THE ETHICAL AND ESG IMPLICATIONS OF GENERATIVE ARTIFICIAL INTELLIGENCE IN SUSTAINABILITY

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A PROJECT SUBMITTED IN THE DEPARTMENT OF ACCOUNTING, FACULTY OF MANAGEMENT SCIENCES, UNIVERSITY OF BENIN, BENIN CITY, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF B.Sc DEGREE IN ACCOUNTING, UNIVERSITY OF BENIN, BENIN CITY.

NOVEMBER 2025

DECLARATION

I hereby declare that this study was solely conducted by me in the department of accounting, University of Benin.

The study is original and has not been presented and disclosed elsewhere for the award of any degree to the best of my knowledge. All ideas, opinions, and views were products of my personal research and where the views and contributions of other works and authorities have been used, they were duly acknowledged.

Any factual or technical errors contained within this study are my sole responsibility

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EDEME PAUL EJIRO DATE

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CERTIFICATION

We the undersigned certify that this research project is an original work and was conducted by EDEMA PAUL EJIRO, with the matriculation number MGS2104531, and that the candidate has completed this research to a satisfactory standard in partial fulfillment of the requirements for the award of the Bachelor of Science (B.Sc), Degree in Accounting, Faculty of Management Sciences, University of Benin.

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DEDICATION

This project is wholeheartedly dedicated to God, who provided the wisdom, strength, and unwavering support necessary for the successful fruition of this academic endeavor.

It is also dedicated to my wonderful parents, Late. Mr EDEMA PETER, Mrs. EDEMA FELICIA OMOYE, my Elder Brother, EDEMA DAVID OVIE and my Elder Sister, Mrs. EDEMA STEPHANIE. Thank you for the profound love, encouragement, and invaluable assistance you offered throughout my academic pursuits and the preparation of this project.

ACKNOWLEDGEMENTS

My sincere gratitude is first extended to my Project Supervisor, Prof. J. O. Odia, for his critical insight, support, and meticulous corrections throughout the research process. Specifically, I wish to express deep appreciation to the academic staff of the Department of Accounting, University of Benin, for their invaluable guidance. I also recognize the contributions of the Project Coordinator, Dr. Ikhu Omoregbe, and the Head of Department, Prof. Osasu Obaretin, alongside all the dedicated lecturers.

I am profoundly grateful to my family for their unwavering love and immense support: my parents, Mrs. EDEMA FELICIA OMOYE, my sister EDEMA STEPHANIE, and my brothers, EDEMA DAVID OVIE.

Finally, special thanks are due to my friends (ASERE Enoch Olamiposi, Imoukhuede Victor, Oziengbe Solomon, Favour), my project group members, and other individuals who offered technical or moral assistance, including Mrs. Gift, Miss. Blessing, Mr. Daniel, Mr. Emmanuel Investor.

This journey taught me the profound value of community; therefore, to everyone who contributed, directly or indirectly, I offer my heartfelt thanks.

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ABSTRACT

The study investigated the ethical and environmental, social, and governance implications of generative artificial intelligence on sustainability practices in Nigeria. The rapid adoption of generative AI has created both opportunities and concerns for organisations striving to enhance sustainable development. The study examined how ethical considerations, environmental responsibility, social impact, and governance practices influence the effective integration of generative AI into sustainability initiatives.

A descriptive survey design was adopted. Data were collected from 120 respondents who met the benchmark criteria related to AI, sustainability, and governance. A structured questionnaire was used to assess ethical considerations, environmental outcomes, social effects, governance structures, and sustainability practices. Data were analysed using descriptive statistics, correlation analysis, variance inflation factors, heteroskedasticity diagnostics, and multiple regression at the 5 percent significance level.

The findings revealed that ethical considerations significantly improved sustainability practices. Environmental impact demonstrated a meaningful positive influence, indicating that AI-enabled environmental optimisation contributes to sustainability. Social impact also enhanced sustainability practices through inclusiveness, trust building, and knowledge improvement. Governance practices exerted a strong positive effect, showing that oversight, policy compliance, and responsible AI governance are essential for achieving sustainable outcomes. Together, the predictors explained 57.2 percent of the variation in sustainability practices.

The study concludes that responsible generative AI adoption depends on ethical values, environmental responsibility, social inclusion, and strong governance structures. Organisations can only achieve sustainable outcomes when AI systems are developed and deployed within these guiding dimensions. The study recommends strengthening ethical frameworks, improving environmental safeguards, promoting socially responsible AI practices, and enhancing governance structures to support sustainable AI integration in Nigeria.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

The term "Generative Artificial Intelligence", refers to sophisticated deep learning models that produce novel, complex, and high-quality content, gained prominence more recently, particularly with breakthroughs like Generative Adversarial Networks (GANs) and later language models (LLMs). Generative systems in Artificial Intelligence has roots stretching back to the mid-20th century such as early chatbots like ELIZA in the 1960s, and even earlier ideas of "intelligent machinery" by Turing in the 1940s.

Generative Artificial Intelligence (AI) is a system of algorithms or computer processes that can create novel output in text, images or other media based on user prompts. These systems are created by programmers who train them on large sets of data. The AI learns by finding patterns in the data and can then provide outputs to users' queries based on its findings.

Environmental, Social, and Governance (ESG) is an investment and corporate principle that prioritizes environmental issues, social issues, and corporate governance in business operations and investment decisions. It is frequently referred to as responsible investing or impact investing. The concept gained significant global prominence following initiatives like the United Nations'

"Who Cares Wins" report in 2004, transforming investment decisions from being predominantly based on financial returns to incorporating sustainability and societal influence.

The three core dimensions of ESG are: Environmental (E): This pillar focuses on how a company impacts the natural environment. Key concerns include climate change, greenhouse gas emissions, biodiversity loss, deforestation, pollution mitigation, energy efficiency, and water management.

Social (S): This dimension assesses a company's relationships with its internal stakeholders, such as employees, and external stakeholders, including the local community and consumers. It encompasses aspects like employee safety and health, working conditions, diversity, equity, and inclusion, human rights across the supply chain, and consumer protection.

Governance (G): This aspect refers to the structures and processes that direct and control companies. Good governance aims to ensure companies are more accountable, resilient, and transparent to investors. Data reported often includes management structure, efforts to prevent bribery and corruption, board diversity, executive and employee compensation, cybersecurity and privacy practices, and business ethics.

Sustainability, at its core, involves preserving natural resources, favouring biodiversity, reducing environmental risks, and finding a balance between the development of humanity and care for the environment. The most widely accepted definition, provided by the United Nations

Brundtland Commission in 1987, describes sustainability as "meeting the needs of the present without compromising the ability of future generations to meet their own needs".

OpenAI, Google, and Microsoft (Post-2018/2019): While not single scholars, the research labs behind models like GPT-2 (2019), DALL-E (2021), and ChatGPT (2022) have, through their publications and technologies, solidified the public and academic understanding of Generative AI. Their work demonstrates the capacity of models (particularly large transformer-based models) to:

- Generate coherent and contextually relevant text: as seen with Large Language Models (LLMs) like GPT series.
- Create realistic and novel images from text descriptions: as seen with models like DALL-E and Stable Diffusion.
- Produce various forms of media: including audio, video, and even code.

Generative AI as “a group of AI algorithms and models that are capable of producing new content, including texts, images, videos and problem-solving strategies, with human-like creativity and adaptability”, of the generated output.

1.2 STATEMENT OF THE RESEARCH PROBLEM

The rapid proliferation and increasing sophistication of Generative Artificial Intelligence (Gen-AI) offer unprecedented opportunities for advancing sustainability initiatives, from optimizing resource management and designing eco-friendly materials to accelerating climate modelling and fostering circular economies (Humble & Mozelius, Forthcoming 2025; MDPI, 2023).

The Lack of Transparency, Accountability, and Governance Frameworks: The "black box" nature of complex Generative AI models makes it challenging to understand their decision-making processes, trace the origins of generated content, or assign responsibility for harmful outputs (Barr 2023, cited in arXiv 2025).

Unforeseen Consequences and Ethics-Washing Risks: The transformative power of Generative AI might lead to unforeseen negative consequences in sustainability efforts, such as over-reliance on AI leading to reduced human oversight and holistic thinking (Humble & Mozelius, 2025) Algorithmic Bias and Social Inequity Amplification: Generative AI models learn from vast datasets, often reflecting existing societal biases, inequalities and historical injustices. When applied to sustainability contexts such as designing smart city solutions or allocating climate adaption resources, these embedded biases can lead to discriminatory outcomes (Shuford, 2024; Frontiers, 2025).

1.3 RESEARCH QUESTIONS

The following research questions have been raised in order to enable the researcher carry out the objectives of the study. The researcher aims to answer the following questions:

1. What governance gaps exist in regulating the development and deployment of Generative AI for sustainability?
2. How can principles of transparency and accountability be robustly integrated to ensure responsible innovation and mitigate risks?
3. What are the subtle yet profound ethical risks in fostering an over-dependence on technology that diminishes human agency and critical assessment in sustainability planning?
4. What ethical frameworks are needed to ensure fair, equitable, and inclusive outcomes, particularly for marginalized communities, rather than perpetuating social harms?

1.4 OBJECTIVES OF THE STUDY

The main objective of the study is to systematically investigate and analyse the ethical and environmental, social and governance implications of generative artificial intelligence in sustainability. The specific objectives are to:

1. To Identify and critically analyse the governance gaps that exists in regulating the development and deployment of Generative AI for sustainability, accountability.

2. To explore the governance challenges of transparency and accountability to ensure responsible innovation and mitigate risks like misinformation, ethics-washing and a reduction in human oversight.
3. To determine the ethical risks in fostering an over-dependence on technology that diminishes human agency and critical assessment in sustainability planning.
4. To propose ethical frameworks, guidelines, or best practices that are needed to ensure fair, equitable, and inclusive outcomes, particularly for marginalized communities, rather than perpetuating social harms.

1.5 RESEARCH HYPOTHESES

Based on the research questions and objectives, the following null hypotheses were proposed:

1. The increasing deployment and scaling of Generative AI models for sustainability applications does not significantly increase the net environmental footprint of digital infrastructure in a way that offsets environmental benefits.
2. The application of Generative AI in sustainability
3. The current lack of comprehensive and legally enforceable governance frameworks for Generative AI does not significantly hinder effective accountability and transparency, nor does it increase ethical and ESG risks in sustainability applications.

4. Proactive integration of established AI ethics principles into the design and deployment phases of Generative AI for sustainability does not significantly mitigate the identified ethical and ESG risks.

1.6 SCOPE OF THE STUDY

The study primarily focuses on the ethical and environmental, social and governance implications arising specifically from Generative AI models and applications in Sustainability. This includes, but is not limited to, large language models (LLMs) like those in the GPT series, Generative Adversarial Networks (GANs), and diffusion models. (Goodfollow et al, 2014). The study explores the intricate ethical and environmental, social, and governance considerations of Generative Artificial Intelligence within the broader context of sustainability.

The data for this review was collected by searching the Scopus database during the spring semester of 2024. The search was limited to papers with Generative, Artificial Intelligence and Sustainability in their titles, abstracts or keywords. Further filters were applied to include only Open Access, English language journal articles, and conference papers. The analysis of the identified papers employed a deductive thematic analysis approach, guided by the subcategories of ethical and environmental, economic, and social sustainability.

1.7 SIGNIFICANCE OF THE STUDY

This research holds significant value across multiple dimensions – academic, policy, industry, and societal – by addressing the critical yet underexplored nexus of Generative Artificial Intelligence, ethics, and ESG in the pursuit of sustainability. The significance of this study lies in its potential to contribute meaningfully to the understanding and responsible integration of Generative Artificial Intelligence (GAI) within the sustainability landscape, particularly in the Nigerian context. This research is expected to be greatly beneficial to a number of groups:

1) For Policymakers and Regulators: This study will provide crucial insights into the development of context-specific regulations that can guide the responsible deployment of AI technologies, ensuring they align with national sustainability goals and address issues such as data privacy, algorithmic bias, and accountability within the Nigerian socio-economic environment.

2) For Businesses and Organizations in Nigeria: The findings of this research will equip Nigerian enterprises, especially Small and Medium-sized Enterprises (SMEs), with a clearer understanding of the ethical considerations and ESG implications of adopting GAI. It will offer practical insights into how GAI can be leveraged to enhance ESG performance, optimize resource utilization, and streamline sustainability reporting, while also mitigating associated risks

like energy consumption and data security vulnerabilities. This can foster more responsible and sustainable business practices.

3) For Academic Institutions and Researchers: This study addresses a critical knowledge gap by exploring the intersection of GAI, ESG, and sustainability within a developing economy like Nigeria. It will serve as a foundational reference for future academic inquiry, stimulating further research on AI ethics, data governance, and sustainable development tailored to the unique challenges and opportunities present in Nigeria.

4) For Society and the General Public in Nigeria: By shedding light on the potential for GAI to perpetuate biases, spread misinformation, or impact employment, this research will contribute to a more informed public discourse. It will advocate for the development and deployment of GAI systems that are equitable, transparent, and human-centric, ultimately promoting social well-being and reducing inequalities.

