Adoption of Green Innovation by Smes: A Sectoral Analysis

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ABSTRACT

Small and Medium-sized Enterprises (SMEs) constitute the backbone of Ghana's economy, accounting for approximately 90% of all businesses and playing a critical role in employment creation and economic growth. In recent years, the growing global emphasis on environmental sustainability has placed increased attention on the capacity of SMEs to adopt green innovations. This study examines the extent, drivers, and performance implications of green innovation adoption among Ghanaian SMEs, drawing exclusively on secondary data from reputable sources including the Ghana Statistical Service, World Bank Enterprise Surveys, and United Nations Development Programme (UNDP) reports. The analysis revealed a steady but uneven increase in adoption across sectors, with agriculture and industry leading, and the service sector showing slower progress. The findings also demonstrate that green innovation adoption is driven by a combination of external pressures and internal capacities. Regulatory enforcement, environmental certification requirements, and market demand from eco-conscious customers and foreign buyers were key external motivators. Access to finance, technical training, and the presence of sustainability-oriented leadership within firms emerged as important internal enablers. Together, these factors created a conducive environment for the uptake of eco-friendly technologies and processes. The results further showed that SMEs adopting green innovations consistently outperformed their non-adopting counterparts in revenue growth, productivity, and environmental compliance. These benefits appear to stem from cost savings through resource efficiency, enhanced market opportunities, and improved reputational capital. The study contributes to both theory and practice by applying the natural resource-based view (NRBV) theory to the Ghanaian SME context, demonstrating how environmental capabilities can yield strategic advantage. Policy implications highlight the need for targeted green finance schemes, sector-specific technical support, and regulatory frameworks that incentivize sustainable practices.

INTRODUCTION

Background of the study

In the contemporary business landscape, the pursuit of sustainability has emerged as one of the most pressing imperatives for organizations, governments, and societies at large (Prabhakar, 2025). Issues such as environmental degradation, climate change, and the depletion of scarce natural resources have intensified calls for businesses to reconfigure their operational models in ways that mitigate harm to the planet while still supporting economic growth (Ullah, 2025). Against this backdrop, sustainability is no longer considered a peripheral or optional aspect of business practice but has become central to long-term competitiveness and survival. Increasingly, firms are expected to integrate ecological and social considerations into their strategies in order to secure legitimacy from stakeholders, enhance resilience against external shocks, and position themselves within the framework of global sustainable development goals (SDGs) (Gomez-Trujillo et al., 2024).

One notable pathway toward sustainability that has gained prominence in both academic and policy discussions is green innovation. Green innovation is generally defined as the development or adoption of products, processes, or practices that are new to the firm and generate less environmental harm compared to conventional alternatives (Kemp and Pearson, 2007). It goes beyond mere compliance with environmental regulations, seeking instead to transform operations in a manner that achieves both ecological sustainability and business competitiveness. Green innovation encompasses a broad spectrum of practices, ranging from the introduction of energy-efficient technologies and the use of renewable resources to waste reduction initiatives, sustainable packaging, and eco-

friendly supply chain management (Herzallah et al., 2025). For countries such as Ghana that are striving to align their development strategies with the SDGs, green innovation represents a viable mechanism to reconcile the seemingly competing objectives of economic progress and environmental stewardship.

Small and medium-sized enterprises (SMEs) are central to the global economy and play a particularly critical role in developing economies like Ghana. They account for a significant share of employment generation, income creation, and poverty reduction. In Ghana, SMEs constitute approximately 90% of all businesses and contribute nearly 70% of the country's gross domestic product (GDP) (GSS, 2022). This makes them not only vital engines of economic development but also important actors in the transition toward sustainability. However, while their economic importance is clear, their environmental footprint is equally significant given the scale of their operations collectively (Oduro and Haylemariam, 2025). Thus, their capacity to adopt and implement green innovations becomes pivotal in shaping Ghana's broader sustainability trajectory.

Despite their importance, Ghanaian SMEs face considerable challenges that constrain their adoption of green innovation. Limited access to financial resources, inadequate technological capabilities, insufficient institutional support, and a lack of awareness of environmental issues often prevent SMEs from prioritizing eco-friendly practices (Afum et al., 2024; Oduro, 2020). Additionally, the cost of implementing green innovations is often perceived as prohibitively high, especially for smaller firms that operate on narrow profit margins. Yet, SMEs also have unique advantages that could enable them to play a catalytic role in sustainable transformation. Their relatively flexible structures, proximity to customers, and capacity for quick decision-making mean they can often adapt more readily to environmental demands compared to larger, more bureaucratic corporations (Omowole et al., 2024). These attributes highlight the dual nature of SMEs in Ghana, that is, while constrained in many respects, they also hold untapped potential for driving green innovation from the grassroots level.

