term economic resilience (World Bank, 2023). Similarly, the United Nations' Sustainable Development Goals (SDGs) Financing Lab serves as a critical mechanism for mobilising investment in projects that enhance business growth and economic stability in emerging markets (UNDP, 2022).

In view of this, the integration of sustainability investments into corporate strategy has emerged as a crucial lever for overcoming value creation challenges, as embedding ESG principles fosters financial resilience and societal impact. As Sroka and Szántó (2021) highlight, a well-structured ESG framework enhances value creation through targeted capital allocation in sustainable projects, investments in renewable energy, compliance with environmental certifications, pollution control measures, and green research and development expenditures. Furthermore, Escobar-Anel and Jiao (2023) emphasised that embedding sustainability within core business operations not only mitigates financial and operational risks but also unlocks new opportunities for value generation, particularly in private equity investments. Additionally, Cesarone et al. (2023) argue that sustainability-driven initiatives contribute to shareholder value by improving operational efficiencies, enhancing corporate reputation, and fostering innovation. Collectively, these insights underscore the critical role of sustainability investments in reshaping traditional value creation paradigms, aligning business success with positive environmental and social outcomes while ensuring long-term economic viability.

Environmental sustainability investment has emerged as a strategic imperative for firms seeking to enhance value creation while addressing global sustainability challenges (Grant, 2023). Extensive research in developed economies underscores the role of sustainability-driven investments in strengthening firm performance, fostering stakeholder engagement, and ensuring long-term resilience. Porter (2022) identifies key components of such investments, including capital expenditure in sustainable projects, renewable energy adoption, environmental certification, compliance costs, pollution control, and green R&D expenditure. Empirical studies by Chen et al. (2022), Hitt et al. (2023), and Stewart and Andrews (2024) demonstrate that sustainability initiatives significantly enhance firm profitability, particularly in industries such as renewable energy, technology, and consumer goods. Furthermore, research by Lee and Kim (2022) and Kang et al. (2023) highlights the positive correlation between sustainability-oriented investments such as clean technology adoption and eco-friendly product development and increased market share, investor confidence, and customer loyalty reinforcing the strategic importance of sustainability in contemporary business models.

Despite the well-documented benefits of environmental sustainability investments in developed markets, research on their impact in developing economies, particularly regarding sustainable capital expenditure projects, renewable energy, environmental certification and compliance costs, pollution control expenditures, and green research and development are still debated. While developed economies suggest that such investments can help firms address local environmental challenges and regulatory requirements while generating long-term financial and non-financial benefits (Singh & Agarwal, 2022; Mupemhi et al., 2023), other emerging economies need the

investment as additional costs. This explains the reason for most existing literature predominantly focusing on multinational corporations (MNCs) and large enterprises, leaving a significant gap in understanding their implications for small and medium-sized enterprises (SMEs) and other local firms, which play vital roles in economic growth. Additionally, sustainability research in key sectors such as agriculture and manufacturing often prioritize regulatory compliance and cost-saving measures, overlooking broader dimensions of value creation, including stakeholder trust, innovation capacity, and social impact (Mohammed & Osman, 2023; Kumar et al., 2023). This underscores the need for more comprehensive investigations into how environmental sustainability investments contribute to firm value, particularly in resource-constrained economies where such strategies could drive sustainable development.

Furthermore, current research mainly addresses short-term environmental compliance, without fully exploring key investment areas such as sustainable project expenditure, renewable energy adoption, environmental certification and compliance costs, pollution control investments, and green R&D. Given Nigeria's unique challenges of regulatory uncertainties, energy inefficiencies, and environmental degradation (Onyeiwu, 2023; Akinwale, 2023), there is a pressing need for deeper insights into how sustainability investments can help firms create long-term value. This study aims to fill this gap by investigating the effect of environmental sustainability investment on value creation in Nigerian non-financial firms, offering both theoretical contributions and practical implications for firms in emerging markets.

Considering the identified gaps, this study investigates the effect of environmental sustainability investment on value creation of non-financial listed firms in Nigeria. The choice of listed non-financial firms is ideal for this study as they span diverse, economically critical industries while facing distinct sustainability challenges and limited regulatory support compared to financial firms, thereby providing insights into broader economic and environmental dynamics. The study specifically investigates the effect of investment in renewable energy, expenditure on pollution control, green research and development expenditure, and environmental certification and compliance cost, with value creation represented by the market value added.

There are five sections to this study, an overview of the study was covered in the first section. Section two of the study covers the conceptual, theoretical, and empirical assessments of the literature, while the third section addresses the methodology. Data presentation, analysis, and hypothesis testing are covered in section four, while the study's summary, conclusion, and recommendations are covered in section five.

LITERATURE REVIEW

The conceptual review, theoretical review, empirical review, and gap identification that support environmental sustainability investment and value creation are the main parts of this section.

CONCEPTUAL REVIEW

This section critically examines key concepts and scholarly perspectives, establishing a robust foundation for the study by identifying theoretical connections, prevailing insights, and existing research gaps.

Value Creation

Value creation is a key element in strategic management and economics, referring to processes through which companies generate benefits that surpass the costs of their activities, thus enhancing stakeholder wealth. In the context of environmental sustainability investment, this concept emphasizes the integration of sustainable business practices that promote long-term profitability while benefiting society and the environment. McKinsey & Company (2020) underscores the need to consider the interests of all stakeholders customers, employees, suppliers, communities, and the environment when pursuing value creation, as this approach fosters sustainable growth. In line with this, Salas-Molina et al. (2020) propose a shared value framework, where sustainability becomes a central driver of value creation. By addressing both environmental concerns and business objectives, companies can not only achieve a competitive advantage but also improve community well-being and ecosystem health. Additionally, Cuevas Lizama and Royo-Vela (2023) emphasize the link between economic value and

environmental contributions, suggesting that shared value strategies can enhance corporate success while protecting natural resources.

Despite its significance, measuring value creation in the realm of environmental sustainability presents substantial challenges. Traditional financial metrics often fail to account for intangible assets such as environmental reputation, green innovations, and long-term resource stewardship. As Faster-Capital (2021) points out, an overemphasis on short-term financial outcomes can undermine investments in environmental initiatives that generate long-term value. In developing economies, the difficulty of measuring value creation is exacerbated, as Oloyede et al. (2023) highlight the lack of consistent data and varying definitions of environmental impact in digital economies. Moreover, balancing stakeholder interests remains a challenge, as short-term shareholder returns may conflict with long-term environmental goals. Abid et al. (2022) argue that value creation is experiential, with outcomes varying based on context, which makes it essential to develop adaptable evaluation frameworks that accurately assess both financial performance and environmental sustainability. This will allow companies to measure their long-term contributions to both the economy and the planet.

Market Value Added (MVA) is a crucial financial metric that measures the excess value a firm generates beyond the capital invested by shareholders and debt holders, reflecting management's effectiveness in value creation (Stewart, 2021; Pandya, 2023). It is computed as the difference between a company's total market value and its invested capital, where a positive MVA signifies successful value creation, while a negative MVA indicates value erosion (Brigham & Ehrhardt, 2022). This metric provides valuable insights into a firm's ability to generate returns above its cost of capital, aligning financial performance with strategic objectives (Sundari et al., 2023). Empirical studies reinforce MVA's role in financial performance evaluation, particularly in assessing firms' long-term value creation strategies and corporate sustainability (Babu & de Rozari, 2024; Chen et al., 2022). For instance, Babu and de Rozari (2024) analysed PT Mustika Ratu Tbk's financial performance using MVA and Economic Value Added (EVA) methodologies, demonstrating MVA's utility in value assessment before and during the COVID-19 pandemic. Similarly, Sundari et al. (2023) applied MVA and EVA techniques in Indonesia's cement sub-sector, revealing that firms with higher MVA exhibited superior financial health and operational efficiency. These findings highlight MVA as an essential tool for evaluating corporate sustainability, financial efficiency, and strategic investment decisions in dynamic market conditions.