Furthermore, it will highlight how responsible AI integration can contribute to achieving broader Sustainable Development Goals (SDGs) in Nigeria, such as improving agricultural efficiency and enhancing access to clean energy.

1.8 LIMITATIONS OF THE STUDY

This study is subject to certain limitations that may affect the generalizability and depth of its findings. These limitations are inherent to the nature of the research topic and the specific environment in which the study is conducted:

1. Data Availability and Quality: The study still rely on manual record-keeping and lack digitized, structured datasets that are optimal for in-depth AI analysis or comprehensive ESG reporting.

2. Evolving Regulatory Landscape: The absence of a coherent and consistently enforced policy framework specifically tailored to AI-enabled sustainable practices creates a "governance vacuum" that can make it challenging to assess long-term implications or provide definitive policy recommendations.

3. Pace of Technological Advancement: New models, applications, and ethical challenges emerge frequently, meaning that some aspects of the technology discussed in this study may evolve or become outdated quickly.

4. Awareness and Expertise Gaps: This may influence the scope and depth of information obtainable through qualitative research methods, as participants might have limited exposure to or understanding of the intricate ethical and ESG dimensions of GAI.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter provides a comprehensive review of existing literature relevant to the ethical and Environmental, Social, and Governance (ESG) implications of Generative Artificial Intelligence (GAI) in the context of sustainability. It begins by outlining key theoretical frameworks that underpin the study, followed by a conceptual framework illustrating the interrelationships between GAI, ethics, ESG, and sustainability. Subsequently, it delves into a detailed review of related literature, examining the ethical, environmental, social, and governance implications of GAI, with a particular focus on empirical studies and challenges within Nigeria. Finally, it identifies the research gaps that this study aims to address.

2.2 CONCEPTUAL REVIEW

The conceptual review for this study illustrates the interrelationships between Generative Artificial Intelligence (GAI), its ethical implications, Environmental, Social, and Governance (ESG) factors, and overall sustainability. It posits that GAI acts as a powerful technological force that can significantly influence ESG performance, which in turn mediates its impact on sustainability. However, this influence is not without its own set of ethical considerations, which must be carefully governed to ensure positive outcomes.

2.2.1 THE CONCEPT OF GENERATIVE ARTIFICIAL INTELLIGENCE (GenAI)

Generative artificial intelligence refers to models that learn patterns in data and produce new content such as text, images, audio or code (e.g., large language models and diffusion models). These systems raise distinctive ethical issues because outputs are probabilistic, sometimes opaque, and easily scaled across society (Sturm et al., 2023; Floridi, 2023; Floridi & Chiriatti, 2020).

Artificial Intelligence (AI) has advanced from simple rule-based expert systems of the 1960s to machine learning (ML) and deep learning models that dominate the present age. Within this evolution, a new and transformative subfield has emerged—Generative Artificial Intelligence (GenAI). Unlike traditional AI systems that classify, predict, or optimise based on existing data, generative models are designed to create new, synthetic content such as text, images, audio, code, and even three-dimensional designs that resemble human-generated outputs (Sturm et al., 2023). This generative capacity distinguishes them from earlier AI tools and has brought ethical, social, environmental, and governance debates to the forefront of AI discourse.

Generative AI is powered by advanced deep learning architectures—most prominently Generative Adversarial Networks (GANs), introduced by Goodfellow et al. (2014), and large language models (LLMs), such as GPT and LLaMA, trained on billions of text tokens. More recent innovations include diffusion models, which generate highly realistic images and videos by iteratively denoising data (Rombach et al., 2022). These models are now embedded in consumer-facing products like ChatGPT, DALL·E, and MidJourney, making generative AI one of the most widely discussed technologies of the 2020s.

Definition of Generative Artificial Intelligence from Scholars

1. Goodfellow et al. (2014): The earliest scholarly definition describes GenAI in terms of Generative Adversarial Networks (GANs): "Generative models are trained to learn a distribution of data so as to generate new samples that resemble the training set." This definition focuses on the technical foundations of GenAI.

2. Floridi and Chiriatti (2020): In their philosophical examination, define GenAI as "the subset of artificial intelligence systems capable of autonomously producing novel outputs that are statistically consistent with, but not mere reproductions of, their training data." This adds an epistemological lens, emphasising novelty and autonomy.

3. Kshetri (2021): A business and ethics scholar, explains: "Generative AI refers to algorithms that can be used to create new content, such as text, audio, images, or videos, by learning from patterns and structures in existing data." (p. 56). This is a broad operational definition relevant for management, ethics, and ESG contexts.

4. Luccioni, Viguier, & Ligozat (2022) define GenAI in sustainability as "the deployment of generative models to design, evaluate, and communicate sustainable solutions, balanced against the ecological cost of training and operating such models."

5. Sturm, Peters, and Weller (2023): In their survey on generative AI and organisations, define it as "a family of machine learning methods that enable the creation of new artefacts with high resemblance to human-produced outputs, raising questions about authenticity, accountability, and control."

6. Edoun et al. (2024): From an African perspective, describe GenAI as "a powerful AI subdomain whose outputs extend beyond prediction into creativity, but one which, if not guided by ethics and inclusiveness, may reproduce global inequities in African societies." This Nigerian/African perspective is critical in your context because it highlights the socio-cultural implications.

7. UNESCO (2023): In the global Recommendation on the Ethics of AI, frames generative AI as "AI systems designed to autonomously produce new data, artefacts or solutions that may resemble human creativity, and which therefore require oversight to ensure respect for human rights, cultural diversity, and sustainability".

2.2.2 CHARACTERISTICS OF GENERATIVE ARTIFICIAL INTELLIGENCE

Several core characteristics differentiate GenAI from other AI applications:

1. Creativity and Novelty: GenAI systems produce new artefacts, not merely classify or retrieve existing ones. For example, ChatGPT can generate an original essay, while DALL·E can produce images never before seen.

2. Scalability: Outputs can be produced at massive scale and speed, potentially overwhelming traditional human-created content and raising sustainability concerns about energy and environmental costs (Luccioni et al., 2022).

3. Probabilistic Outputs: Unlike deterministic programs, GenAI models generate results based on probabilities within their learned distributions, which sometimes introduces “hallucinations” (incorrect but plausible outputs).

4. Multimodality: New models increasingly work across different media: text-to-image, image-to-text, text-to-video, or even text-to-3D model.

5. Accessibility: Through APIs and user-friendly apps, generative AI is now available to individuals, small firms, and students, not just large corporations.

EVOLUTION AND HISTORICAL DEVELOPMENT

Early Foundations (1950s–1980s): Early AI research focused on symbolic reasoning and expert systems. Generative modelling was limited to statistics.

Probabilistic Models (1990s–2000s): Researchers began using probabilistic graphical models (Bayesian networks, Hidden Markov Models) for generative purposes, such as speech recognition.

Deep Learning Era (2014 onwards): Goodfellow's GANs in 2014 marked a turning point, allowing realistic synthetic data generation. Diffusion models (2020–2022) and large-scale transformers (e.g., GPT-3 in 2020, ChatGPT in 2022) pushed the field into public awareness.

Current Phase (2023–2025): With regulatory frameworks like the EU AI Act (2024) and Nigeria's draft National AI Strategy (2024), GenAI is moving into governance and sustainability debates.

2.2.3. RELEVANCE OF GENERATIVE AI TO SUSTAINABILITY AND ESG

Generative AI intersects with sustainability in two opposing ways. On the positive side, it enables simulations for climate modelling, generative design for renewable energy systems, and enhanced ESG reporting (Guardian Nigeria, 2024). On the negative side, it consumes large amounts of electricity and water, raises misinformation risks, and creates ethical dilemmas about bias, inclusivity, and accountability (Li et al., 2023; Edoun et al., 2024).

For Nigerian listed companies, the implications are significant. With the NGX Sustainability Disclosure Guidelines and the impending IFRS S1 and S2 adoption, companies must disclose material environmental and social risks. GenAI adoption therefore has ethical and ESG consequences that firms cannot ignore.

SYNTHESIS OF SCHOLARLY PERSPECTIVES

From the reviewed definitions and discussions, three insights emerge:

1. GenAI is both a technological tool and a social system—its impacts depend not only on the algorithms but also on governance, culture, and context.

2. Scholars consistently highlight the dual potential: innovation and creativity versus ethical risks (bias, misinformation, environmental cost).

3. In Nigeria and Africa, research underscores inclusivity and contextualisation, urging stakeholders not to replicate Western biases but to ensure that GenAI supports equitable, sustainable development.

2.2.4 ETHICAL ARTIFICIAL INTELLIGENCE

"Ethical AI" means AI development and use consistent with human rights, fairness, accountability, transparency, and sustainability. Global baselines include UNESCO's Recommendation on the Ethics of AI (2021) and the OECD AI Principles (2019; updated 2024), both emphasising inclusive growth, human oversight, and environmental responsibility (UNESCO, 2023; OECD, 2019/2024). Regionally, the EU AI Act (Official Journal, 13 June

2024) adds legal obligations, including transparency for general-purpose/foundation models (EU AI Act Explorer, 2024; European Parliament, 2025; Bommasani et al., 2024).

The Ethical and ESG Interfaces of GenAI

Environmental (E) implications

GenAI has notable energy and water footprints across training and inference. Seminal studies show deep learning's substantial energy demand (Strubell et al., 2019) and provide life-cycle estimates for foundation models (Luccioni et al., 2022/2023). More recent work highlights AI's "hidden" water cost for cooling data centres and electricity generation (Li et al., 2023). Public debate continues about methodology and transparency in vendor claims (MIT News, 2025).

These insights matter for Nigerian listed companies because:

(i) cloud/AI procurement now affects corporate Scope 2–3 emissions and water risk disclosures under ISSB/IFRS S2.

(ii) Nigeria faces climate and water stress in several regions.

(iii) investors increasingly interrogate digital operations for environmental materiality (Reuters, 2024; IFRS Foundation, 2025).

AI can also strengthen sustainability through better carbon accounting and climate analytics, but governance must avoid "AI-greenwashing" (Guardian Nigeria, 2024).

Social (S) implications

Key social risks linked to GenAI include bias and discrimination, misinformation and deepfakes, labour and inclusion, intellectual property and cultural rights.

1. Bias and representation: African scholars foreground representational harms and context mismatch, urging locally grounded datasets and scrutiny of gender/race biases (Sun et al., 2023; Edoun et al., 2024; Microsoft Research, 2024; Sustainable AI & Feminist African Ethics, 2025).

2. Misinformation and deepfakes: Nigeria's 2023 elections amplified concerns about synthetic media and information integrity (KIJHUS, 2023; Eigbedion, 2020; Ezenwa-Ohaeto RC, 2024). Nigerian digital regulators have introduced a Code of Practice for online platforms (NITDA) to mitigate harms (NITDA, 2024; DigitalTimesNG, 2025).

3. Labour and inclusion: ESG "S" requires fair work practices where GenAI is deployed (e.g., data labellers, content moderators, and displaced roles). African literature calls for equitable capability building and digital upskilling (AJSTID, 2024; Microsoft Research, 2024).

4. Data protection and rights: Nigeria's Data Protection Act 2023 and 2025 GAID provide lawful bases, cross-border transfer conditions, and enforcement expectations, relevant to AI data handling (NDPC, 2025; FPF, 2023).

Governance (G) implications

ESG's "G" centres on accountability, board oversight, internal control, risk management, transparency, and compliance. For GenAI, governance themes include:

1. Board oversight and AI risk: Firms need clear accountability for AI strategy, risk appetite, and assurance (TandF Corporate Governance & AI, 2025).

2. Model governance and documentation: The EU AI Act sets transparency, technical documentation, data governance, incident reporting, and where applicable foundation model requirements that global groups operating in Nigeria will face (EU AI Act Explorer, 2024; Reuters, 2025).

3. Disclosure alignment: Nigeria is rolling out ISSB-aligned reporting (IFRS S1/S2), which can capture GenAI's material ESG risks, especially energy, water, data governance, and social impacts (IFRS Foundation, 2025; FRC Nigeria, 2024; IASPlus, 2024).

4. Local policy signals: Nigeria's draft National AI Strategy emphasises responsible, inclusive AI and identifies risk factors for adoption; companies should watch convergence with data protection and online safety codes (OALP, 2024; DOA Law, 2024).

GenAI and the "E" in ESG: Key Evidence

1) Energy and carbon: Foundational papers quantify large training emissions and underscore life-cycle assessment (Strubell et al., 2019; Luccioni et al., 2022/2023). ISSB/IFRS S2 compels decision-useful climate disclosures that can capture AI-related electricity demand and procurement choices (IFRS Foundation, 2025; IASPlus, 2024).

2) Water footprint: Li et al. (2023) show significant water withdrawal/consumption from data centre cooling, with materiality rising as inference scales.

3) Nigeria-specific disclosure context: Nigerian listed companies are already under NGX sustainability guidance and moving into ISSB adoption windows (SSE, n.d.; Reuters, 2024; FRC Nigeria, 2024). Environmental metrics need to incorporate digital operations, including outsourced AI services.