A critical issue that motivates this study is the uneven adoption of green innovation across various SME sectors in Ghana. Evidence suggests that while some sectors, such as agriculture and manufacturing, are making strides toward integrating eco-friendly technologies and practices, other sectors, such as retail, and other services, lag significantly behind (Afum et al., 2024). For instance, agricultural SMEs have begun experimenting with organic farming, renewable energy for irrigation, and waste-to-compost initiatives, while manufacturing firms are exploring cleaner production techniques and energy-efficient machinery. Conversely, service-oriented SMEs, often exhibit limited awareness or capability to engage with green practices beyond basic compliance with waste management rules.

One of the central gaps in the literature is the lack of comprehensive, sector-specific studies on the adoption of green innovation in Ghana. Much of the existing research has either examined individual firms or focused on generalized barriers to adoption without disaggregating data by sector (Oduro, 2020). This lack of sectoral nuance undermines the capacity of policymakers, SME support agencies, and development partners to design targeted interventions. Without such knowledge, broad-based policies risk being misaligned with the specific realities and challenges of different SME sectors, thereby reducing their overall effectiveness.

The importance of green innovation for Ghana cannot be overstated, particularly in light of the country's development aspirations and commitments to sustainability. Ghana's policy framework, including the Ghana National Climate Change Policy and the Ghana Green Jobs Strategy (Melr, 2022), explicitly emphasizes the need to promote environmental sustainability, foster innovation, and encourage green entrepreneurship. These policies reflect an acknowledgment of the centrality of SMEs in achieving sustainable industrialization and green economic transformation. However, the effectiveness of such policies depends heavily on the degree to which SMEs in high-impact sectors adopt and institutionalize green innovations. This study, therefore, seeks to align with national priorities by examining sectoral dynamics in SME adoption of green innovations and providing evidence-based insights to support policy implementation.

Several reasons justify the necessity of this study. First, from an academic perspective, it addresses a notable gap in the literature. While extensive research on green innovation exists in developed economies, empirical evidence from developing economies, particularly in sub-Saharan Africa, remains scarce (Zhang et al., 2025). Within Ghana specifically, the sectoral dimension of green innovation adoption has received little attention despite the evident disparities across industries. By focusing on Ghanaian SMEs, this study provides much-needed empirical depth and contextual relevance to the discourse on green innovation.

Second, the study has strong practical relevance. Policymakers, development agencies, and SME-support organizations often grapple with the challenge of designing effective programs to promote sustainability (Nketsiah and Van der Westhuizen, 2025). Understanding the sector-specific challenges, motivations, and opportunities for green innovation adoption will provide these actors with actionable insights. For example, manufacturing SMEs may require technological subsidies or cleaner production training, while service-sector SMEs may benefit more from awareness campaigns and green consumerism incentives. A one-size-fits-all approach is unlikely to be effective, and this research offers the granular evidence needed for tailored interventions.

Third, the study contributes to sustainable development at both the national and global levels. By exploring the sectoral adoption of green innovation, it enhances understanding of how SMEs can align with the SDGs, particularly SDG 9 (Industry, Innovation, and Infrastructure), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action). Given that SMEs collectively form the backbone of Ghana's economy, their active engagement in green innovation could have transformative effects on the country's environmental and economic landscape.

The significance of this research is multidimensional. From an academic standpoint, it extends theoretical and empirical discussions on sustainability and innovation in the SME context. It contributes to ongoing debates on how institutional, sectoral, and firm-level factors interact to shape green innovation adoption in developing economies. By situating the study in Ghana, it also provides contextual insights that challenge the dominance of Western-centric sustainability narratives.

From a practical standpoint, the findings of this study are expected to inform the design of sector-specific policies, financial instruments, and training programs. For government agencies, understanding sectoral adoption patterns will help prioritize resources toward industries with the greatest environmental impact or the highest potential for green transformation. For development partners, the insights will guide programmatic support for SMEs, while for SMEs themselves, the study offers a roadmap for enhancing competitiveness through green innovation.