Environmental Sustainability Investment

Environmental sustainability investment (ESI) is a strategic approach in which financial resources are allocated to projects, industries, and enterprises that promote long-term environmental benefits while maintaining financial viability. It focuses on sectors such as renewable energy, sustainable agriculture, green infrastructure, carbon reduction initiatives, and pollution control. ESI aims to reconcile economic growth with environmental conservation by encouraging investments that foster both ecological sustainability and financial returns (Smith & Johnson, 2021). This aligns with the growing recognition in the literature that sustainability-focused investments not only contribute to global environmental goals but also hold the potential to generate robust economic returns for investors (Chen et al., 2022). As defined by scholars, ESI emphasises investments that facilitate the achievement of environmental objectives, such as climate change mitigation, biodiversity protection, and resource efficiency, through integrated financial strategies (Williams & Clark, 2021).

The significance of environmental sustainability investments has gained momentum because of increasing institutional and regulatory support for sustainable finance. For instance, the integration of environmental, social, and governance (ESG) criteria into investment decision-making has been a key driver of this trend (Doe & Brown, 2021). However, despite its potential, challenges remain in effectively measuring and reporting the impact of these investments. One of the key obstacles is the lack of universally accepted metrics for assessing sustainability outcomes, which often leads to inconsistencies in performance evaluation (Abubakar & Yusuf, 2022). Additionally, the tension between short-term financial returns and long-term environmental goals often creates hesitancy among investors, particularly in sectors where green financing remains scarce, especially in developing economies (Nguyen & Lee, 2021). Nevertheless, frameworks like the Return on Sustainability Investment (ROSI) and growing mechanisms such as green bonds and sustainability-linked loans are helping

bridge the gap between environmental goals and financial profitability (Nguyen & Lee, 2021; Smith & Johnson, 2021).

Investment in Renewable Energy

Investment in renewable energy refers to the financial commitment directed towards the development and implementation of energy sources that are naturally replenishing, such as solar, wind, hydro, and geothermal energy (Sharma et al., 2023). This form of investment is critical for transitioning towards low-carbon economies and is a key driver of environmental sustainability investments (ESI). In developing countries, renewable energy investments are particularly influential in addressing energy poverty, enhancing energy security, and meeting climate goals (Ahmed et al., 2022). Studies by Jamil et al. (2021) and Mlambo & Naidoo (2023) highlight that these investments not only reduce environmental impact but also foster economic growth by creating green jobs and enhancing energy access. Furthermore, research by Patel et al. (2024) reveals that the growing focus on renewable energy in developing regions helps align environmental and financial goals, positioning renewable energy as a cornerstone of sustainable development. Collectively, these studies demonstrate the profound effect of renewable energy investments on promoting long-term sustainability and driving environmental, social, and economic benefits in developing economies.

Expenditure on Pollution Control

Expenditure on pollution control refers to financial investments aimed at mitigating environmental degradation, such as funding for technologies, policies, and practices to reduce the harmful impacts of pollution on ecosystems. This expenditure is crucial for environmental sustainability, helping to restore biodiversity, improve air, water, and soil quality, and combat climate change. In Africa, such investments significantly influence sustainability by promoting a balance between economic development and environmental preservation. Asante et al. (2022) highlighted that in Ghana, pollution control spending led to the adoption of green technologies, enhancing sustainable practices. Moyo et al. (2023) noted that South Africa's increased pollution control expenditure improved corporate environmental responsibility and spurred investments in green industries. However, Osei-Bonsu et al. (2024) found that in Nigeria, while pollution control spending is rising, challenges like insufficient enforcement and limited funds hinder its full impact on sustainable investments. Overall, pollution control expenditure in Africa plays a vital role in driving both environmental protection and long-term sustainable development. (Asante et al., 2022; Moyo et al., 2023; Osei-Bonsu et al., 2024).

Green Research and Development Expenditure

Green Research and Development (R&D) Expenditure refers to the financial investment directed towards research and technological innovations aimed at developing environmentally sustainable products, processes, and practices. It involves the creation of new green technologies, eco-friendly solutions, and the improvement of existing systems that contribute to environmental conservation and reduce ecological footprints. Green R&D plays a significant role in advancing environmental sustainability by fostering innovations that reduce resource consumption, lower carbon emissions, and enhance the overall ecological balance. In developed countries, such investments have spurred significant advancements in renewable energy, waste management, and eco-efficient manufacturing. For instance, Smith et al. (2021) and Jones and Larson, (2023) found that in Europe, increased green R&D expenditure has accelerated the transition to sustainable energy systems. In Africa, green R&D expenditure has been pivotal in addressing climate change challenges. Adebayo et al. (2023) and Kumasi and Adegboye (2022) observed that in Nigeria, investments in green R&D have enhanced sustainable agricultural practices and improved water management systems. Similarly, Du et al. (2022) argued that in South Africa, green R&D has contributed to innovations in sustainable urban development. However, despite positive impacts, challenges such as limited funding and technological infrastructure persist.

Environmental Certification and Compliance Cost

Environmental certification and compliance costs refer to the financial expenditures that organizations incur to meet environmental regulations and attain certification for their sustainability efforts, such as ISO 14001 or Energy Star (Chikodzi & Nyathi, 2021; Osei & Fosu, 2022). These certifications recognize a company's

commitment to environmental stewardship and regulatory adherence. While initial costs can be high, they often lead to long-term benefits like improved market access, brand reputation, and consumer trust, which influence environmental sustainability investments (Mwangi & Gitau, 2023). In developing countries, these certifications can act as competitive differentiators and promote sustainable business practices (Jha & Kumar, 2024). Studies by Bensah and Oteng (2021) and Zeng and Ding (2023) show that firms investing in certifications often see better financial performance due to global demand for sustainable products. These certifications also attract green financing and align operations with international standards, fostering further investments in renewable energy and sustainable infrastructure (Mahajan & Patel, 2024). Thus, the costs of environmental certification contribute to both financial growth and sustainability goals.

Theoretical Review

This study is anchored in the foundational frameworks of signaling theory and institutional theory.

Signaling Theory

Signaling theory, developed by Spence (1973), explains how firms communicate information to stakeholders in situations of asymmetric information. In the context of environmental sustainability investment and value creation, firms can signal their commitment to sustainability through green investments, renewable energy adoption, and resource efficiency, enhancing corporate reputation, market positioning, and investor confidence (Hassan et al., 2022). The theory assumes that firms with superior sustainability practices will send credible signals to differentiate themselves, but its effectiveness depends on stakeholder perceptions and the risk of greenwashing (Kim & Hwang, 2023).

Critics argue that signaling theory does not fully account for institutional pressures and regulatory environments, which influence sustainability disclosures (Choi & Lee, 2024). In Nigeria, signaling theory helps explain how non-financial firms use sustainability investments to attract investors and gain competitive advantages, particularly in less regulated markets (Ahmed et al., 2022; Ogunyemi et al., 2023). Effective sustainability signaling can facilitate access to international markets and favourable financing terms while shaping stakeholder perceptions and corporate legitimacy (Anwar & Malik, 2021). Policymakers can leverage this theory to enhance corporate sustainability practices through transparent reporting mechanisms, like frameworks adopted in developed economies (Gordon & Williamson, 2023). Ultimately, signaling theory provides a valuable lens for understanding how firms' sustainability investments influence value creation by shaping market perceptions and stakeholder behaviours in both local and global contexts.