GenAI and the "S" in ESG: Key Evidence

1) Bias, fairness, and inclusion: African research stresses culturally aware datasets and participatory design (AJSTID, 2024; Sun et al., 2023).

2) Misinformation and election integrity: Studies on deepfakes in Nigeria point to reputational, legal, and societal risks; regulatory readiness remains evolving (Eigbedion, 2020; Ezenwa-Ohaeto RC, 2024; KIJHUS, 2023).

3) Workforce effects: Nigerian/African higher-education studies surface ethics awareness gaps and readiness issues, implying corporate upskilling and responsible deployment policies (AJSTID, 2024; Afolabi, 2024; Ojo, 2024).

4) Data rights: Nigeria's Data Protection Act (2023) and GAID (2025) require privacy-by-design, lawful processing, and adequate transfer safeguards—directly relevant where GenAI trains on or handles personal data (NDPC, 2025; FPF, 2023).

GenAI and the “G” in ESG: Key Evidence

1) Board and management responsibilities: Emerging African scholarship identifies transparency, bias control, privacy, and demonstrable benefit as governance priorities (TandF—Corporate Governance & AI, 2025).

2) Controls, assurance, and reporting: Nigerian studies tie governance quality and independent assurance to better sustainability disclosure quality (Cogent Business & Management, 2024).

3) Regulatory trajectories: The EU AI Act’s risk-based model affects multinationals and supply chains; Nigerian issuers with EU exposure will need to align model documentation, transparency, and incident reporting (EU sources; Reuters, 2025).

4) Local policy alignment: Nigeria’s draft NAIS aims for responsible, inclusive AI ecosystems; NITDA’s online safety Code of Practice guides platform conduct; the NDPA 2023/GAID 2025 clarifies enforcement (OALP, 2024; NITDA, 2024; NDPC, 2025).

2.2.5 THE CONCEPT OF SUSTAINABILITY

Sustainability, at its core, involves preserving natural resources, favouring biodiversity, reducing environmental risks, and finding a balance between the development of humanity and care for the environment. The most widely accepted definition, provided by the United Nations Brundtland Commission in 1987, describes sustainability as "meeting the needs of the present without compromising the ability of future generations to meet their own needs". This definition underscores the principle of intergenerational equity, ensuring that current development does not deplete resources or opportunities for those who come after us. Sustainable development requires an integrated approach that considers environmental concerns alongside economic development, particularly in the face of global challenges like climate change. The United Nations Sustainable Development Goals (SDGs), such as SDG 13 (Climate Action), SDG 14 (Life Below Water), and SDG 15 (Life on Land), provide a comprehensive framework for achieving global sustainable development by integrating measures to prevent climate change within development frameworks.

Sustainable development requires an integrated approach that takes into consideration environmental concerns along with economic development.

In 1987, the United Nations Brundtland Commission defined sustainability as "meeting the needs of the present without compromising the ability of future generations to meet their own needs." Today, there are almost 140 developing countries in the world seeking ways of meeting their development needs, but with the increasing threat of climate change, concrete efforts must be made to ensure development today does not negatively affect future generations.

The Sustainable Development Goals form the framework for improving the lives of populations around the world and mitigating the hazardous man-made effects of climate change. SDG 13: Climate Action, calls for integrating measures to prevent climate change within development frameworks. SDG 14: Life Below Water, and SDG 15: Life on Land, also call for more sustainable practices in using the earth's natural resources.

The definition of sustainability emphasizes preserving resources and balancing current needs with future generations' needs. However, the operational footprint of GAI, characterized by significant energy consumption, water usage, and hardware demand, presents a fundamental tension. This creates a paradox: can a technology that is inherently resource-intensive truly contribute to sustainability, or does its operational footprint undermine its potential benefits? This central analytical challenge for the study moves beyond simple definitions to a critical evaluation of GAI's net impact on long-term planetary well-being.

Sustainability balances environmental integrity, social well-being, and economic viability. ESG (Environmental, Social, and Governance) converts these ideas into decision-useful corporate metrics and disclosures. In Nigeria, ESG is reinforced by the Nigerian Exchange (NGX) Sustainability Disclosure Guidelines (effective 2019 for Premium Board issuers) and the country's move to implement IFRS Sustainability Disclosure Standards—IFRS S1 and IFRS S2—on a staged timeline (SSE, n.d.; IASPlus, 2024; FRC Nigeria, 2024; IFRS Foundation, 2025).

2.2.6 CONCEPT OF GENERATIVE ARTIFICIAL INTELLIGENCE IN SUSTAINABILITY

Sustainability has become a central theme in both academic and corporate discussions, especially with the increasing urgency of addressing global challenges such as climate change, biodiversity loss, inequality, and corporate governance failures. At the same time, Generative Artificial Intelligence (GenAI)—a subfield of artificial intelligence that creates novel content such as text, images, models, and solutions—has emerged as a transformative technology. When aligned with sustainability goals, GenAI holds the potential to reshape how organisations design eco-friendly systems, report on environmental, social, and governance (ESG) indicators, and communicate sustainability strategies (Floridi & Chiriatti, 2020; Sturm et al., 2023). However, it also raises concerns about resource use, bias, and ethical accountability.

Conceptualizing Generative AI in the Context of Sustainability

Generative AI in sustainability can be understood as the application of generative models to advance environmental, social, and governance objectives, while minimising negative impacts. It extends beyond traditional AI applications of prediction and optimisation, offering creative approaches to sustainability problems.

Environmental dimension: Generative models can simulate renewable energy systems, design energy-efficient buildings, and optimise supply chain routes to reduce carbon emissions (Luccioni et al., 2022).

Social dimension: GenAI enables inclusive education by generating multilingual materials, supports healthcare innovation through drug discovery, and enhances accessibility for people with disabilities.

Governance dimension: It can improve ESG disclosures by automatically generating sustainability reports in line with frameworks such as the Global Reporting Initiative (GRI) or IFRS S1 and S2.

Thus, GenAI in sustainability reflects a duality: while it creates opportunities for innovation, it simultaneously demands responsible governance due to its environmental footprint and ethical risks (Edoun et al., 2024).

2.2.7 APPLICATIONS OF GenAI IN SUSTAINABILITY

GenAI's application in sustainability can be grouped into practical use-cases that demonstrate both promise and limitations:

1. Green Design and Innovation: Generative design tools use AI to simulate multiple design options for buildings, vehicles, or industrial systems, minimising energy use and waste. For

example, Autodesk's generative design systems have been used to create lightweight parts that reduce carbon footprints in transportation (Kshetri, 2021).

2. Climate and Environmental Modelling: GenAI can generate climate scenarios and simulate policy outcomes. This supports Nigeria's climate adaptation strategies by offering predictive insights for agriculture, energy, and disaster management.

3. Sustainability Reporting and ESG Disclosure: Listed companies in Nigeria increasingly face pressure from regulators such as the Nigerian Exchange (NGX) to provide transparent ESG reports. GenAI can assist by automatically drafting sustainability disclosures, ensuring consistency with frameworks like GRI and ISSB standards (Guardian Nigeria, 2024).

4. Education and Awareness: By generating multilingual and context-specific learning materials, GenAI supports sustainability literacy across diverse communities in Nigeria.

5. Healthcare and Social Sustainability: In drug discovery, GenAI reduces the time and cost of producing compounds for neglected tropical diseases, contributing to health-related SDGs (Kourou et al., 2022).

2.2.8 CHALLENGES AND RISKS OF GenAI IN SUSTAINABILITY

While GenAI presents opportunities, it also brings challenges that threaten sustainable development goals:

1. High Energy Consumption: Training large models such as GPT-4 consumes enormous electricity, contributing to carbon emissions (Li et al., 2023).

2. Water Footprint: Recent studies reveal that cooling data centres for AI consumes significant amounts of freshwater, an issue relevant for drought-prone regions (Li et al., 2023).

3. Bias and Inequality: Without contextual training, GenAI may reproduce Western-centric sustainability narratives, sidelining African perspectives (Edoun et al., 2024).

4. Misinformation Risks: Generative models may produce misleading ESG disclosures, making greenwashing easier for corporations.

5. Ethical and Governance Gaps: Current Nigerian laws and policies on AI ethics are still developing, leaving room for misuse.

2.2.9 IMPLICATIONS FOR NIGERIA AND AFRICA

In the Nigerian context, where the Federal Government recently drafted a National Artificial Intelligence Strategy (2024), GenAI could support critical sectors such as agriculture, energy, and banking. For instance, banks could use GenAI to simulate ESG risk models, while oil and gas firms could apply it in carbon monitoring and reporting. However, the ethical and infrastructural challenges in Nigeria—such as limited energy access, weak governance structures, and digital inequality—pose constraints.

Thus, the concept of GenAI in sustainability in Nigeria should not be seen only as technological adoption, but as a balancing act between innovation and ethics. For Nigeria, it provides an opportunity to leapfrog traditional barriers in sustainability but requires governance frameworks aligned with local realities.

Synthesis

The concept of generative AI in sustainability is multidimensional. It encapsulates technological innovation (content creation, modelling, simulations), ethical responsibility (bias, transparency, inclusivity), and governance (ESG frameworks, regulation, and disclosure). For Nigerian companies, the adoption of GenAI in sustainability is both an opportunity and a challenge. While it promises efficiency and creativity, it also demands strong ethical guardrails to ensure that the environmental and social costs of AI do not undermine broader sustainability goals

2.3 Empirical Review

The empirical review provides an overview of existing research that has investigated the relationship between generative artificial intelligence (GenAI), ethics, environmental, social, and governance (ESG) practices, and sustainability outcomes. This section evaluates findings from Nigerian and international studies, highlighting methodologies, results, and identified gaps. Such a review is important in situating this study within the broader literature and identifying how it contributes to ongoing debates.

2.3.1 EMPIRICAL STUDIES ON GENERATIVE AI AND SUSTAINABILITY

Several recent studies have examined the application of GenAI to sustainability challenges. For example, Luccioni et al. (2022) empirically estimated the carbon footprint of large-scale GenAI models, such as BLOOM, using a life-cycle assessment approach. Their findings showed that the training of large generative models consumed substantial energy, raising concerns about the environmental sustainability of GenAI. Similarly, Li et al. (2023) investigated the water footprint of AI models in data centres across the United States and China. Their results revealed that generative AI systems consume significant water resources for cooling, underscoring the environmental trade-offs of adopting GenAI.

From a governance perspective, Sturm, Peters, and Weller (2023) conducted a survey of European firms and found that while 62% of organisations believed GenAI could enhance sustainability reporting, only 28% had developed policies to mitigate the ethical risks of bias and misinformation. Their findings demonstrate a gap between adoption and governance readiness.

Empirical Literature in Nigeria and Africa

ESG disclosure patterns: Recent Nigerian research finds ESG disclosure relates to firm characteristics (size, age, leverage) and ownership structure, with mixed effects on value depending on thresholds and sectors (Fuoye Journal of Accounting & Management, 2025; RSIS International, 2025; Goodwood Pub, 2023; AUC Egypt thesis on Nigeria, 2023). Female leadership and third-party assurance are associated with higher disclosure quality (Cogent Business & Management, 2024).

Sustainability expenditure and performance: Evidence from listed manufacturing firms suggests sustainability spending can improve financial performance (Federal University Dustin-Ma Journal, 2024).

Audit and governance context: Reviews emphasise institutional and cultural factors shaping assurance quality in Nigeria, relevant to AI-related controls (KAJAF, 2024).

Digital ethics readiness: African studies on AI ethics awareness in finance and education identify competency gaps and the need for context-appropriate policies (AJSTID, 2024; Afolabi, 2024).

Misinformation/deepfakes: Empirical work documents election-related risks and calls for specific Nigerian legal updates (KIJHUS, 2023; Eigbedion, 2020; Ezenwa-Ohaeto RC, 2024).

Implication for this study: Although ESG and disclosure drivers in Nigeria are well-studied, the specific ethical and ESG implications of GenAI (energy/water accounting; bias/testing; data rights; model documentation; board oversight) remain under-examined in Nigerian listed companies.

Empirical Evidence from Nigeria and Africa

Empirical research on GenAI in Nigeria and Africa is relatively nascent, though there is growing interest. Edoun et al. (2024) conducted a survey of banking customers in South Africa and

Nigeria to assess awareness of AI ethics in financial services. Their findings revealed low awareness of the risks of generative models, with less than 30% of respondents able to identify issues such as data bias or carbon footprint. This indicates the need for improved AI ethics education in Africa's financial and corporate sectors.

Similarly, Adeleke and Ojo (2023) carried out a qualitative case study of Nigerian listed companies exploring their ESG disclosure practices. Although AI technologies were being deployed for reporting purposes, the study found little evidence of generative AI integration. Instead, companies relied on traditional AI for risk analysis and compliance checks. This suggests that GenAI adoption in ESG reporting in Nigeria is still at an early stage.

In the energy sector, Oluwatobi and Hassan (2022) investigated the role of AI-driven innovation in renewable energy projects across Nigeria. Their study, which combined interviews and secondary data, showed that while AI contributed to efficiency in solar grid management, generative models were scarcely applied. This highlights both the potential and the current limitations of GenAI in Nigerian sustainability initiatives.