Additionally, this research could serve as a baseline for future longitudinal studies tracking green innovation trends among SMEs in Ghana. As environmental challenges and climate risks escalate, SMEs will increasingly be expected not only to comply with regulatory standards but also to adopt proactive strategies that integrate sustainability into their core operations (Herzallah et al., 2025). This study provides an initial mapping of the sectoral landscape, against which future progress can be measured.

In summary, this study is both timely and necessary. By focusing on the sectoral adoption of green innovation among SMEs in Ghana, it addresses a critical research gap while providing insights of direct relevance to policymakers, practitioners, and academics. SMEs are indispensable to Ghana's economy, and their role in advancing sustainability cannot be overlooked. Yet their adoption of green innovations varies widely across sectors, raising important questions about the drivers, barriers, and implications of these differences. This research seeks to provide evidence-based answers to those questions, ultimately contributing to the design of more effective strategies for fostering inclusive, sustainable, and competitive economic development in Ghana and Sub-Saharan Africa as a whole.

Organizational Context

Ghana's SME sector is a diverse ecosystem spanning multiple industries including agriculture, manufacturing, and services. The sector is regulated by institutions such as the Ghana Enterprise Agency (GEA), the Ministry of Trade and Industry (MoTI), and various business associations. These entities offer business support services, training, and sometimes funding aimed at promoting entrepreneurial growth and innovation, while also encouraging inclusive participation in emerging sustainable business opportunities.

However, SMEs in Ghana often operate in a challenging environment. According to UNCTAD (2023), common constraints include limited access to finance, weak institutional support, inadequate infrastructure, and low levels of technological diffusion. These challenges are even more pronounced when it comes to green innovation, which often requires upfront investment, specialized knowledge, and access to environmentally sound technologies. Despite these hurdles, a number of Ghanaian SMEs have made strides in adopting green practices,

such as solar-powered production, recycling initiatives, water conservation systems, and organic product development (Asare et al., 2025).

Importantly, Ghana's commitment to the global sustainability agenda provides a supportive policy context for promoting green innovation. For example, the country's participation in the Paris agreement and the implementation of its nationally determined contributions provide a policy impetus for environmental innovations. Moreover, the Ghana Green Jobs Strategy outlines a multi-sectoral approach to building a sustainable economy by supporting green entrepreneurship and green jobs, especially within SMEs (Melr, 2022).

Nevertheless, the extent and nature of green innovation adoption differ widely across sectors. Manufacturing SMEs, for instance, may adopt green technologies to reduce waste or energy consumption, while service-oriented SMEs may focus more on green certifications and sustainable business models. Understanding these sectoral differences is therefore critical to formulating effective interventions, targeted capacity-building programs, and coherent policy responses that can accelerate the transition toward a greener economy.

Research Aim

The overarching aim of this research is to conduct a sectoral analysis of green innovation adoption among SMEs in Ghana.

Research Objectives

To address the aim stated above, the study is guided by the following specific objectives:

1. To examine the extent of green innovation adoption among SMEs in various sectors in Ghana.
2. To identify the key drivers influencing green innovation adoption across SME sectors.
3. To assess the relationship between green innovation adoption and business performance among SMEs.

Research Questions

In line with the objectives, the research seeks to answer the following questions:

1. What is the extent of green innovation adoption across different SME sectors in Ghana?
2. What are the key drivers influencing green innovation adoption among Ghanaian SMEs by sector?
3. How does the adoption of green innovation affect the performance of SMEs?

Organization of the study

The study is made of six chapters. The chapter one is the introduction, which consists of background, organizational context, research aims, objectives and questions. The chapter two consists of the review of literature. The chapter three is the research design which includes the methodology, methods of data collection and analysis and ethical consideration. The chapter four consists of research results and the presentation of data. Chapter five is made up of the discussion of findings and how they are linked to literature and objectives of the study. Chapter six is made up of the conclusion which include the contributions and limitations of the study.

REVIEW OF LITERATURE

Introduction

The section reviews the literature on the concepts of the study as well as the prior empirical studies on the concepts of the study. It reviews the concept, green innovation and studies that have been done on green innovation.

Conceptual Review

Green innovation, also referred to as sustainable innovation or environmental innovation, originates from principles like eco-design, which prioritize minimizing environmental harm during a product's life cycle (Lopez-Pérez et al., 2024; Hizarci-Payne et al., 2021). While green innovation has gained significant scholarly attention as a subset of broader innovation research (Hizarci-Payne et al., 2021), it has been conceptualized in various ways. Many researchers define green innovation as a transformative approach that involves integrating environmental considerations into managerial, marketing, process, and production activities, often triggered by green supply chain management (Li et al., 2017).