Institutional Theory

Institutional theory, developed by DiMaggio and Powell (1983), explains how organisational behaviour is shaped by institutional pressures, including norms, regulations, and societal expectations. In the context of environmental sustainability investment and value creation, firms adopt sustainable practices not only for economic benefits but also due to pressures from regulatory bodies, industry standards, and societal demands (Bansal & McKnight, 2021). These pressures drive firms to integrate sustainability initiatives to gain legitimacy, enhance reputation, and comply with evolving regulations. However, institutional theory has been criticized for being overly deterministic, as it often overlooks managerial agency and firms' ability to innovate beyond institutional constraints (Ahlstrom et al., 2022; Lee & Mason, 2023).

In Nigeria, this theory explains how firms respond to both global sustainability trends and local pressures such as government policies and corporate social responsibility expectations (Okafor et al., 2024). Nigerian firms may align with sustainability standards not only to meet regulatory requirements but also to enhance legitimacy, attract investments, and access global markets. Institutional theory also informs policymakers on the need for robust regulatory frameworks to support sustainability-driven value creation (Adomako et al., 2021). In developed economies, it has been instrumental in explaining how regulatory and societal pressures influence firms' environmental investments, leading to improved operational efficiency and corporate value (Brown & Richards, 2022). Overall, institutional theory provides a structured lens for understanding how firms navigate sustainability challenges by balancing compliance with strategic environmental initiatives.

Theoretical Framework

This study adopts Signaling Theory and Institutional Theory to explain the link between environmental sustainability investments and value creation in Nigerian listed non-financial firms. Signaling Theory suggests that firms engage in sustainability investments, such as green R&D, pollution control, and environmental certifications, to signal long-term commitment to environmental responsibility and financial stability (Spence, 2022; Akinola & Nwachukwu, 2023). These investments enhance reputation, attract investors, and improve market valuation (Cheng & Zhao, 2023). Conversely, Institutional Theory highlights how regulatory bodies, industry norms, and societal expectations influence firms' sustainability strategies (DiMaggio & Powell, 2022; Munyua & Mwangi, 2024). In Nigeria, firms must comply with evolving ESG standards to maintain legitimacy and avoid regulatory penalties (Mwenda & Njoroge, 2024). This study integrates both theories to examine how sustainability investments function as strategic signals while also being driven by institutional pressures. Understanding these dynamics provides insight into the financial implications of sustainability investments in Nigerian non-financial firms.

Figure 1: Theoretical Framework Illustrating the Link between Theories



Source: Author's design (2025)

Empirical Review

This section of the study provides a comprehensive empirical review of the existing literature pertinent to environmental sustainability investments and their effect in value creation.

Munyua and Ochieng (2021) investigated the impact of environmental certification and compliance costs on value creation among Kenyan firms. Utilizing a randomly selected sample of 45 firms and analysing data from 2017 to 2021 through descriptive and regression techniques, the study found a negative correlation between environmental certification costs and market value. The authors attributed this decline to the substantial financial burden of certification, which failed to yield immediate financial benefits, thereby reducing profitability. However, the study did not explore the long-term financial implications of environmental certification, particularly in non-financial firms. To address this gap, the present research will examine the long-term economic effects of environmental certification on listed non-financial firms in Nigeria.

Zhang and Li (2022) investigated the impact of environmental certification and compliance costs on value creation in Chinese firms. Utilizing a quantitative approach, the study purposively sampled 40 firms and analysed data from corporate financial records and environmental impact reports spanning 2016 to 2021. Through ordinary least squares regression, the findings indicated that higher environmental certification and compliance costs contributed positively to market positioning and customer loyalty, ultimately enhancing firm market value. However, the study did not specifically examine the effect of certification costs on listed non-financial firms in China. To address this gap, the present research will explore how Nigerian listed non-financial firms can strategically leverage environmental certification to gain a competitive advantage.

Patel and Kumar (2022) conducted a longitudinal study to evaluate the impact of green research and development (R&D) on value creation in Indian firms. Using a sample of 60 firms selected through convenience sampling, the study analysed sustainability reports and financial data from 2014 to 2019. Employing a fixed-effects regression model, the findings revealed that investments in green R&D significantly enhanced innovation and competitive advantage, leading to positive value creation. However, the study was limited to the Indian context. To build on this research, the present study will examine how green R&D can drive innovation and competitiveness in Nigerian listed non-financial firms.

Adebayo and Oladele (2022) investigated the influence of capital expenditure on sustainable projects (CESP) on market performance in Nigeria. Drawing on a stratified random sample of 50 firms listed on the Nigerian Stock Exchange (NSE) between 2015 and 2020, the study utilised regression analysis to reveal a significant positive correlation between sustainable capital expenditures and market value. The findings underscored the role of sustainability investments in enhancing environmental reputation, reducing operational costs, and driving profitability. However, the study offered limited sector-specific insights within listed firms in Nigeria. To bridge this gap, the present research will examine the impact of sustainability investments on market performance among Nigerian-listed non-financial firms.

Ochoa and Rivera (2022) examined the role of green research and development (R&D) in value creation through a case study approach in Colombian firms. Using purposive sampling, the study selected 30 firms and analysed data from corporate financial and sustainability reports spanning 2016 to 2020. The findings demonstrated that green R&D investments significantly enhanced market share expansion, fostered innovation, and improved financial performance. However, the study lacked a comparative analysis of green R&D's impact across different sectors and economies, including Nigeria. To address this gap, the present research will conduct a comparative study on the effects of green R&D in Nigerian listed non-financial firms.

Abubakar and Yusuf (2022) analysed the impact of environmental certification and compliance costs on value creation in Kenyan firms. Employing a random sample of 40 firms, the study utilised data from 2016 to 2021 sourced from annual reports and sustainability disclosures. Correlation analysis revealed that firms with higher environmental certification and compliance costs experienced enhanced market positioning, leading to increased shareholder value and improved market performance. However, the study did not examine the impact of compliance costs on Nigerian firms. To bridge this gap, the present research will investigate how compliance costs influence profitability in Nigerian listed non-financial firms.

Juma and Odhiambo (2022) investigated the effect of pollution control expenditure on value creation in Tanzanian firms. The study used a purposive sample of 30 firms, with data gathered from public financial statements and sustainability reports between 2015 and 2020. Multiple regression analysis revealed that firms investing heavily in pollution control measures not only achieved cost savings but also enhanced their brand value, which positively influenced their market value. However, the study lacked empirical evidence on the impact of pollution control expenditures in non-financial firms. To address this gap, the present research will explore the financial returns of pollution control investments in Nigerian listed non-financial firms.

Banda and Komba (2022) examined the impact of pollution control expenditures on the financial performance of firms in Malawi. The study, using a stratified sample of 40 firms with data collected from 2016 to 2021, employed panel data regression analysis. The findings revealed no significant relationship between pollution control expenditure and value creation, suggesting that firms' investments in pollution control were primarily compliance-driven rather than aimed at improving operational efficiency, which resulted in no observable impact on market value. Building on this, the current study will explore various sustainability investment variables, including pollution control, and their influence on value creation in non-listed firms in Nigeria.

Brown and Lee (2023) investigated the impact of renewable energy investments on the financial performance of U.S.-based firms through a longitudinal study. Utilizing a randomly selected sample of 100 firms, the study analysed data from sustainability performance reports and financial records spanning 2012 to 2022. Panel data regression analysis revealed that investments in renewable energy significantly enhanced operational efficiency, reduced costs, and improved profitability, ultimately contributing to increased market value. While the study confirmed the financial benefits of green energy investments for U.S. firms, it did not extend its analysis beyond the U.S. market. To address this gap, the current study will conduct a cost-benefit analysis of renewable energy investments in Nigerian listed non-financial firms.