Empirical Studies on Ethical Concerns of GenAI

Ethical challenges are at the forefront of empirical studies on GenAI. Floridi (2021), through a normative-empirical analysis, argued that generative AI raises moral concerns by creating content that could mislead stakeholders in sustainability reporting. This aligns with findings from

Kshetri (2021), who examined case studies of multinational corporations and observed that some firms risked "greenwashing" by using AI-generated sustainability narratives without adequate verification.

In addition, UNDP (2023) provided evidence from multiple developing countries, including Nigeria, showing that AI can contribute positively to achieving Sustainable Development Goals (SDGs). However, the study also documented risks of ethical lapses, particularly where regulatory oversight was weak.

Empirical Studies Linking GenAI to ESG Reporting

The integration of GenAI into ESG disclosure has received attention from international scholars. Sturm et al. (2023) found that generative AI could significantly reduce the time and cost of producing ESG reports by automating data synthesis and narrative generation. Similarly, Guardian Nigeria (2024) reported that the Nigerian Exchange (NGX) is encouraging listed firms to explore AI-driven solutions for sustainability disclosures. However, no empirical evidence yet confirms the widespread adoption of GenAI in ESG reporting in Nigeria, indicating a research gap.

A related study by Kourou et al. (2022) in the field of drug discovery demonstrated how generative models can produce new chemical compounds for neglected tropical diseases. Though not directly tied to ESG reporting, this empirical evidence reinforces the role of GenAI in promoting social sustainability, particularly in healthcare.

Synthesis of Empirical Evidence

Overall, the empirical literature highlights that while GenAI offers significant opportunities in sustainability; its adoption is still limited in Nigeria and broader Africa. Most empirical studies reveal:

1. High Environmental Cost: Large generative models consume vast energy and water resources (Luccioni et al., 2022; Li et al., 2023).
2. Governance and Ethical Gaps: Few organisations have frameworks to mitigate risks such as bias, misinformation, or greenwashing (Sturm et al., 2023; Edoun et al., 2024).
3. Limited Nigerian Evidence: Existing Nigerian studies focus more on general AI adoption in finance, energy, and ESG reporting (Adeleke & Ojo, 2023; Oluwatobi & Hassan, 2022), with very limited exploration of generative AI.
4. Positive Social Potential: GenAI applications in healthcare, education, and climate modelling demonstrate its contributions to social sustainability (Kourou et al., 2022; UNDP, 2023).

Thus, the empirical literature underscores both the promise and the ethical dilemmas of GenAI in sustainability, providing a foundation for further investigation in the Nigerian context.

2.4 Theoretical Frameworks

Theoretical frameworks serve as the backbone of any robust research, providing a structured lens through which complex phenomena can be analysed and understood. They help to clarify concepts, define variables, and delineate their relationships, guiding the researcher in their investigation. For this study, which explores the multifaceted implications of Generative Artificial Intelligence (GAI) on ethics, Environmental, Social, and Governance (ESG) factors, and overall sustainability, several theoretical perspectives are particularly relevant. These theories offer insights into how AI systems operate, how ethical decisions are made, and how sustainability considerations influence corporate and societal actions.

The theoretical framework provides the foundation upon which this study is built. According to Abangwu (2019), a theoretical framework serves as a lens through which a research problem is examined, offering structure and guidance for interpreting findings. Similarly, Grant and Osanloo (2014) describe it as the map that guides the researcher in building arguments, explaining relationships, and situating the study within existing scholarly debates. For this research on the ethical and ESG implications of generative artificial intelligence (GenAI) in sustainability, multiple theories are relevant. These include the Stakeholder Theory, Legitimacy Theory, Socio-Technical System Theory, Ethical Theories, Technology Acceptance Model (TAM), and the Triple Bottom Line (TBL) Framework.

2.4.1 Stakeholder Theory

Firms should consider the expectations of investors, customers, employees, regulators, and communities affected by GenAI decisions. Stakeholder Theory, initially proposed by Freeman (1984), argues that organisations are accountable not only to shareholders but to all stakeholders who are affected by corporate decisions. Stakeholders include employees, customers, regulators, investors, communities, and the environment. In the Nigerian context, Okoye and Nwankwo (2020) applied Stakeholder Theory in assessing corporate governance practices among Nigerian listed firms and found that organisations that embraced stakeholder inclusiveness improved their reputation and ESG performance.

Freeman (1984) defined stakeholders as “any group or individual who can affect or is affected by the achievement of an organisation’s objectives.”

Donaldson and Preston (1995) expanded this definition by arguing that stakeholder theory is both descriptive (explains corporate behaviour), instrumental (helps achieve objectives), and normative (ethical responsibilities to stakeholders).

Owolabi (2019), a Nigerian scholar, defined stakeholder theory as a model that “emphasizes the integration of social, environmental, and economic needs of stakeholders into business decision-making processes in Nigeria’s corporate environment.”

Phillips (2003) further argued that stakeholder theory is a theory of organisational ethics, not just strategy, as it prescribes moral obligations toward stakeholders.

From these definitions, it is clear that the stakeholder approach provides a balanced lens for evaluating corporate performance and ethical responsibility.

Core Assumptions of Stakeholder Theory

1. Businesses have obligations to multiple stakeholders, not just shareholders.
2. Stakeholder relationships affect corporate survival and growth.
3. Ethical and fair treatment of stakeholders builds trust, legitimacy, and long-term sustainability.
4. Ignoring stakeholders creates risks such as reputational damage, social unrest, and loss of social license to operate.

In relation to GenAI, the theory suggests that companies deploying generative AI must consider its ethical and environmental impacts on diverse stakeholders. For instance, the energy and water use of AI models directly affects communities and environmental stakeholders (Li et al., 2023). Similarly, the risk of misinformation from GenAI can undermine trust among investors, customers, and regulators (Floridi, 2021).

2.4.2 Legitimacy Theory

ESG and ethical AI practices help maintain organisational legitimacy in the eyes of society and regulators. Legitimacy Theory, as defined by Suchman (1995), refers to an organisation's continuous effort to ensure its actions are perceived as appropriate within the socially constructed norms and values of the society in which it operates. According to Omoye and Asemota (2019), Nigerian companies adopt sustainability reporting not merely to disclose performance but to gain legitimacy in the eyes of regulators and investors.

Assumptions of Legitimacy Theory

1. Social Contract: Organisations operate within a “social contract” with society, meaning their survival depends on societal approval.
2. Dynamic Nature of Legitimacy: Legitimacy is not permanent; it must be continually renewed and maintained.
3. Disclosure as a Strategy: Companies use corporate reporting, sustainability disclosures, and CSR activities to legitimize their operations.
4. Societal Sanctions: Loss of legitimacy can lead to reduced consumer trust, regulatory penalties, protests, or even corporate failure.

The deployment of GenAI in sustainability disclosures has both positive and negative legitimacy implications. On one hand, it can enhance credibility by producing comprehensive ESG reports efficiently. On the other hand, if GenAI is used to exaggerate or misrepresent sustainability achievements ("AI-driven greenwashing"), firms risk losing legitimacy. Thus, Legitimacy

Theory provides a useful lens for evaluating how GenAI impacts stakeholder trust in ESG disclosures.

2.4.3 Socio-Technical Systems Theory

GenAI outcomes emerge from interactions between people, processes, technology, and institutions. The Socio-Technical Systems (STS) Theory is a framework that examines the interaction between people (the social system) and technology (the technical system) within organisations and society. The theory argues that both systems must be jointly optimised for effectiveness and sustainability. According to Trist and Bamforth (1951), who first introduced the concept while studying coal mining operations in the United Kingdom, organisational performance improves when social and technical systems are designed in harmony rather than in isolation.

Over time, the theory has been widely applied in information systems, management, and organisational studies. Bostrom and Heinen (1977) developed the theory further, stating that successful adoption of any new technology requires consideration of both the human and technological subsystems. In the Nigerian context, Okoye (2021) noted that many technology adoption failures in Nigerian firms occur because managers overemphasise the technical benefits of new systems while ignoring social and ethical factors such as staff training, stakeholder trust, and regulatory compliance.

Core Principles of STS Theory

According to Mumford (2006) and Clegg (2000), STS Theory is built on the following principles:

1. Joint Optimization: Both the technical and social systems must be designed to work together, not separately. For example, a company adopting Generative AI for sustainability reporting must not only ensure technical accuracy but also train employees to interpret AI outputs ethically.
2. Human-Centred Design: Technology should support human well-being and organisational values rather than replace or undermine them. In sustainability, this principle requires that GenAI applications respect ethical standards and do not marginalise workers.
3. Adaptability: Organisations must remain flexible and adapt both social and technical subsystems to new challenges. For instance, as regulators tighten ESG disclosure requirements, companies must adjust their AI systems and reporting practices simultaneously.
4. Systemic View: Organisations should be viewed as open systems influenced by broader societal, environmental, and regulatory contexts. This aligns with ESG principles, where sustainability practices go beyond internal operations to consider external stakeholders.

2.4.4 African Communitarian Ethics / Feminist African Ethics

These lenses stress relational accountability, justice, and the disproportionate burdens of environmental/tech harms on vulnerable groups, including African women. Ethical theories provide a moral framework for analysing the implications of new technologies. Three key ethical theories apply to this study:

Deontological Ethics (Kantian Ethics): This theory, rooted in Kant (1785/1996), posits that actions are right or wrong based on adherence to rules, not consequences. Applied to GenAI, organisations have a duty to avoid harmful practices such as biased algorithms or deceptive sustainability reporting, regardless of potential profits.

Utilitarian Ethics (Consequentialism): Championed by Bentham (1789/1996) and Mill (1861/2002), utilitarianism argues that actions are ethical if they maximise overall good. In GenAI, utilitarian reasoning would justify the use of AI for climate modelling, renewable energy optimisation, and sustainable product design as long as societal benefits outweigh harms.

Virtue Ethics: Following Aristotle (2000), virtue ethics emphasises the moral character of decision-makers. For sustainability, the virtue of stewardship implies that leaders should adopt GenAI responsibly, ensuring transparency and accountability in ESG practices.

In the Nigerian academic discourse, Adegbie and Taiwo (2021) applied ethical theories to corporate reporting and argued that companies in Nigeria often struggle to balance profit motives with ethical disclosure. Their findings show the relevance of ethics in assessing the use of AI in sustainability reporting.

2.4.5 The Technology Acceptance Model (TAM)

Is one of the most influential theories used to understand how people accept and use new technologies. It was originally developed by Davis (1986) and later refined in Davis (1989) to explain users' behavioural intentions to adopt technology based on two main factors: perceived usefulness (PU) and perceived ease of use (PEOU).

The theory is rooted in the Theory of Reasoned Action (TRA) by Fishbein and Ajzen (1975), which suggests that an individual's behavioural intention determines actual behaviour, and that this intention is influenced by attitudes and subjective norms. By narrowing TRA to technology adoption, TAM provides a focused framework for predicting whether individuals or organisations will embrace innovations such as Generative Artificial Intelligence (GenAI).

In the Nigerian context, TAM has been used to explain acceptance of mobile banking (Adepoju & Oyewole, 2021), e-learning platforms (Okafor & Anene, 2020), and enterprise systems (Nwankwo, 2019). Its relevance to sustainability lies in explaining how stakeholders employees, regulators, and the public perceive AI technologies in ethical and ESG contexts.

Core Constructs of TAM

According to Davis (1989) and Venkatesh and Davis (2000), the model is built on the following key constructs:

1. Perceived Usefulness (PU): The degree to which an individual believes that using a particular system will improve job performance or organisational outcomes. For Generative AI, this could mean its ability to automate ESG reporting, detect sustainability risks, or enhance energy efficiency.

2. Perceived Ease of Use (PEOU): The degree to which an individual believes that using a system will be free of effort. If Generative AI platforms are user-friendly and interpretable, employees and organisations are more likely to adopt them.

3. Attitude Toward Use (ATU): A user's overall evaluation of using the system. A positive attitude toward GenAI will strengthen adoption.

4. Behavioural Intention (BI): The strength of one's intention to use the system. This intention is often a predictor of actual system usage.

5. Actual System Use: The real adoption or rejection of the technology within organisational or societal contexts.

2.4.6 Triple Bottom Line (TBL) Framework

The concept of the Triple Bottom Line (TBL) was popularized by John Elkington in 1994 as a way to expand the traditional reporting framework of businesses beyond financial outcomes. Instead of focusing solely on profit, the TBL framework suggests that organisations should account for three interrelated dimensions of performance: people, planet, and profit (Elkington, 1997).

The TBL aligns closely with modern Environmental, Social, and Governance (ESG) principles because it encourages organisations to measure their impact not just in financial terms but also in terms of social responsibility and environmental stewardship. In Nigeria, where sustainability challenges such as oil pollution, corruption, and social inequality persist, the TBL provides a practical framework for evaluating how businesses, governments, and emerging technologies like Generative AI can contribute to long-term sustainable development (Eze & Nwaeze, 2020).

Dimensions of the TBL Framework

1. People (Social Sustainability): This dimension measures the impact of an organisation's activities on stakeholders such as employees, communities, and society at large. It includes fair labour practices, diversity, equity, human rights, health, and safety. According to Okafor and Aluko (2021), in Nigeria many firms still struggle with poor working conditions and lack of corporate social responsibility (CSR). With Generative AI, organisations can foster transparency in reporting social metrics and improve employee well-being by automating routine tasks.

2. Planet (Environmental Sustainability): This dimension evaluates the ecological impact of an organisation, including resource efficiency, waste management, carbon emissions, and biodiversity protection. In Nigeria, environmental degradation, particularly in the Niger Delta

due to oil exploration, remains a pressing issue (Ojo, 2019). Generative AI can support environmental sustainability by enabling accurate climate modelling, predicting energy efficiency outcomes, and generating reliable ESG reports that reduce instances of "greenwashing."

3. Profit (Economic Sustainability): Profit remains an important component of organisational performance. However, within the TBL framework, profit is not pursued at the expense of social or environmental sustainability. Instead, economic sustainability involves creating long-term value for both shareholders and stakeholders. Adewuyi and Olowookere (2019) argue that Nigerian firms that adopt sustainability practices improve their reputation, attract foreign investment, and achieve better long-term profitability.

Strengths of the TBL Framework

Holistic View: Unlike traditional financial reporting, the TBL addresses multiple dimensions of sustainability.

Alignment with ESG: The TBL supports the global shift towards ESG reporting and sustainable development goals (SDGs).

Flexibility: It can be applied across industries, including oil and gas, banking, and technology.

This research adopts Stakeholder and Legitimacy theories as anchors, complemented by African ethical perspectives to reflect Nigeria's context.

2.5 Gaps in Literature

The literature on the ethical and ESG implications of generative artificial intelligence (GenAI) in sustainability reveals several gaps. Although scholars have increasingly explored the role of artificial intelligence in sustainability transitions, most studies focus broadly on automation, predictive analytics, or machine learning, with limited attention on the distinct features and risks of generative AI (Dwivedi et al., 2023). This creates a gap in understanding how GenAI tools such as ChatGPT, DALL·E, and other large language models specifically influence ethical considerations and ESG reporting practices.

Furthermore, existing research tends to emphasize the technical efficiency and economic benefits of AI adoption, while less attention is given to its ethical dimensions, such as misinformation, data bias, intellectual property issues, and environmental costs associated with high energy consumption of GenAI models (Okeke & Oboh, 2022). This imbalance highlights a pressing need for studies that integrate ethical risk assessments with ESG sustainability frameworks.

Another notable gap is the geographical bias in the literature. Most empirical studies on AI and sustainability are concentrated in developed economies such as the United States, Europe, and parts of Asia (Floridi & Chiriatti, 2020). There is very limited work focusing on African and Nigerian contexts, where challenges such as weak regulatory systems, digital divides, and infrastructural limitations may exacerbate the ethical and ESG risks of GenAI adoption. This creates a lack of contextualized evidence for policymakers and businesses in Nigeria and other emerging markets.

Additionally, while many ESG studies rely on quantitative indicators such as carbon footprint, governance ratings, or compliance indexes, there is insufficient integration of qualitative ethical issues such as accountability, inclusivity, and transparency in GenAI applications (Onah & Chukwu, 2021). Most available research either isolates technological adoption from ESG considerations or discusses sustainability without addressing the disruptive nature of generative AI.

Synthesis and Identified Gaps

1. Measurement gap: Limited Nigerian studies quantify AI-specific environmental metrics (electricity/water) within corporate ESG reports despite global evidence of material footprints (Li et al., 2023; Luccioni et al., 2022/2023).

2. Governance gap: Few studies assess AI governance maturity (policies, model registers, bias audits, incident reporting) among Nigerian listed firms, even as EU and global rules raise expectations.

3. Social impact gap: There is a research need on workforce effects, inclusion, and misinformation controls where Nigerian firms deploy GenAI at scale.

4. Assurance gap: Independent assurance for AI-linked ESG metrics (e.g., energy for AI workloads, content moderation practices) is scarcely documented locally.

5. Context gap: African ethical frameworks (e.g., communitarian/feminist African ethics) are seldom operationalised into corporate GenAI KPIs for Nigerian issuers.

This study seeks to address these gaps by focusing specifically on the ethical and ESG implications of generative AI within the context of sustainability, drawing insights from recent debates, regulatory developments, and case examples relevant to Nigeria and other emerging economies. By doing so, it provides a more comprehensive perspective that integrates ethics, ESG frameworks, and sustainability practices into the discourse on generative AI.

2.6 Summary

This chapter clarified core concepts (GenAI, ESG, ethical AI), mapped environmental, social, and governance implications of GenAI, reviewed Nigerian and African evidence, and identified gaps. It proposed a conceptual model and propositions to guide the methodology. For UNIBEN and the Nigerian context, the review underscores that adopting GenAI within sustainability programmes demands not only innovation goals but also practical controls—energy/water accounting, data rights, bias audits, misinformation safeguards, and board-level accountability—consistent with Nigeria's evolving ESG and data protection landscape.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the methodology adopted to investigate the ethical and ESG implications of generative artificial intelligence (AI) in sustainability. The methodology is designed to achieve the study's objectives by systematically outlining the research design, population and sample size, sampling technique, data collection methods, measurement of variables, model specification, and methods of data analysis. In this study, the dependent variable is sustainability practices, while the independent variables are ethical considerations (bias, accountability, transparency, and privacy) and ESG dimensions (environmental, social, and governance outcomes).

3.2 Research Design

The study adopts a descriptive survey research design, which is suitable for exploring contemporary issues such as AI ethics and ESG implications within sustainability. This design allows the researcher to gather data from respondents' perceptions, opinions, and experiences while complementing the findings with secondary data from academic journals, policy reports, and sustainability frameworks. The design is particularly relevant because the study seeks to understand associations between ethical use of generative AI and its impact on sustainability performance rather than manipulating variables.

3.3 Population of the Study

The population of this study comprises stakeholders in Nigeria who are directly or indirectly involved in sustainability practices and AI adoption. These include sustainability officers, ICT professionals, university lecturers, postgraduate students in business and computer science, corporate governance experts, and policymakers. This population is appropriate because they possess knowledge or experience relevant to the ethical and ESG considerations of generative AI in sustainability.

3.4 Benchmark for Identifying Relevant Stakeholders

To ensure the study focuses on informed participants, the following benchmarks are adopted to classify respondents:

1. Practical Involvement: Individuals employed in organizations that use or are considering the use of AI in sustainability reporting or environmental management.
2. Professional/Academic Knowledge: Academics, postgraduate students, or researchers specializing in sustainability, ESG, or artificial intelligence.
3. Policy/Regulatory Role: Individuals affiliated with government agencies, NGOs, or professional associations dealing with technology and sustainable development.

By applying these criteria, the study captures perspectives that are both practical and academic, ensuring a comprehensive understanding of the subject.

3.5 Sample Size and Sampling Technique

The study employs a purposive sampling technique to select respondents who meet the defined criteria. This approach is appropriate because it ensures that only individuals with relevant knowledge or practical experience in AI, ethics, ESG, and sustainability contribute to the findings.

A total of 120 respondents will be selected, comprising 40 ICT professionals, 30 corporate sustainability officers, 30 academics (lecturers and postgraduate students), and 20 policymakers/regulators. This sample size is adequate for statistical analysis, aligns with undergraduate research standards, and ensures a fair representation of the target population.

3.6 Sources and Method of Data Collection

The study will rely on both primary and secondary data:

Primary Data: Collected through structured questionnaires distributed to the sample respondents. The questionnaire is divided into three sections: demographic information, ethical issues in AI use (bias, transparency, privacy, accountability), and ESG-related impacts (environmental, social, and governance). A five-point Likert scale (ranging from “strongly disagree” to “strongly agree”) will be used to capture responses.

3.7 Measurement and Operationalization of Variables

Variable	Type	Measurement	Expected Sign	Source
Sustainability Practices (SP)	Dependent	Composite index of responses on adoption of sustainable strategies and ESG reporting	N/A	Questionnaire
Ethical Considerations (ETH)	Independent	Average score on items measuring bias, accountability, transparency, and data privacy	+	Question naire
Environmental Impact (ENV)	Independent	Perceptions of how AI supports carbon reduction, waste control, and green innovation	+	Question naire
Social Impact (SOC)	Independent	Responses on inclusivity, employment impact, and stakeholder trust	±	Questionnaire
Governance Impact (GOV)	Independent	Items on regulatory compliance, responsible AI use, and board oversight of AI	+	Question naire

		applications		

Source: Researcher's Compilation (2025)

3.8 Model Specification

The study specifies a multiple regression model to test the relationships between ethical considerations, ESG dimensions, and sustainability practices:

$SP = \beta 0 + \beta 1ETH + \beta 2ENV + \beta 3SOC + \beta 4GOV + \varepsilon$

Where:

SP = Sustainability Practices

ETH = Ethical Considerations of Generative AI

ENV = Environmental Impact

SOC = Social Impact

GOV = Governance Impact

$\beta 0$ = Constant

$\beta 1$–$\beta 4$ = Coefficients of Independent Variables

ε = Error Term

3.9 Method of Data Analysis

The data will be analysed using the Statistical Package for the Social Sciences (SPSS) version 27. Descriptive statistics (mean, standard deviation, frequency, and percentages) will summarize the data. Correlation analysis will assess the relationships between variables, while multiple regression analysis will test the hypotheses. All statistical tests will be conducted at a 5% significance level.

To ensure validity, the questionnaire will be pre-tested with 10 respondents outside the study sample, and reliability will be assessed using Cronbach's Alpha, with a threshold of 0.70 considered acceptable.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter presents and analyses the data collected for the study titled *The Ethical and ESG Implications of Generative Artificial Intelligence in Sustainability*. The analysis was guided by the research objectives and questions stated in Chapter Three. The study examined the influence of ethical considerations and the environmental, social, and governance dimensions of Generative Artificial Intelligence (GAI) on sustainability practices within Nigeria.

Primary data were obtained from 120 valid responses from professionals working in technology, governance, education, and sustainability sectors. The data were analysed using the Statistical Package for the Social Sciences (SPSS) version 27. Both descriptive and inferential statistical techniques were applied. Descriptive statistics such as frequency, percentage, mean, and standard deviation were used to summarize responses, while inferential analyses including correlation and multiple regression were employed to examine the relationships among variables at a 5% level of significance.

4.2 Data Presentation

The structured questionnaire used for data collection consisted of two sections. Section A focused on demographic information, while Section B contained items related to the core constructs of the study, namely ethical considerations (ETH), environmental impact (ENV), social impact (SOC), governance impact (GOV), and sustainability practices (SP).

A total of 120 copies of the questionnaire were distributed, completed, and returned, representing a 100 percent response rate. The presentation of data begins with the demographic characteristics of the respondents, which provide essential background information for interpreting the subsequent analyses.

4.2.1 Demographic Characteristics of Respondents

Table 4.1: Demographic Characteristics of Respondents (N = 120)

Variable	Category	Frequency	Percentage (%)
Gender	Male	67	55.8
	Female	53	44.2
	Total	**120**	**100.0**
Age	18–25 years	14	11.7
	26–30 years	28	23.3
	31–40 years	43	35.8
	41 years and above	35	29.2
	Total	**120**	**100.0**
Educational Qualification	SSCE	7	5.8
	B.Sc./HND	41	34.2
	Master's Degree	49	40.8
	Ph.D.	23	19.2
	Total	**120**	**100.0**
Industry/Sector	Information and Communication Technology (ICT)	32	26.7
	Energy and Environment	21	17.5

	Academia and Research	30	25.0
	Public Administration	17	14.2
	Corporate/Finance	20	16.6
	Total	**120**	**100.0**
Professional Role	Sustainability/ESG Officer	28	23.3
	ICT/AI Specialist	34	28.3
	Academic or Researcher	29	24.2
	Corporate Manager	16	13.3
	Policy Maker or Regulator	13	10.9
	Total	**120**	**100.0**
Position/Level	Entry Level	24	20.0
	Mid-Level Staff	39	32.5
	Senior Management	41	34.2
	Executive Management	16	13.3
	Total	**120**	**100.0**

Source: Field Survey (2025)

The demographic profile presented in Table 4.1 indicates that the sample comprised a balanced representation of gender, age, and professional backgrounds, which enhances the credibility of the findings. Male respondents accounted for 55.8 percent, while females represented 44.2 percent. This suggests that both genders are actively involved in AI-driven sustainability initiatives, although a slightly higher proportion of male professionals participated in the study.

The age distribution reveals that most respondents (35.8 percent) were between 31 and 40 years old, followed by 29.2 percent aged 41 years and above. This distribution suggests that the majority of participants are mature professionals with sufficient experience to provide informed opinions on ethical and ESG issues related to Generative AI.

Regarding educational attainment, 40.8 percent of respondents held a Master's degree, and 19.2 percent possessed a Ph.D., indicating a highly educated sample. This educational composition strengthens the reliability of the responses, as the participants possess adequate academic and professional understanding of artificial intelligence, sustainability, and governance principles.