Jones and Clark (2023) examined the effect of pollution control expenditure on market value in UK-based firms through a cross-sectional study. The study employed stratified sampling with a sample of 120 firms, using data collected from financial statements and sustainability reports spanning 2018 to 2021. Structural equation modelling (SEM) revealed that pollution control expenditures led to significant reductions in operational costs and increased profitability, which positively influenced market value and long-term financial stability. However,

the study did not provide a sector-specific analysis of pollution control investments. To address this gap, the current study will focus on analysing industry-specific pollution control strategies and their financial impact on Nigerian listed non-financial firms.

Gonzalez and Alvarez (2023) explored the impact of renewable energy investments on financial performance in Mexican firms through a quantitative cross-sectional study. Using random sampling, the study selected 45 firms, with data drawn from public financial disclosures and sustainability reports for 2020. Regression analysis revealed a positive correlation between renewable energy investments and enhanced financial performance, primarily driven by reduced energy costs and improved profit margins. However, the study did not address the impact of renewable energy investments in other countries' non-financial sectors. To fill this gap, the current study will investigate the effects of renewable energy investments on the financial sustainability of Nigerian non-financial firms.

Roberts and Wang (2023) conducted a longitudinal study to investigate the effect of pollution control expenditures on the financial performance of Canadian firms. The study, which employed stratified random sampling with a sample size of 75 firms, analysed data from 2015 to 2021. Using multivariate regression analysis, the authors found that investments in pollution control not only led to operational efficiencies and cost savings but also improved corporate reputation, resulting in higher market value. However, the study was limited to Canadian firms and did not address the impact on non-financial firms in Nigeria. This research will extend the analysis by examining the influence of pollution control expenditures on market value in Nigerian non-financial firms.

Cheng and Zhao (2023) conducted a cross-sectional study to analyse the impact of environmental certification on value creation in Japan. The study, which involved 60 firms selected through random sampling, utilized data collected in 2021 from sustainability reports and corporate financial disclosures. Structural equation modelling (SEM) revealed that environmental certification and associated compliance costs significantly enhanced firm reputation and consumer loyalty, leading to improved market value and financial performance. However, the study was limited to Japanese firms and did not address Nigeria's non-financial sector. This research will extend the analysis by exploring the effect of environmental certification on market value in Nigerian non-financial firms.

Moyo and Khumalo (2023) examined the relationship between investment in renewable energy and value creation in South African firms. The study involved 70 firms selected through purposive sampling, with data collected from corporate sustainability reports and financial disclosures between 2017 and 2022. Panel data regression analysis revealed that firms investing in renewable energy saw significant reductions in energy costs and achieved long-term operational efficiencies, which led to higher market valuation and improved financial performance. However, the study was focused on South African firms and did not consider Nigeria's non-financial sector. This study will address this gap by analysing the financial impact of renewable energy investments in Nigerian non-financial firms.

Akinola and Nwachukwu (2023) investigated the role of green research and development expenditure (GRDE) in value creation within Nigerian manufacturing firms. The study utilized purposive sampling to select 35 firms, with data collected from sustainability reports and financial disclosures from 2018 to 2022. Fixed-effects regression analysis indicated that green R&D investments led to the development of innovative products and technologies, which significantly boosted firms' market value by attracting both investors and consumers interested in sustainable solutions. However, the study was limited to Nigerian manufacturing firms and did not address non-financial firms. To fill this gap, the current study will explore the impact of green R&D on value creation in Nigerian non-financial firms.

Chikodzi and Nyasha (2023) analysed the effect of capital expenditure on sustainable projects (CESP) on market performance in Zimbabwean firms. The study employed purposive sampling to select 38 firms, with data collected from 2015 to 2021. Using regression analysis, the study found that while capital expenditure on sustainable projects was expected to enhance value creation, the relationship with market value was statistically insignificant. The authors concluded that the environmental benefits of such investments did not immediately translate into improved financial performance, likely due to the high initial costs involved. The study was limited

to Zimbabwean firms and did not explore the impact on Nigerian firms. This research will investigate the effect of capital expenditure on sustainable projects in Nigerian non-financial firms.

Akpan and Eze (2024) examined the relationship between investment in renewable energy and financial performance in Ghanaian firms. The study, which involved 60 firms from various sectors, utilized secondary data from sustainability reports and financial records spanning 2016 to 2023. Regression analysis revealed a negative relationship between renewable energy investments and market value, suggesting that the short-term financial burden of transitioning to renewable energy outweighed the expected long-term benefits, resulting in a decline in market performance. The study focused on Ghanaian firms and did not address the Nigerian non-financial sector. This research will explore the impact of renewable energy investments on the market value of Nigerian non-financial firms.

Munyua and Mwangi (2024) investigated the relationship between environmental sustainability investment and value creation in Uganda. The study, which included 45 firms selected through stratified random sampling, analysed data from sustainability and financial reports spanning 2015 to 2023. Regression analysis revealed that environmental sustainability investments, especially in renewable energy and pollution control, positively impacted the firms' market value by enhancing operational efficiency and providing a competitive advantage in the local market. This study will extend the analysis to explore how environmental sustainability investments influence market value in Nigerian non-financial firms.

Mohan and Kanu (2024) examined the link between green research and development expenditure (GRDE) and market value in Nigerian firms. The study, involving 30 purposively selected firms, analysed data from 2013 to 2022. Regression analysis revealed no significant relationship between green R&D spending and value creation. The authors concluded that the high initial costs of R&D investments hindered the expected returns, resulting in no substantial impact on market value. This study focused on Nigerian manufacturing firms and did not address non-financial firms. To address this gap, the current study will explore the financial returns of green R&D investments in Nigerian non-financial firms.

Mwenda and Njoroge (2024) investigated the impact of environmental sustainability investments on value creation in Ugandan firms. The study, based on a random sample of 50 firms, analysed data from 2013 to 2022 using regression analysis. The findings revealed a negative relationship between sustainability investments and market value, attributed to underdeveloped sustainability practices and the difficulty in realizing short-term financial gains. While the study focused on Ugandan firms, it did not consider the Nigerian non-financial sector. To bridge this gap, the present study will examine the effect of environmental sustainability investments on the market value of Nigerian non-financial firms.

Gap in Literature

Despite extensive research on the link between environmental sustainability investments and value creation, critical gaps remain. Conceptually, while studies examine individual sustainability initiatives such as environmental certifications, green R&D, and pollution control, few integrate these factors to assess their combined impact on firm value (Munyua & Ochieng, 2021; Smith & Thompson, 2022; Juma & Odhiambo, 2022). Theoretically, most research fails to incorporate both Signaling Theory and Institutional Theory in explaining financial outcomes (Akinola & Nwachukwu, 2022; Gupta & Sharma, 2023). Signaling Theory suggests firms use sustainability investments to demonstrate long-term stability and environmental responsibility, yet studies rarely explore how these signals influence investor confidence in Nigeria (Spence, 2022; Cheng & Zhao, 2023). Institutional Theory highlights external pressures like regulations and industry norms that compel firms to adopt sustainability practices (DiMaggio & Powell, 2022; Munyua & Mwangi, 2024). However, limited research investigates how Nigeria's inconsistent regulations affect firms' environmental investment strategies. The lack of a framework integrating these theories leaves a gap in understanding how firms balance voluntary sustainability investments with institutional compliance.

Empirically, research findings on the financial effects of sustainability investments remain inconsistent, with some studies reporting positive effects while others show negative or insignificant results, largely due to differences in measurement methodologies (Chikodzi & Nyasha, 2023; Mwenda & Njoroge, 2024).

Additionally, most studies focus on developed economies, limiting applicability to African markets with different regulatory and economic structures (Juma & Odhiambo, 2022; Moyo & Khumalo, 2023; Mohan & Kanu, 2024). Many use short timeframes of five to six years, failing to capture long-term effects (Abubakar & Yusuf, 2022; Banda & Komba, 2022; Jones & Clark, 2023). Small sample sizes further reduce statistical robustness. Moreover, limited research examines how firm-specific factors like industry type, financial health, and governance moderate the relationship between sustainability investments and value creation. Addressing these gaps requires longitudinal studies with broader sample sizes and standardised measurement tools to better assess the financial implications of sustainability investments.

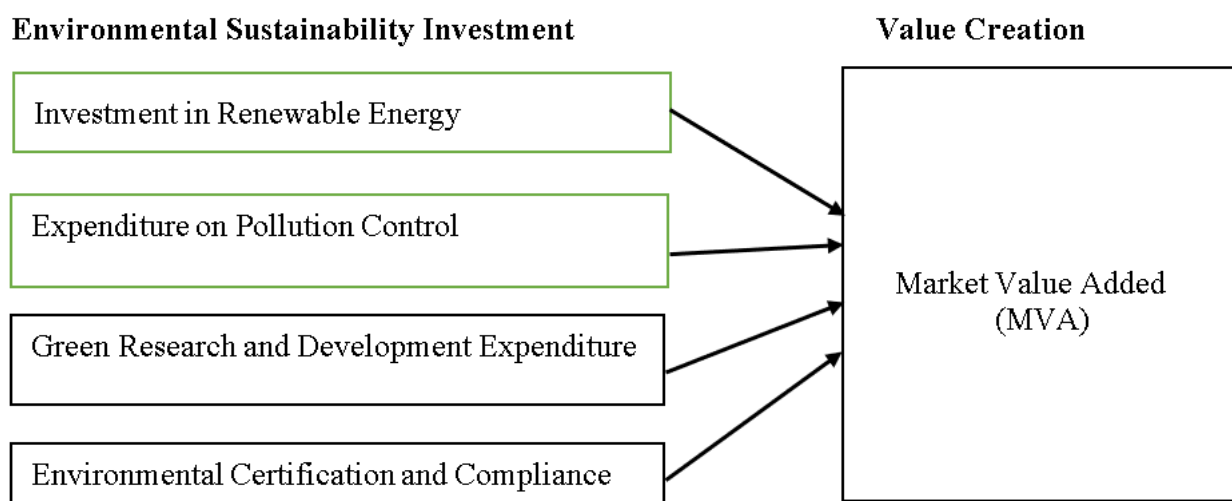
Considering the highlighted gaps, the following hypotheses were formulated in their null form to guide the empirical investigation:

- i. Investment in renewable energy does not have significant effect on value creation of listed non-financial firms in Nigeria
- ii. Expenditure on pollution control does not have significant effect on value creation of listed non-financial firms in Nigeria.
- iii. Green research and development expenditure does not have significant effect on value creation of listed non-financial firms in Nigeria.
- iv. Environmental certification and compliance cost does not have significant effect on value creation of listed non-financial firms in Nigeria.

Conceptual Framework

The conceptual framework model is systematically designed to address the identified research gaps while supporting the study's objectives and hypotheses. This model visually represents the relationship between the independent and dependent variables, forming the foundation for the current investigation. As depicted in Figure 1, the study primarily focuses on value creation, with market value added (MVA) serving as the proxy for the dependent variable. The independent variable, environmental sustainability investment, is operationalised through four key proxies: investment in renewable energy (INRE), expenditure on pollution control (EXPC), green research and development expenditure (GRDE) and environmental certification and compliance cost (ECCC).

Figure 2: Conceptual Framework illustrating the relationship between Environmental Sustainability Investment and Value Creation



Source: Researcher's Design (2025)

METHODOLOGY

The study employs a longitudinal research design to assess the impact of environmental sustainability investments on value creation among listed non-financial firms in Nigeria. The target population consists of 104 non-financial firms listed on the Nigerian Exchange (NGX), spanning ten sectors: agriculture (5), conglomerates (6), construction/real estate (9), consumer goods (21), healthcare (7), ICT (8), industrial goods (13), natural resources (4), oil and gas (9), and services (22). To ensure representativeness and reliability, the study utilises a criteria-based sampling method, proportionally selecting 35 firms across these sectors. Selection criteria include market capitalisation, completeness of financial records, and continuous listing on the NGX as of December 2023. Firms with extensive financial disclosures, active trading status, and significant capital investments in sustainability initiatives are prioritised to enhance data availability and analytical rigour (See Appendix 1). The study covers 10 years (2014–2023) to capture long-term sustainability trends and their financial implications.

To facilitate robust empirical analysis, the study relies on secondary data sources, drawing financial and sustainability information from annual reports, standalone sustainability reports, and corporate disclosures of the sampled firms. Key environmental sustainability investment variables include investment in renewable energy, environmental certification and compliance costs, pollution control expenditures, and green research and development spending, while market value added serves as the measure of value creation. The selection of 2014 as the base year is strategic, considering the significant economic and regulatory reforms in Nigeria that have influenced corporate sustainability practices and financial performance (UNDP, 2022). By employing a decade-long dataset, the study provides a comprehensive evaluation of the relationship between environmental sustainability investments and value creation in the Nigerian non-financial sector. For data analysis, the study employs descriptive statistics, correlation analysis and panel least-square regression.

Table 1: Sample Size Determination

Classification of Firms	No of Companies	Companies Without Full Coverage from 2014 to 2023	Sample size
Agriculture	5	3	2
Conglomerates	6	4	2
Construction/ Real estate	9	6	3
Consumer goods	21	14	7
Healthcare	7	5	2
ICT	8	5	3
Industrial goods	13	9	4
Natural resources	4	2	2
Oil and gas	9	6	3
Services	22	15	7
TOTAL	104	69	35

Source: Culled from Nigeria Exchange Group Website (2025).

Model Specification

To measure the effect of environmental sustainability investment on value creation, this study adopts an econometric model adapted from Munyua and Mwangi (2024). The model, originally developed to explore the relationship between environmental sustainability investment and value creation in Ugandan firms, has been modified to suit the context of Nigerian non-financial firms.

The model was simplified into a linear form as follows:

$$VC_{it} = \beta_0 + \beta_1 INRE_{it} + \beta_2 EXPC_{it} + \epsilon_{it}$$

Where:

VC = Value Creation; INRE= Investment in Renewable Energy; EXPC = Expenditure on Pollution Control,

This study will refine the model by substituting Market Value Added (MVA) for value creation as the dependent variable, while replacing Investment in Renewable Energy (INRE), Expenditure on Pollution Control (EXPC), Green Research and Development Expenditure (GRDE) and Environmental Certification and Compliance Costs (ECCC), with Investment in Renewable Energy (INRE) and Expenditure on Pollution Control (EXPC). This adjustment provides a more holistic and integrated measure that captures the comprehensive commitment to environmental sustainability investment and the impact of a firm's sustainability initiatives. Introduction of these new variables will strengthen the assessment of market value added by incorporating a wider scope of sustainability-related activities.