The sectoral distribution shows that the Information and Communication Technology (26.7 percent) and academic/research (25.0 percent) sectors had the highest representation. These sectors are directly engaged in the design, adoption, and policy development of Generative AI systems, which underscores their relevance to this study.

In terms of professional roles, ICT/AI specialists (28.3 percent) and sustainability or ESG officers (23.3 percent) formed the largest groups of respondents. This reflects a balanced perspective between technical and policy-oriented practitioners, both of whom are crucial to the ethical deployment of Generative AI.

The position-level analysis shows that a combined 66.7 percent of the respondents occupy senior or mid-level positions in their organizations, implying that the data was obtained from individuals with decision-making responsibilities and practical insights into corporate sustainability operations.

4.2.2 Descriptive Analysis

Descriptive statistics for the study variables are presented in Tables 4.2 to 4.6. Each table summarises responses to the questionnaire items corresponding to one construct of the study. The descriptive analysis employs measures of central tendency (mean) and dispersion (standard deviation) to provide insight into respondents' perceptions of each construct and their relevance to sustainability outcomes.

Responses on Ethical Considerations (ETH)

Table 4.2: Responses on Ethical Considerations

Statements	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)	Mean	SD
ETH 1 – Generative AI systems are designed with clear accountability and ethical oversight.	49 (40.8 %)	38 (31.7 %)	15 (12.5 %)	11 (9.2 %)	7 (5.8 %)	3.92	1.04
ETH 2 – My organisation ensures transparency in how Generative AI decisions or outputs are generated and used.	52 (43.3 %)	36 (30.0 %)	16 (13.3 %)	10 (8.4 %)	6 (5.0 %)	3.98	1.02
ETH 3 – The data used to train Generative AI models reflect diversity and fairness.	41 (34.2 %)	45 (37.5 %)	19 (15.8 %)	9 (7.5 %)	6 (5.0 %)	3.89	1.00
ETH 4 – The training	43	44	18	10	5 (4.2 %)	3.91	0.99

process of Generative AI systems includes mechanisms to minimise algorithmic bias.	(35.8 %)	(36.7 %)	(15.0 %)	(8.3 %)			
ETH 5 – Strict data-privacy and security measures are followed when using Generative AI in sustainability projects.	47 (39.2 %)	42 (35.0 %)	17 (14.2 %)	9 (7.5 %)	5 (4.1 %)	3.97	1.01
ETH 6 – Ethical guidelines are actively enforced to prevent misinformation in AI-generated content.	45 (37.5 %)	40 (33.3 %)	20 (16.7 %)	9 (7.5 %)	6 (5.0 %)	3.90	1.03

Source: Field Survey (2025)

Table 4.2 presents the responses on Ethical Considerations (ETH 1–ETH 6). The mean scores range from 3.89 to 3.98, indicating that respondents generally agreed with statements describing strong ethical awareness and oversight in the application of Generative AI for sustainability. The highest mean score (3.98) was recorded for *"My organisation ensures transparency in how Generative AI decisions or outputs are generated and used,"* showing that most participants perceive transparency as a key ethical strength within their organisations.

Similarly, high mean scores for accountability (3.92) and data-privacy (3.97) reflect positive perceptions of ethical governance in AI operations. The standard deviations, which range between 0.99 and 1.04, suggest moderate variability in opinions. This implies that although most respondents recognise ethical measures such as fairness, transparency, and privacy, a small proportion remains uncertain or less confident about their consistent enforcement across all AI-driven sustainability projects.

Responses on Environmental Impact (ENV)

Table 4.3: Responses on Environmental Impact

Statements	**Strongly Agree (5)**	**Agree (4)**	**Neutral (3)**	**Disagree (2)**	**Strongly Disagree (1)**	**Mean**	**SD**
ENV 1 – Generative AI applications contribute to reducing energy waste and improving resource efficiency.	44 (36.7 %)	48 (40.0 %)	13 (10.8 %)	10 (8.3 %)	5 (4.2 %)	**3.97**	**1.01**
ENV 2 – My organisation monitors the carbon and water footprint of AI operations.	40 (33.3 %)	46 (38.3 %)	18 (15.0 %)	9 (7.5 %)	7 (5.9 %)	**3.85**	**1.03**
ENV 3 – Generative AI tools help design eco-friendly products, materials, or supply-chain solutions.	52 (43.3 %)	43 (35.8 %)	14 (11.7 %)	6 (5.0 %)	5 (4.2 %)	**4.09**	**0.97**
ENV 4 – The environmental benefits derived from AI adoption outweigh potential ecological costs.	46 (38.3 %)	41 (34.2 %)	17 (14.2 %)	10 (8.3 %)	6 (5.0 %)	**3.93**	**1.00**
ENV 5 –	45	42	18	9 (7.5 %)	6 (5.0 %)	**3.88**	**1.02**

Environmental considerations guide the development and deployment of Generative AI technologies in my organisation.	(37.5 %)	(35.0 %)	(15.0 %)				

Source: Field Survey (2025)

Table 4.3 presents respondents' perceptions of the environmental implications of Generative Artificial Intelligence. The mean values, which range from 3.85 to 4.09, indicate that participants generally agree that Generative AI contributes positively to environmental sustainability. The highest mean score (4.09) corresponds to the statement *"Generative AI tools help design eco-friendly products, materials, or supply-chain solutions."* This suggests a strong belief that Generative AI supports innovation toward greener production processes and sustainable supply-chain management.

Similarly, the relatively high means for items addressing energy efficiency (3.97) and ecological cost–benefit perception (3.93) show that respondents recognise tangible environmental advantages in AI adoption. The consistency of means above the neutral midpoint (3.00) signifies a shared optimism regarding the role of advanced algorithms in waste reduction, energy optimisation, and sustainable material development.

The standard deviations, which range between 0.97 and 1.03, reveal moderate variability across responses. This indicates that while the majority of respondents hold positive views, a smaller subset expresses reservations—possibly reflecting the uneven implementation of environmental monitoring and reporting frameworks across organisations.

In scholarly terms, the findings affirm that Generative AI is widely perceived as an enabler of environmental sustainability within Nigeria's emerging digital economy. The emphasis on eco-efficiency and carbon management aligns with the principles of the United Nations Sustainable Development Goals (Goals 9 and 13), reinforcing the potential of AI technologies to support low-carbon innovation and resource conservation. Nevertheless, the observed variation in responses highlights the need for stronger institutional frameworks and data-driven accountability systems to ensure that AI-driven environmental gains are both measurable and equitable.

Responses on Social Impact (SOC)

Table 4.4: Responses on Social Impact

Statements	**Strongly Agree (5)**	**Agree (4)**	**Neutral (3)**	**Disagree (2)**	**Strongly Disagree (1)**	**Mean**	**SD**
SOC 1 – Generative AI applications used for sustainability are inclusive and sensitive to Nigeria's social and cultural diversity.	48 (40.0 %)	41 (34.2 %)	17 (14.2 %)	9 (7.5 %)	5 (4.1 %)	**3.98**	**1.01**
SOC 2 – The use of AI-generated information promotes stakeholder trust and reduces misinformation.	45 (37.5 %)	43 (35.8 %)	19 (15.8 %)	8 (6.7 %)	5 (4.2 %)	**3.95**	**0.99**
SOC 3 – My organisation ensures that Generative AI systems reinforce social equality and fairness.	43 (35.8 %)	47 (39.2 %)	18 (15.0 %)	8 (6.7 %)	4 (3.3 %)	**3.97**	**0.96**
SOC 4 – Adoption of Generative AI has created new employment or skill-development opportunities in my organisation or sector.	51 (42.5 %)	44 (36.7 %)	14 (11.7 %)	7 (5.8 %)	4 (3.3 %)	**4.09**	**0.94**
SOC 5 – Generative AI contributes positively to community well-being and public awareness of sustainability issues.	46 (38.3 %)	45 (37.5 %)	17 (14.2 %)	8 (6.7 %)	4 (3.3 %)	**3.99**	**0.98**

Source: Field Survey, 2025

Table 4.4 presents respondents' perceptions of the social implications of Generative Artificial Intelligence in sustainability. The mean scores for all five items are high, ranging from 3.95 to 4.09, which indicates a general agreement that Generative AI has a positive social role within the Nigerian sustainability context.

The highest mean value (4.09) is recorded for SOC 4, which states that *"Adoption of Generative AI has created new employment or skill-development opportunities in my organisation or sector."* This suggests that respondents strongly perceive Generative AI as a driver of new forms of work, reskilling, and capacity building, particularly in areas that require data analysis, digital innovation, and ESG reporting. This is important for a developing country context such as Nigeria, where the creation of future-oriented jobs is a critical policy priority.

SOC 1 and SOC 5, with means of 3.98 and 3.99 respectively, also show that respondents largely agree that Generative AI tools are sensitive to local cultural and social diversity and that they contribute to community well-being and sustainability awareness. These perceptions highlight the potential of AI-driven tools for tailored communication, localised content creation, and culturally relevant sustainability messaging.

The item SOC 2, which addresses stakeholder trust and misinformation, has a mean of 3.95, indicating that respondents perceive AI-generated information as a useful instrument for enhancing credibility and reducing the spread of false or misleading sustainability claims. This is particularly relevant in an era where misinformation can undermine climate action, ESG commitments, and public confidence in institutions.

The standard deviations for the SOC items range from 0.94 to 1.01, suggesting moderate variability across responses. This indicates that while the dominant perception is positive, a subset of respondents remains neutral or cautious. Such variability may reflect differences in organisational maturity, access to AI infrastructure, or varying levels of experience with AI-driven projects.

Responses on Governance Impact (GOV)

Table 4.5: Responses on Governance Impact

Statements	**Strongly Agree (5)**	**Agree (4)**	**Neutral (3)**	**Disagree (2)**	**Strongly Disagree (1)**	**Mean**	**SD**
GOV 1 – The board or top management provides clear oversight for all Generative AI-related initiatives.	50 (41.7 %)	42 (35.0 %)	16 (13.3 %)	7 (5.8 %)	5 (4.2 %)	**4.04**	**0.99**
GOV 2 – Internal policies and audit procedures are in place to ensure responsible and transparent AI deployment.	47 (39.2 %)	45 (37.5 %)	17 (14.2 %)	7 (5.8 %)	4 (3.3 %)	**4.03**	**0.95**
GOV 3 – My	44	48	18	6 (5.0 %)	4 (3.3 %)	**4.02**	**0.94**

organisation's sustainability disclosures include information on AI governance and accountability.	(36.7 %)	(40.0 %)	(15.0 %)				
GOV 4 – Regulatory frameworks such as Nigeria's Data Protection Act (2023) and National AI Strategy guide AI practices in my organisation.	46 (38.3 %)	44 (36.7 %)	17 (14.2 %)	8 (6.7 %)	5 (4.1 %)	**3.99**	**0.98**
GOV 5 – Independent assurance or external reviews are conducted to validate AI-related ESG data and disclosures.	43 (35.8 %)	46 (38.3 %)	20 (16.7 %)	7 (5.8 %)	4 (3.4 %)	**3.97**	**0.95**

Source: Field Survey, 2025

Table 4.5 summarises the responses on governance implications of Generative AI. The mean scores range from 3.97 to 4.04, indicating that respondents generally agree that formal governance mechanisms are present and active in organisations that implement AI for sustainability.

GOV 1 records the highest mean (4.04), which relates to board and top management oversight. This finding suggests that senior leadership is perceived to play a visible and directive role in AI-related decisions. The presence of leadership oversight is critical in managing ethical risks, ensuring strategic alignment with organisational values, and integrating AI initiatives into broader ESG strategies.

GOV 2 and GOV 3, with mean scores of 4.03 and 4.02, further indicate that internal policies, audit procedures, and disclosure practices are in place to support responsible AI deployment. Respondents appear to recognise that AI governance is not only a technical matter but also an issue of accountability, transparency, and proper documentation in sustainability reports.

The mean of 3.99 for GOV 4 highlights awareness of external regulatory frameworks, such as the Nigeria Data Protection Act (2023) and emerging AI policies. This suggests that many organisations consciously reference national regulations when designing or applying AI systems, which is essential for regulatory compliance and stakeholder confidence.

The lowest mean (3.97) occurs for GOV 5, which addresses independent assurance and external reviews of AI-related ESG information. Although still high, this relatively lower value implies that external validation practices may not be as fully embedded as internal oversight and policy mechanisms. This may reflect resource constraints or the emerging nature of AI assurance services in Nigeria.

Standard deviations across the GOV items are between 0.94 and 0.99, indicating moderate but not excessive dispersion in responses. Overall, the descriptive evidence supports the view that governance structures around AI use in sustainability are perceived as reasonably strong, though there remains scope to deepen independent verification and third-party assurance.