Thus, below is the study model with the linear representation:

$$VC = f(ESI) \dots\dots\dots(1)$$

$$MVA = f(INRE, EXPC, GRDE, ECCC) \dots\dots\dots(2)$$

The model for econometrics will be:

$$MVA_{it} = \beta_0 + \beta_1 INRE_{it} + \beta_2 EXPC_{it} + \beta_3 GRDE_{it} + \beta_4 ECCC_{it} + \epsilon_{it} \dots\dots\dots (3)$$

Where:

MVA = Market Value Added,

INRE = Investment in Renewable Energy,

EXPC = Expenditure on Pollution Control

GRDE = Green Research and Development Expenditure

ECCC = Environmental Certification and Compliance Cost

i = company

t = time

ϵ_{it} = error term

β_0 = constant/intercept;

$\beta_1 - \beta_4$ = slope of the independent elements

The researcher a priori expectation based on extant literature is as follow: $\beta_1 > 0, \beta_2 > 0, \beta_3 > 0, \beta_4 > 0$

Measurement of variables

This section presents a comprehensive analysis of the key variables influencing the relationship between environmental sustainability investment and value creation, offering well-defined conceptual frameworks and

precise measurement methodologies. It systematically delineates each variable, ensuring clarity in definition, scope, and operationalization to enhance empirical rigor and analytical accuracy.

Table 2: Variables Description / Measurements

S/N	Variable (s)	Description	Measurement	Source
1	Investment in Renewable Energy (INRE) (Independent)	Funds directed towards the development, acquisition, or integration of renewable energy sources, including solar, wind, hydro, and biomass, to reduce reliance on fossil fuels.	Natural log of the total annual financial commitment to renewable energy initiatives, reflected in capital budgets or specific line items in sustainability disclosures.	Brown & Lee (2023); Gonzalez & Alvarez (2023)
2	Expenditure on Pollution Control (EXPC) (Independent)	Financial resources allocated to technologies, systems, and processes designed to reduce, manage, or eliminate pollutants from production and operational activities.	Natural log of the total costs spending on pollution control measures, including installation and maintenance of equipment, as detailed in environmental management accounts.	Jones & Clark (2023); Roberts & Wang (2023)
3	Green Research and Development Expenditure (GRDE) (Independent)	Investment in research and development activities focused on creating environmentally friendly products, processes, or technologies that promote sustainability.	Measured by the proportion of R&D budget allocated to green initiatives, as indicated in the company's R&D expenditure reports or sustainability disclosures.	Patel & Kumar (2022); Akinola & Nwachukwu (2023)
4	Environmental Certification and Compliance Cost (ECCC) (Independent)	Expenses incurred to obtain environmental certifications (e.g., ISO 14001) and to ensure adherence to environmental regulations and standards.	Natural log of all the total costs associated with certification processes, compliance audits, and related administrative activities within the reporting period.	Munyua & Ochieng (2021); Cheng & Zhao (2023)
5	Market Value Added (MKVA) (Dependent)	A financial metric that represents the difference between the market value of a company and the capital contributed by investors,	Natural log of the difference between the company's total market value (equity and debt) and the total capital invested by	Pandya (2023); Babu & de Rozari (2024)

		indicating the value created beyond the invested capital.	shareholders and debt holders.	
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Source: Researchers' Compilation (2025).

Data Analysis and Discussion of Findings

Descriptive Statistics

Table 3: Descriptive Statistics

Stats	MVA	INRE	EXPC	GRDE	ECCC
Mean	4.489	5.276	1.876	4.460	0.332
S.D	6.962	1.721	2.340	2.115	1.207
Se(mean)	0.378	0.093	0.127	0.115	0.065
Min	-8.905	0.000	0.000	0.000	0.000
Max	13.008	8.601	6.692	7.940	6.446
Sum	1526.308	1793.762	637.824	1516.266	112.921
Skewedness	-0.991	-1.505	0.502	-0.902	3.634
Kurtosis	2.254	6.361	1.371	3.420	15.193

Researcher's Computation (2025)

The descriptive analysis of variables is reported in Table 3. The results shows that market value added (MVA) of the firms sampled on the average is 4.489 with standard deviation of 6.962 and this indicate that market value added on the average for the firms is positive. The standard deviation value shows that there is moderate variability in the rate of value added across the sampled firms while the standard error of mean implied that the sample mean is a reflection of the actual population having a small value close to zero (0) indicating 0.0378. Firms with the value added has -8.905 while the maximum market value added recorded is 13.008 which imply market value added is positive for some firms. The total sum of market value added is 1526.308 and the data is negatively skewed and have normal distribution.

From Table 2, it is observed that investment in renewable energy (INRE) for sampled firms on the average is 5.276 with standard deviation of 1.721. The standard deviation value shows that there is high variability in the level of investment in renewable energy across the sampled firms while the standard error of mean implied that the sample mean is a reflection of the actual population having a small value compared to the mean showing 0.093.

Firm with the least that investment in renewable energy (INRE) has 0 while the firm with the maximum investment in renewable energy is 8.601 and the total sum of investment in renewable energy by all the firms sampled is 1793.762. The data is negatively skewed and abnormally distributed. Furthermore, on Table 3, it is observed that expenditure on pollution control (EXPC) of firms sampled firms on the average is 1.876 with standard deviation of 2.340.

The standard deviation value shows that there is moderate variability in the expenditure on pollution control level across the sampled firms while the standard error of mean implied that the sample mean is a reflection of the actual population having a small value compared to the mean 0.127. Firm with the least expenditure on

pollution control has 0 while the maximum expenditure on pollution control by the firms is 6.692 and the total sum of expenditure on pollution control by all the firms is over 637.824. The data is positively skewed and normally distributed showing kurtosis value of 1.371.

Likewise, from table 3, it is revealed that green research and development expenditure (GRDE) on the average is 4.460 with standard deviation of 2.115 and this imply that many of the firms invest in green research and the variability of green research and development expenditure across the firm is moderate. The minimum green research and development expenditure of the firms is 0 and the maximum is 7.940, the total sum of green research and development expenditure across the sampled firms is 1516.266. Data for the variable is negatively skewed and abnormally distributed. Lastly on Table 3, it is shown that environmental compliance cost (ECC) for sampled firms on the average is 0.332 with standard deviation of 1.207.

The standard deviation value shows that there is high variability in the level of environmental compliance cost across the sampled firms while the standard error of mean implied that the sample mean is a reflection of the actual population having a small value compared to the mean 0.065. Firms with the least compliance cost has 0 while the maximum compliance cost is 6.446 and has the total sum of 112.921. The data is positively skewed and abnormally distributed showing kurtosis value of 15.193.

Correlation Analysis

Table 4: Correlation Analysis of Study Variables

Variables	MVA	INRE	EXPC	GRDE	ECCC
MVA	1.0000				
INRE	-0.0130 (0.8118)	1.0000			
EXPC	0.1275* (0.0187)	-0.2490* (0.0000)	1.0000		
GRDE	-0.1333* (0.0139)	0.3570* (0.0000)	-0.1201* (0.0268)	1.0000	
ECCC	-0.2141* (0.0001)	-0.1177* (0.0301)	-0.0751 0.1670	0.1193* (0.0278)	1.0000

Source: Researchers' Computation (2025)

Table 4 shows the results of a pairwise correlation coefficient test to determine the linear relationship between environmental sustainability investment and value creation of non-financial firms. The data revealed an inverse and insignificant relationship between Market value added (MVA) and investment in non-renewable energy (INRE), as evidenced by the coefficient value -0.0130 and probability of 0.8118. Furthermore, it is demonstrated that, for firms' expenditure on pollution control (EXPC) has a positive and significant correlation with market value added (MVA), having coefficient value of 0.1275* indicating an increase in pollution control cost will results to 12.75 percent increase in the growth of firms.

Furthermore, Table 4 shows an inverse linear association between listed firms green research and development expenditure (GRDE) and their value creation. The results are evidenced with a coefficient of -0.1333* and p-value of 0.0139. The same goes for the relationship between environmental compliance cost (ECC) and market value added having coefficient value of -0.2141 and p-value of 0.0001.

The overall implication of this relationship is that investment in environmental sustainability is not yet yielding positive returns for Nigerian firms except for the cost that address pollution control. Nigeria expanding to mandatory investments will expose to the investors rudiments that will make them create value in sustainability effort.

Test of Variables

Pre-Estimation Tests

Table 5: Panel Unit Root Test

Variable	Levin-Lin-Chu unit-root test	
	statistics	P-value
MVA	-5.3096	0.0000
INRE	-2.3597	0.0091
EXPC	-5.4389	0.0000
GRDE	-2.2172	0.0133
ECCC	-2.1161	0.0172

Source: Author's Computations (2025)

Panel variables have the tendency of been non stationary at level which may likely affect the parameter stability and consistency of the model. However, in order to identify the stationary conditions of the variables, the study uses Levin-Lin-Chu unit-root test. The null hypothesis assumption of the unit root test is that all panels contain unit roots while the alternate hypothesis implies that some panels are stationary. The results of unit root tests were displayed in Table 5. It shows that all the variables are integrated of order zero that is $I(0)$ which is significant at 5 percent level of significance. Therefore, we reject the null hypothesis and conclude that the series is stationary. Therefore, it is not necessary to conduct the co-integration test in order to determine the long run relationship among the variables. The panel least square is capable of estimating an efficient model and that is less spurious.

Post-Estimation Tests

Table 6: Summary of Post Estimation Test Results

Ramsey RESET test		
Null Hypothesis	F-Statistics	Probability
Ho: model has no omitted variables ($P > 0.05$)	2.03	0.1097
Tolerance and VIF Value		
Null Hypothesis	VIF	Mean VIF
There is no multicollinearity among the variables ($1/VIF > 0.10$)	-	1.06
Breusch-Pagan / Cook-Weisberg test for Heteroscedasticity		
Null Hypothesis	Chi2 Statistics	Probability
Constant variance across the variables residuals ($P > 0.05$)	0.03	0.8575
Wooldridge test for autocorrelation		
Null Hypothesis	F-Statistics	Probability

No first-order autocorrelation ($P > 0.05$)	16.100	0.0003
Pesaran's test of cross sectional independence		
Null Hypothesis	Statistics	Probability
There is no cross-sectional dependence ($P > 0.05$)	2.187,	0.0287
Hausman Test		
Null Hypothesis	Statistics	Probability
Difference in coefficients not systematic ($P > 0.05$)	3.51	0.4759
Breusch and Pagan Lagrangian multiplier test for random effects		
Null Hypothesis	Statistics	Probability
Difference in coefficients not systematic ($P < 0.05$)	508.30	0.0000

Researcher's Computation (2025)

Error test for model specification is conducted using Ramsey RESET test. The results show probability of 0.1097 and this indicate that the model has no omitted variable bias and misspecification. The heteroscedasticity test was conducted to check the validity of homoscedasticity assumption that variance in the residuals is constant. Heteroscedasticity test was conducted using Breusch-Pagan/Cook-Weisberg test and the result is presented in Table 6. Data for the study revealed there is absence of heteroscedasticity given the probability value of 0.8575 which is higher than 0.05. Likewise, variables for the study are also tested for auto-correlation using Wooldridge test for autocorrelation in panel data. Autocorrelation depicts how closely variable values are correlated across time. The result is presented in Table 6, and it shows the probability of 0.0003 which is significant indicating that there is problem of auto-correlation hence the null hypothesis that there is no first-order correlation is accepted.

Furthermore, the cross-sectional dependence test is carried out, and the result is presented in Table 6. The result indicates that null hypothesis which implied there is cross-sectional dependence is accepted as the statistics shows 2.187 with probability value indicated 0.0287 Hence, there is sufficient evidence to conclude that environmental sustainability investment under fixed-effect condition does exhibits cross-sectional dependence. However, the observed estimation problem of serial autocorrelation and cross-sectional dependence is to be corrected using panels corrected standard errors (PSCE) with the option that the standard error is independent-corrected. The Hausman test was also conducted to specify the appropriate model between fixed-effect model and random effect model and the result favoured the random effect model as the probability shows 0.4759 implying that difference in coefficient is not systematic. The appropriate model between random effect and pooled OLS regression examined using Breusch and Pagan Lagrangian multiplier test for random effects and the result shows that random effect is most appropriate as the probability is significant showing p-value of 0.0000 supporting the null hypothesis.

Environmental Sustainability Investment and Value Creation

The model specification test revealed that random effect model is more appropriate for interpretation. However, in order to correct statistical problem of serial autocorrelation and auto correlation that made the model negate the assumption of linear regression, the effect of environmental sustainability investment proxied by Investment in Renewable Energy, Environmental Certification and Compliance Cost (ECCC), Expenditure on Pollution Control (EXPC) and Green Research and Development Expenditure (GRDE) is inferred from the result of Praise-Winsten regression. This is a panel corrected standard error regression computed after correcting observed statistical problems identified in the pre and post estimation tests. Probability value and the Z-statistics

is used as the indices of interpretation for the linear relationship. The overall result shows that investment in environmental sustainability have significant effect on value creation and this is evidenced by the Wald χ^2 which is significant and this imply that the model analysed is significant at 5 percent. The variance that can be caused in value creation by environmental sustainability investment is 7 percent.

The regression result shows that investment in renewable (INRE) have positive but insignificant effect on value creation as measured by market value added (MVA) having z-statistics of 0.45 and probability of 0.655. The implication of the result is that renewable energy investments is capable of influencing the value creation of firms because it will address energy problem and enhance security and make the companies meet climate goals as designed by the United Nations. However, the effect is not significant because the companies does not make such investment a compulsion because the regulatory framework for environmental sustainability in Nigeria is still at developmental stage. The result presented on Table 7 shows that expenditure on pollution control (EXPC) have z-statistics of 1.98 and P-value of 0.048 and this indicate positive and significant effect on market value added (MVA). This indicates when there are enough resources to direct towards pollution control, it will enable the company to restore biodiversity and improve environmental state and well-being of the host community. And such investments will significantly attract the benefit of legitimacy and support from business stakeholders that will guarantee the company value being increased.

Furthermore, on Table 7, it is shown that green research and development expenditure (GRDE) has positive but insignificant effect on market value added (MVA) of firms and this is evidenced by z-statistics of 0.53 and probability value of 0.599. This may be an implication that the innovations cost of the company may have reduce energy consumption, lower carbon emissions and improve eco-friendly production but the investment has not made enough significant impact enough to create significant value creation outcome.

Many of the product and service of the company still has high environmental impact and until the research and development cost reduce environmental impact of products drastically, the value creation outcome might remain insignificant. Lastly on Table 7, it is shown that environmental compliance cost (ECC) has negative and significant effect on the market value added of firms in Nigeria.

This is evidenced by z-statistics of -5.21 and probability value of 0.000. This imply that the company's expenses on regulatory compliance diminishes the resources available to create wealth for the shareholders as the compliance cost being a deterrent will result to substantial financial burden for the firm. The effect is significant because annual expenditure on meeting up with regulation in case of fines and penalties will diminish the value of the firms if it increases.