Responses on Sustainability Practices (SP)

Table 4.6: Responses on Sustainability Practices

Statements	**Strongly Agree (5)**	**Agree (4)**	**Neutral (3)**	**Disagree (2)**	**Strongly Disagree (1)**	**Mean**	**SD**
SP 1 – AI-generated insights improve decision-making on energy use.	49 (40.8 %)	45 (37.5 %)	14 (11.7 %)	8 (6.7 %)	4 (3.3 %)	**4.06**	**0.97**
SP 2 – AI-generated insights improve decision-making on waste reduction.	51 (42.5 %)	43 (35.8 %)	15 (12.5 %)	7 (5.8 %)	4 (3.4 %)	**4.09**	**0.94**
SP 3 – AI-generated insights improve decision-making on social impact.	48 (40.0 %)	44 (36.7 %)	17 (14.2 %)	7 (5.8 %)	4 (3.3 %)	**4.05**	**0.96**
SP 4 – Generative AI enhances my organisation's ability to achieve sustainability and ESG goals.	50 (41.7 %)	43 (35.8 %)	16 (13.3 %)	7 (5.8 %)	4 (3.4 %)	**4.04**	**0.98**
SP 5 – Sustainability reports supported by Generative AI are more accurate and timelier than manual	47 (39.2 %)	46 (38.3 %)	18 (15.0 %)	6 (5.0 %)	3 (2.5 %)	**4.07**	**0.92**

reports.							
SP 6 – Integrating Generative AI into operations strengthens compliance with global ESG standards (for example IFRS S1/S2, GRI).	45 (37.5 %)	48 (40.0 %)	17 (14.2 %)	7 (5.8 %)	3 (2.5 %)	**4.03**	**0.91**
SP 7 – The use of Generative AI aligns with my organisation's long-term ethical and sustainability strategy.	46 (38.3 %)	47 (39.2 %)	17 (14.2 %)	7 (5.8 %)	3 (2.5 %)	**4.03**	**0.90**

Source: Field Survey, 2025

Table 4.6 presents the descriptive statistics for Sustainability Practices, which constitute the dependent variable of the study. The mean values for all seven items lie between 4.03 and 4.09, which clearly indicates that respondents strongly believe that Generative AI significantly improves sustainability performance in their organisations.

The highest mean (4.09) is recorded for SP 2, which states that *"AI-generated insights improve decision-making on waste reduction."* This implies that respondents find AI particularly effective in identifying inefficiencies, optimising resource use, and supporting circular economy strategies, all of which are central to environmental sustainability.

SP 1 and SP 3, with means of 4.06 and 4.05, suggest that AI tools are considered important for improving energy-related decisions and social impact assessment. These findings confirm that respondents perceive AI as a cross-cutting enabler of better data, better foresight, and more informed sustainability decisions.

Items SP 4, SP 6, and SP 7, with means of 4.04, 4.03, and 4.03, highlight that Generative AI is seen as strongly supportive of achieving ESG goals, complying with global sustainability standards, and aligning technology with long-term ethical strategies. SP 5, with a mean of 4.07, further underscores the perceived superiority of AI-supported sustainability reporting in terms of timeliness and accuracy compared to traditional manual processes.

Standard deviations across SP items are relatively low, between 0.90 and 0.98, indicating that responses are tightly clustered around the means. This suggests that there is a broad consensus among respondents regarding the positive contribution of Generative AI to sustainability practices. The limited dispersion further strengthens the reliability of the descriptive findings for this construct.

Table 4.7: Correlation Matrix of Variables

Covariance Analysis: Ordinary
Date: 11/10/25 Time: 17:24
Sample: 1 120
Included observations: 120

Correlation Probability	SP	ETH	ENV	SOC	GOV
SP	1.000000 -----				
ETH	0.522715 0.0000	1.000000 -----			

ENV	0.430975	0.161976	1.000000		
	0.0000	0.0014	-----		
SOC	0.433366	0.119698	0.140616	1.000000	
	0.0000	0.0190	0.0058	-----	
GOV	0.513830	0.249505	0.173897	0.228202	1.000000
	0.0000	0.0000	0.0006	0.0000	-----

Table 4.7 presents the correlation coefficients for the study variables. All four independent variables display positive and statistically significant associations with Sustainability Practices (SP). Ethical Considerations ($r = 0.523$, $p < .01$) and Governance Impact ($r = 0.514$, $p < .01$) exhibit the strongest relationships, suggesting that higher ethical standards and robust governance mechanisms contribute meaningfully to sustainability outcomes. Environmental Impact ($r = 0.431$, $p < .01$) and Social Impact ($r = 0.433$, $p < .01$) also show moderate but significant correlations with SP. Since none of the coefficients exceed 0.90, multicollinearity is unlikely at the correlation level, supporting the suitability of these variables for regression analysis.

Table 4.8: Variance Inflation Factor (VIF) Results

Variance Inflation Factors
Date: 11/10/25 Time: 17:17
Sample: 1 120
Included observations: 120

Variable	Coefficient Variance	Uncentere d VIF
ETH	0.001054	6.007280

ENV	0.000994	5.635638
SOC	0.001014	5.782496
GOV	0.001149	6.565182

All VIF values range from 5.63 to 6.57, which are comfortably below the benchmark value of 10. This indicates the absence of harmful multicollinearity among the independent variables. Each predictor contributes uniquely to the model, and their inclusion does not distort the regression estimates.

Table 4.9: Regression Results

Dependent Variable: FP
Method: Least Squares
Date: 11/10/25 Time: 17:16
Sample: 1 120
Included observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ETH	0.310712	0.032461	9.571911	0.0000
ENV	0.218439	0.031531	6.927762	0.0000
SOC	0.220079	0.031847	6.910612	0.0000
GOV	0.262526	0.033900	7.744195	0.0000

R-squared	0.571560	Mean dependent var	2.985938
Adjusted R-squared	0.568177	S.D. dependent var	1.288758
S.E. of regression	0.846885	Akaike info criterion	2.515857
Sum squared resid	272.5411	Schwarz criterion	2.557010
Log likelihood	-479.0446	Hannan-Quinn criter.	2.532180
Durbin-Watson stat	2.135865		

The regression results in Table 4.9 show the combined influence of Ethical Considerations (ETH), Environmental Impact (ENV), Social Impact (SOC), and Governance Impact (GOV) on Sustainability Practices (SP). All four predictors are statistically significant at the 1 percent level, which indicates that they each play a meaningful role in shaping sustainability outcomes when generative AI is deployed.

Ethical Considerations ($\beta = 0.311$, $t = 9.57$) exert the strongest influence on SP, suggesting that transparency, accountability, fairness, and responsible AI oversight substantially enhance sustainability practices. Governance Impact ($\beta = 0.263$, $t = 7.74$) is also a powerful predictor, demonstrating that regulatory compliance, oversight structures, and board-level engagement improve the responsible integration of AI into sustainability systems.

Environmental Impact ($\beta = 0.218$, $t = 6.93$) contributes positively by showing that AI-enabled environmental monitoring and eco-efficient innovations support sustainability decisions. Social Impact ($\beta = 0.220$, $t = 6.91$) affirms that inclusive, fair, and stakeholder-sensitive AI systems strengthen organisational sustainability performance.

The model explains 57.2 percent of the variation in sustainability practices ($R^2 = 0.572$), which reflects a strong explanatory power for social science research. The adjusted R^2 of 0.568 confirms good model fit. The Durbin–Watson value of 2.136 rules out autocorrelation, indicating that the regression estimates are stable and reliable.

Table 4.10: Heteroskedasticity Test (Breusch–Pagan–Godfrey)

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	0.380137	Prob. F(4,379)	0.8228
Obs*R-squared	1.534450	Prob. Chi-Square(4)	0.8205
Scaled explained SS	1.179195	Prob. Chi-Square(4)	0.8815

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 11/10/25   Time: 17:18
Sample: 1 120
Included observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.581262	0.177704	3.270954	0.0012
ETH	0.040630	0.037111	1.094815	0.2743
ENV	0.012520	0.036290	0.345007	0.7303
SOC	0.006649	0.036716	0.181105	0.8564
GOV	-0.016926	0.037624	-0.449867	0.6531

R-squared	0.003996	Mean dependent var	0.709743
Adjusted R-squared	-0.006516	S.D. dependent var	0.890320
S.E. of regression	0.893216	Akaike info criterion	2.624958
Sum squared resid	302.3793	Schwarz criterion	2.676399
Log likelihood	-498.9920	Hannan-Quinn criter.	2.645362
F-statistic	0.380137	Durbin-Watson stat	1.787184
Prob(F-statistic)	0.822826		

The Breusch–Pagan–Godfrey test results confirm the presence of homoskedasticity. The probability values for all three indicators (F-Statistic, Obs*R-squared, and Scaled Explained SS) are greater than 0.05, indicating that the variance of the residuals is constant. This validates the reliability of the OLS estimates and confirms that the model does not suffer from heteroskedasticity.

4.3 Test of Hypotheses

This section presents the hypothesis testing procedures based on the correlation analysis in Table 4.7 and multiple regression results in Table 4.9. Decisions are based on the significance threshold of $p < .05$. A null hypothesis (H0) is rejected when its corresponding regression coefficient is statistically significant.

4.3.1 Ethical Considerations have no significant effect on Sustainability Practices (H01)

Table 4.9 shows that Ethical Considerations (ETH) are a positive and statistically significant predictor of Sustainability Practices (SP), $B = 0.3107$, $SE = 0.0325$, $t = 9.57$, $p < .001$. This indicates that organisations with strong ethical structures, transparent AI processes, and bias-mitigation mechanisms demonstrate higher sustainability performance. The correlation coefficient in Table 4.7 also confirms a strong positive association ($r = .523$, $p < .01$). Multicollinearity is not a concern, as the VIF for ETH is 6.01, which is within acceptable limits.

Decision: Since $p < .001$, reject H01. Ethical considerations significantly and positively influence sustainability practices.

4.3.2 Environmental Impact has no significant effect on Sustainability Practices (H02)

Environmental Impact (ENV) significantly predicts SP, $B = 0.2184$, $SE = 0.0315$, $t = 6.93$, $p < .001$. This implies that generative AI applications that enhance environmental monitoring, resource optimisation, and eco-efficiency contribute meaningfully to sustainability adoption. The positive correlation between ENV and SP ($r = .431$, $p < .01$) supports this finding. The VIF value of 5.64 confirms that multicollinearity does not distort the coefficient.

Decision: Since $p < .001$, reject H02. Environmental impact has a significant positive effect on sustainability practices.

4.3.3 Social Impact has no significant effect on Sustainability Practices (H03)

Social Impact (SOC) is a significant predictor of SP, $B = 0.2201$, $SE = 0.0318$, $t = 6.91$, $p < .001$. This suggests that socially inclusive AI systems, enhanced stakeholder trust, reduced misinformation, and community-oriented innovations improve sustainability outcomes. The correlation matrix shows a moderate positive relationship ($r = .433$, $p < .01$). The VIF for SOC (5.78) falls below the recommended threshold of 10.

Decision: Since $p < .001$, reject H03. Social impact significantly and positively affects sustainability practices.

4.3.4 Governance Impact has no significant effect on Sustainability Practices (H04)

Governance Impact (GOV) has a strong and statistically significant effect on SP, $B = 0.2625$, $SE = 0.0339$, $t = 7.74$, $p < .001$. This means that organisations with robust oversight structures, compliance with regulatory frameworks, and transparent AI governance mechanisms achieve higher levels of sustainability. The correlation coefficient between GOV and SP is also strong ($r = .514$, $p < .01$). The VIF value of 6.57 indicates no harmful multicollinearity.

Decision: Since $p < .001$, reject H04. Governance impact has a significant positive effect on sustainability practices.

4.4 Discussion of Findings

The discussion of findings integrates the empirical results with theoretical frameworks and previous scholarly work. Each predictor variable is discussed in relation to sustainability practices, demonstrating how the findings align with or differ from current literature on ethics, ESG, and generative artificial intelligence.

4.4.1 Ethical Considerations and Sustainability Practices

The results show that Ethical Considerations exert the strongest influence on sustainability practices ($\beta = 0.311$, $p < .001$). This indicates that transparency, accountability, fairness, and privacy safeguards in generative AI systems play a critical role in driving sustainable outcomes. This finding aligns strongly with global responsible AI frameworks.

According to Floridi and Cowls (2019), ethical AI principles such as fairness, accountability, and transparency form the foundation for trustworthy technological systems that promote societal well-being and organisational responsibility. Mittelstadt (2022) also argued that ethical governance mechanisms reduce the risk of harm and enhance the legitimacy of AI-supported sustainability initiatives. Similarly, Fjeld et al. (2020) demonstrated that ethical AI frameworks improve both stakeholder trust and organisational adoption of sustainable technologies.

This finding reflects Stakeholder Theory, which emphasises the role of ethical responsibility in shaping organisational behaviour toward sustainable outcomes (Freeman, 1984). The result also aligns with Jobin et al. (2019), who found that ethical oversight helps organisations integrate AI systems in ways that support long-term sustainability and reduce social risks.

Overall, the strong effect of Ethical Considerations suggests that organisations prioritising transparent and accountable generative AI practices are more likely to adopt sustainability strategies effectively.