The findings of the study corroborate the results of similar studies such as Munyua and Ochieng (2021) which investigated the impact of environmental certification and compliance costs on value creation among Kenyan firms as they found a negative correlation between environmental certification & compliance costs and market value. It likewise supports the result of Patel and Kumar (2022) conducted a longitudinal study to evaluate the impact of green research and development (R&D) on value creation in Indian firms and the findings revealed that investments in green R&D significantly enhanced innovation and competitive advantage, leading to positive value creation.

The study findings also align with the result of Juma and Odhiambo (2022) which investigated the effect of pollution control expenditure on value creation in Tanzanian firms. The study revealed that firms investing heavily in pollution control measures not only achieved cost savings but also enhanced their brand value, which positively influenced their market value. It equally supports the findings of Jones and Clark (2023) which revealed that pollution control expenditures led to significant reductions in operational costs and increased profitability, which positively influenced market value

More so, it contradicts the findings of Banda and Komba (2022) which found out that there is no significant relationship between pollution control expenditure and value creation of firms in Malawi. More so, the result of Moyo and Khumalo (2023) negates the findings of the study as it submitted that the regression analysis revealed that firms investing in renewable energy saw significant reductions in energy costs and achieved long-term operational efficiencies, which led to higher market valuation and improved financial performance

Table 7: Panels Corrected Standard Errors Regression

MVA	Coeff.	Indep-corrected Std.Err	z	P> z
_INRE	0.0567	0.1270	0.45	0.655
EXPC	0.2644	0.1337	1.98	0.048
GRDE	0.0616	0.1171	0.53	0.599
ECCC	-1.4103	0.2708	-5.21	0.000
_cons	3.1672	1.0416	3.04	0.002
Number of obs	340			
R-squared	0.1515			
Wald chi2(4)	30.47			
Prob > chi2	0.0000			

Source: Researcher's Computation (2025)

Policy Implication of Findings

The study's findings indicate that expenditure on pollution control is the most significant investment in environmental sustainability, yielding positive value creation for Nigerian firms. The implications of these findings should motivate the management of Nigerian firms to increase their expenditure on pollution-control costs to be at the forefront of environmental sustainability, as the country transitions to mandatory environmental disclosure and targets sustainable growth. The result also indicates a negative effect of environmental compliance costs on firms' market value added, implying that imposing compliance requirements imposes heavy financial burdens that undermine their value creation. This finding is useful to regulatory bodies in reviewing fines and penalties imposed on firms, as the adverse effects of compliance costs on companies may threaten their viability, as many may lose investors if they cannot generate sufficient wealth.

This finding serves as a blueprint for management, guiding investment decisions, areas for improvement, and aspects to reconsider to avoid costs, including environmental compliance costs such as fines and penalties, which negatively affect firms' market value added. This may imply that high compliance costs signal inefficiency and a lack of commitment to stakeholders, thereby damaging the firm's reputation and reducing its market value. There is a need for a well-balanced investment across areas to ensure that any potential source of negative influence is addressed.

CONCLUSION AND RECOMMENDATIONS

The study examined the effect of environmental sustainability investment on value creation of firms in Nigeria. In this era of sustainable development goals for countries, yet value creation is limited by economic, infrastructural and regulatory challenges. In view of this, the integration of sustainability investments into corporate strategy has emerged as a crucial lever for overcoming value creation challenges. Research findings have promoted the opinion that ESG principles fosters financial resilience and societal impact, but the aspect of sustainability investment has not received enough attention in developing nations. Hence, this research is propelled from the fact that right investment in environmental sustainability will convincible market the firms to investors which is a crucial leveller for value creation. The study is motivated from the fact that when quality

investment is made, it can signal commitment and the outcome is unknown mostly in the developing countries and now that the country is moving to the era of mandatory disclosure, the outcome of such investment on value creation is beneficial. Employing longitudinal research design and sourcing data secondarily from annual reports, obtained data for 34 firms was analysed and the findings shows that expenditure on pollution control have positive and significant effect on value creation of firms in Nigeria. The empirical results support previous researchers who admit the positive effect of environmental pollution cost on firm performance and observed significant influence of environmental compliance cost on firm's market value added. The study concluded that companies achieve wealth creation for its shareholders when they contribute significantly to pollution control and have enough resources to expend on waste management. It is also concluded that heightened pressure to comply with environmental requirements can adversely affect the market value added of business. It is then recommended that management should make an effort to avoid fines and penalties leading to high compliance costs and reduce their value creation effort. It is also recommended that managers should increase investment in other aspect such as green research and development expenditure and renewable energy with positive effect to attain a significant influence.

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Appendix 1

Sample Size of the Study

S/N	CODE	COD E	Listed Non-Financial Firms on Nigerian Exchange Group as at 31 st December 2023
1	AGRICULTURE	NFF 1	OKOMU OIL PALM PLC.
2	AGRICULTURE	NFF 2	PRESCO PLC
3	CONGLOMERATES	NFF 3	CHELLARAMS PLC.
4	CONGLOMERATES	NFF 4	TRANSNATIONAL CORPORATION PLC
5	CONSTRUCTION/REAL ESTATE	NFF 5	JULIUS BERGER NIG. PLC.
6	CONSTRUCTION/REAL ESTATE	NFF 6	SMART PRODUCTS NIGERIA PLC
7	CONSTRUCTION/REAL ESTATE	NFF 7	UPDC PLC
8	CONSUMER GOODS	NFF 8	BUA FOODS PLC
9	CONSUMER GOODS	NFF 9	CADBURY NIGERIA PLC.
10	CONSUMER GOODS	NFF 10	DANGOTE SUGAR REFINERY PLC
11	CONSUMER GOODS	NFF 11	FLOUR MILLS NIG. PLC.
12	CONSUMER GOODS	NFF 12	GOLDEN GUINEA BREW. PLC.
13	CONSUMER GOODS	NFF 13	GUINNESS NIG PLC
14	CONSUMER GOODS	NFF 14	INTERNATIONAL BREWERIES PLC.
15	HEALTHCARE	NFF 15	FIDSON HEALTHCARE PLC
16	HEALTHCARE	NFF 16	NEIMETH INTERNATIONAL PHARMACEUTICALS PLC
17	ICT	NFF 17	E-TRANZACT INTERNATIONAL PLC
18	ICT	NFF 18	NCR (NIGERIA) PLC.



19	ICT	NFF 19	OMATEK VENTURES PLC
20	INDUSTRIAL GOODS	NFF 20	BERGER PAINTS PLC
21	INDUSTRIAL GOODS	NFF 21	CAP PLC
22	INDUSTRIAL GOODS	NFF 22	DANGOTE CEMENT PLC
23	INDUSTRIAL GOODS	NFF 23	MEYER PLC.
24	NATURAL RESOURCES	NFF 24	ALUMINIUM EXTRUSION IND. PLC.
25	NATURAL RESOURCES	NFF 25	INDUSTRIAL & MEDICAL GASES NIGERIA PLC
26	OIL AND GAS	NFF 26	CONOIL PLC
27	OIL AND GAS	NFF 27	MRS OIL NIGERIA PLC.
28	OIL AND GAS	NFF 28	OANDO PLC
29	SERVICES	NFF 29	CAVERTON OFFSHORE SUPPORT GRP PLC
30	SERVICES	NFF 30	JULI PLC.
31	SERVICES	NFF 31	R T BRISCOE PLC.
32	SERVICES	NFF 32	SECURE ELECTRONIC TECHNOLOGY PLC
33	SERVICES	NFF 33	TRANSCORP HOTELS PLC
34	SERVICES	NFF 34	TRANS-NATIONWIDE EXPRESS PLC.
35	SERVICES	NFF 35	UNIVERSITY PRESS PLC.

Source: Nigerian Exchange Group Factbook (2014-2023).