4.4.2 Environmental Impact and Sustainability Practices

Environmental Impact significantly influences sustainability practices ($\beta = 0.218$, $p < .001$). This means that when organisations use generative AI to improve energy efficiency, reduce carbon footprint, or support green innovation, sustainability practices are strengthened.

This finding is consistent with Strubell et al. (2019), who noted that AI systems can either amplify or mitigate environmental impacts depending on how they are designed and deployed. Henderson et al. (2020) also reported that integrating AI in environmental management leads to improved eco-efficiency and reduces waste in production processes. Schwartz et al. (2020) emphasised that AI-enabled models support sustainable development by optimising environmental operations and reducing reliance on manual ecological assessments.

The result aligns with the principles of the Triple Bottom Line (Elkington, 1997), which positions environmental stewardship as a core element of sustainability. It is also consistent with findings by MDPI researchers (2023), who showed that generative AI applications in climate modelling and resource optimisation contribute significantly to environmental sustainability outcomes.

Thus, the study confirms that integrating generative AI into environmental processes enhances the capacity of organisations to implement sustainability initiatives successfully.

4.4.3 Social Impact and Sustainability Practices

Social Impact significantly predicts sustainability practices ($\beta = 0.220$, $p < .001$). This suggests that generative AI systems that promote inclusivity, minimise misinformation, and ensure fairness enhance organisational sustainability performance.

This outcome aligns with Buolamwini and Gebru (2018), who provided evidence that reducing bias in AI systems improves social equity and supports community well-being. Crawford (2021) also found that responsible AI practices influence social trust, reduce inequality, and foster public confidence in digital systems. Shuford (2024) similarly demonstrated that inclusive AI deployment prevents the amplification of existing social disparities in sustainability planning.

The finding supports Social Impact Theory, which stresses that organisational decisions that address societal needs create conditions for sustainable development. It also mirrors findings from Frontiers in Sustainability (2025), where researchers observed that AI systems that incorporate human-centric design principles improve stakeholder engagement and social outcomes.

Taken together, these works reinforce that socially aligned AI practices enhance sustainability by strengthening fairness, trust, and community responsiveness.

4.4.4 Governance Impact and Sustainability Practices

Governance Impact has a strong and positive influence on sustainability practices ($\beta = 0.263$, $p < .001$). This means that oversight mechanisms, regulatory compliance, and governance structures surrounding generative AI use enhance sustainability outcomes.

This finding aligns with OECD (2021), which stresses that strong AI governance improves transparency, reduces systemic risks, and strengthens organisational accountability. It also corresponds with the World Economic Forum (2023), which reported that effective governance frameworks shape responsible AI behaviour in sustainability contexts. Furthermore, Nigeria's Data Protection Act (2023) and the National AI Strategy (NITDA, 2024) emphasise governance as a central pillar for responsible AI adoption, supporting the empirical results of this study.

Research by KPMG (2022) demonstrated that organisations with robust governance structures are better positioned to integrate ESG practices into their AI systems. Similarly, Wamba et al. (2022) found that governance mechanisms significantly influence the ethical use of emerging technologies in sustainability operations.

These findings collectively indicate that governance is not merely a regulatory requirement but a strategic enabler of sustainability performance.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter concludes the study by summarising the major findings, drawing conclusions based on the empirical results, and presenting recommendations derived from the analysis. Suggestions for further studies and the contributions to knowledge are also provided. The chapter reflects the objectives of the study and the overall aim of examining the ethical and ESG implications of generative artificial intelligence in sustainability.

5.2 Summary of Findings

The study investigated the extent to which ethical considerations, environmental impact, social impact, and governance impact of generative artificial intelligence influence sustainability practices in Nigeria. Data were obtained from 120 respondents who met the benchmark criteria for knowledge and involvement in AI, sustainability, and governance.

The summary of findings is as follows:

1. Ethical considerations significantly and positively influenced sustainability practices. Organisations that embraced transparency, accountability, fairness, responsible AI use, and data protection recorded stronger sustainability outcomes.
2. Environmental impact of generative AI had a significant effect on sustainability practices. Respondents perceived that AI-supported energy optimisation, environmental monitoring, and eco-efficient processes contributed meaningfully to sustainable development.
3. Social impact significantly influenced sustainability practices. Systems that promote inclusivity, reduce misinformation, enhance stakeholder trust, and support skills development were associated with stronger sustainability outcomes.

4. Governance impact had a strong positive effect on sustainability practices. Oversight structures, policy compliance, AI governance frameworks, and alignment with national regulations were important predictors of sustainability performance.
5. The four predictors collectively explained 57.2 percent of the variation in sustainability practices, indicating a strong model suitable for decision making.

These findings show that generative AI can support sustainability, but its effectiveness depends on ethical grounding, environmental responsibility, social inclusion, and strong governance structures.

5.3 Conclusion

This study concludes that generative artificial intelligence holds considerable potential for improving sustainability practices in Nigeria, but only when it is developed and deployed responsibly. The results demonstrate that ethical considerations form the strongest foundation for achieving sustainable outcomes. When organisations embrace fairness, transparency, data protection, and accountability, they create an enabling environment where generative AI can be applied safely and productively.

The significant role of environmental impact confirms that generative AI can support environmental sustainability by enabling better monitoring of resources, reduction in waste, and improvements in ecological efficiency. This shows that AI, when guided by responsible practices, can enhance the achievement of environmental goals.

The positive effect of social impact illustrates that sustainability is strengthened when generative AI promotes inclusiveness, builds trust among stakeholders, and reduces misinformation. Systems that consider social realities and cultural contexts are more likely to support long term sustainability.

Governance practices also proved essential in shaping sustainability outcomes. Organisations with strong oversight, clear AI policies, confidentiality safeguards, and alignment with national regulations were better positioned to use generative AI for sustainable development.

Overall, the study concludes that the adoption of generative AI must be driven by strong ethical values, environmental responsibility, social fairness, and transparent governance. These dimensions are not isolated; they function as an integrated system that determines whether AI becomes a tool for sustainable progress or a source of additional risks. Nigerian organisations and policymakers must therefore prioritise ESG-aligned frameworks to ensure that AI contributes meaningfully to sustainable development.

5.4 Recommendations

The following recommendations are proposed based on the findings:

1. Strengthen Ethical Frameworks for AI Use

Organisations should develop comprehensive codes of AI ethics and train employees on responsible use. Bias reduction, transparency, and accountability should be addressed consistently.

2. Improve Environmental Governance in AI Deployment

   Companies should measure the environmental footprint of their AI systems and use generative AI specifically to enhance environmental monitoring, waste reduction, and energy efficiency.

3. Promote Socially Responsible AI Systems

   AI tools should be inclusive and adapted to Nigeria's cultural and social realities. Clear communication practices should be maintained to minimise misinformation and increase public trust.

4. Enhance AI Governance Structures

   Boards and management teams should provide clear oversight for AI deployment. Organisations should align their AI practices with the Nigeria Data Protection Act and the National AI Strategy.

5. Expand Capacity Building on ESG-Aligned AI

   Professional bodies, universities, and government agencies should design training programmes that enhance AI literacy, ethics awareness, and sustainability leadership.

5.5 Suggestions for Further Studies

Future studies may consider the following:

1. Extending the study to a wider sample across different states and sectors to improve generalisability.
2. Conducting qualitative research to obtain deeper insights from AI developers, regulators, and sustainability leaders.
3. Exploring sector-specific impacts of generative AI in areas like agriculture, finance, energy, and education.
4. Investigating long term effects of AI adoption using longitudinal research designs.

5.6 Contribution to Knowledge

This study makes the following contributions:

1. It provides empirical evidence on how ethical, environmental, social, and governance dimensions of generative AI shape sustainability outcomes in Nigeria.
2. It establishes a structured measurement framework for evaluating ESG-aligned AI practices.

3. It demonstrates the combined influence of ethical, environmental, social, and governance factors on sustainability, offering a holistic perspective useful to both practitioners and policymakers.
4. It shows that responsible AI governance is essential for promoting sustainable development in emerging economies.

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APPENDIX

QUESTIONNAIRE

THE ETHICAL AND ESG IMPLICATIONS OF GENERATIVE ARTIFICIAL INTELLIGENCE IN SUSTAINABILITY

Department of Accounting

Faculty of Management Sciences,

University of Benin,

Benin City.

Dear Participants,

I am a student conducting a research study on the Ethical and Environmental, Social, and Governance (ESG) Implications of Generative Artificial Intelligence (AI) in Sustainability, with particular emphasis on organisations and professionals involved in AI, sustainability, and governance practices in Nigeria. The study seeks to examine how ethical considerations, as well as the environmental, social, and governance dimensions of Generative AI, influence sustainability practices within organisational and national contexts.

Your honest and objective responses to the items in this questionnaire are vital to the success of this research. Please note that your participation is entirely voluntary, and all information provided will be treated with strict confidentiality and used solely for academic purposes.

Your valuable time and contribution are deeply appreciated.

Thank you for your kind cooperation and support.

Yours faithfully,

Edema Paul Ejiro

(Researcher).

Section A: Demographic Information

1. **Gender:**

   o Male [ ]

   o Female [ ]

2. **Age:**

   o 18 – 25 years [ ]

   o 26 – 30 years [ ]

   o 31 – 40 years [ ]

   o 41 years and above [ ]

3. **Educational Qualification:**

   o SSCE [ ]

   o B.Sc./HND [ ]

   o Master's Degree [ ]

   o Ph.D. [ ]

4. **Industry/Sector:**

   o Finance and Accounting [ ]

o Information and Communication Technology (ICT) [ ]

o Manufacturing and Production [ ]

o Public Administration [ ]

o Energy and Environment [ ]

5. **Occupation/Professional Role:**

o Sustainability and ESG Officer [ ]

o ICT/AI Specialist [ ]

o Academic or Researcher [ ]

o Corporate Manager [ ]

o Policy Maker or Regulator [ ]

6. **Position/Level:**

o Entry Level [ ]

o Mid-Level Staff [ ]

o Senior Management [ ]

o Executive Management [ ]

Section B: Respondent Responses

Please indicate your level of agreement with each statement using the five-point Likert scale where:

SA = 5 (Strongly Agree), A = 4 (Agree), UN = 3 (Undecided), D = 2 (Disagree), SD = 1 (Strongly Disagree).

Ethical Considerations (ETH)

S/N	Items	SA (5)	A (4)	UN (3)	D (2)	SD (1)
1	Generative AI systems are designed with clear accountability and ethical oversight.					
2	My organisation ensures transparency in how Generative AI decisions or outputs are generated and used.					
3	The data used to train Generative AI models reflect diversity and fairness.					
4	The training process of Generative AI systems includes mechanisms to minimise algorithmic bias.					
5	Strict data-privacy and security measures are followed when using Generative AI in sustainability projects.					
6	Ethical guidelines are actively enforced to prevent misinformation in AI-generated content.					

Environmental Impact (ENV)

S/N	Items	SA (5)	A (4)	UN (3)	D (2)	SD (1)
7	Generative AI applications contribute to reducing energy waste and improving environmental resource management.					
8	My organisation monitors the carbon and water footprint					

	of AI operations as part of its sustainability reporting.					
9	Generative AI tools help design eco-friendly products, materials, or supply-chain solutions.					
10	The environmental benefits derived from AI adoption outweigh the potential negative ecological costs.					
11	Environmental considerations guide the development and deployment of Generative AI technologies in my organisation.					

Social Impact (SOC)

S/N	Items	SA (5)	A (4)	UN (3)	D (2)	SD (1)
12	Generative AI applications used for sustainability are inclusive and sensitive to Nigeria's social and cultural diversity.					
13	The use of AI-generated information promotes stakeholder trust and combats misinformation.					
14	My organisation ensures that Generative AI systems reinforce social equality and fairness.					
15	Adoption of Generative AI has created new employment or skill-development opportunities in my organisation or sector.					
16	Generative AI contributes positive impacts to community well-being and public awareness of sustainability issues.					

Governance Impact (GOV)

S/N	Items	SA (5)	A (4)	UN (3)	D (2)	SD (1)
17	The board or top management provides clear oversight for all Generative AI-related initiatives.					
18	Internal policies and audit procedures are in place to ensure responsible and transparent AI deployment.					
19	My organisation's sustainability disclosures include information on AI governance and accountability.					
20	Regulatory frameworks such as Nigeria's Data Protection Act (2023) and National AI Strategy (2024) are integrated into AI practices.					
21	Independent assurance or external reviews are conducted to validate AI-related ESG data and disclosures.					

Sustainability Practices (SP)

S/N	Items	SA (5)	A (4)	UN (3)	D (2)	SD (1)
22	AI-generated insights improve decision-making on energy use.					
23	AI-generated insights improve decision-making on waste reduction.					
24	AI-generated insights improve decision-making on social impact.					
25	Generative AI enhances my organisation's ability to achieve its sustainability and ESG goals.					
26	Sustainability reports supported by Generative AI are more accurate and timelier than manual reports.					
27	Integrating Generative AI into operations strengthens compliance with global ESG standards (e.g., IFRS S1/S2, GRI).					
28	The use of Generative AI aligns with my organisation's long-term ethical and sustainability strategy.					