Hall et al. (2013) and Horbach (2008) describe green innovation as the use of new or modified technologies, systems, and products aimed at preventing or mitigating environmental degradation. Similarly, Carrillo-Hermosilla et al. (2010) and Pan et al. (2020) frame green innovation as a practical solution to pressing environmental issues through innovations that reduce the environmental footprint of consumption and production. Kemp and Pearson (2007), whose definition is widely accepted, see green innovation as the development or adoption of products, processes, or practices that are new to the firm and generate less environmental harm compared to conventional alternatives.

While some scholars highlight green innovation's strategic value in achieving competitive advantage, others emphasize its role in fulfilling environmental responsibilities (Vence and Pereira, 2018). This divergence in interpretation underscores the need to explore the various forms and functions of green innovation.

Several typologies have been proposed. Kemp and Pearson (2007), in their MEI Project report, identify four major types: environmental technologies, organizational innovations, green product/service innovations, and broader green system innovations. Further distinctions have been drawn by Prieto-Sandoval et al. (2018) and Hofstra and Huisingh (2014), who classify green innovations as exploitative, restorative, cyclical, and regenerative. Vence and Pereira (2018) suggest other forms such as complementary, integrated, alternative product, and macro-organizational green innovations.

Nevertheless, the most frequently referenced classifications in the literature remain product and process green innovations (Liao, 2018; Rodríguez-Rebés et al., 2021; Rodríguez-García et al., 2019). García-Granero et al. (2018) extend this to include marketing-related green innovations, which, though underexplored, are highly relevant to firm competitiveness and public perception. Thus, this study focuses on three main categories: product green innovation, process green innovation, and marketing green innovation.

The choice of these three is grounded in their broad relevance to sustainability and the circular economy. As businesses confront mounting ecological pressures, there is an increasing shift toward innovations that align environmental, societal, and financial priorities (Tsai and Liao, 2017a). These three dimensions enable firms to operationalize sustainable principles while maintaining or enhancing competitiveness (Jain et al., 2024).

Product green innovation targets environmental impacts at the product design stage, where material selection and product features can either mitigate or exacerbate ecological harm (Hizarci-Payne et al., 2021). Process green innovation involves improving production techniques to reduce waste and resource use (Hizarci-Payne et al., 2021). Marketing green innovation focuses on integrating environmental values into communication, pricing, and product positioning strategies (García-Granero et al., 2018). Each of these supports both environmental stewardship and market performance, making them central to this study. The following sections discuss each type in detail.

Product Green Innovation

Product green innovation involves the development or significant enhancement of goods and services with the aim of conserving resources and reducing environmental impact (Liao, 2018). Since raw materials used in product manufacturing can have serious ecological implications (García-Granero et al., 2018), firms are increasingly compelled to invest in technologies and design approaches that make products more environmentally friendly (Rodríguez-García et al., 2019).

This form of innovation emphasizes integrating environmental concerns into product development, from reducing energy consumption to choosing biodegradable or recyclable materials (Chen, 2024). Klewitz and Hansen (2014) outline several elements of product green innovation among SMEs, such as eco-design, life cycle analysis, sustainable packaging, organic product lines, and material substitutions like biodegradable inputs.

For example, Le and Ikram (2022) note that SMEs can lower their ecological footprint by redesigning products for easier reuse, decomposition, or recycling. Dangelico et al. (2017) highlighted the need to incorporate environmental factors, such as energy efficiency and sustainable sourcing into both new product development and the modification of existing offerings.

In this study, product green innovation is conceptualized following Liao (2018): as the introduction of products that are either new or significantly improved, with a clear emphasis on reducing environmental impact and conserving resources.

Process Green Innovation

Process green innovation refers to the redesign or enhancement of production methods to minimize environmental pollution through more efficient resource use (Qi et al., 2010). While products themselves can influence environmental outcomes, the way in which they are produced plays an equally significant role (García-Granero et al., 2018).

This form of innovation typically involves adopting cleaner technologies, optimizing manufacturing systems, or introducing entirely new production approaches that are energy-efficient and generate less waste (Rodríguez-García et al., 2019; Liao, 2018). Alraja et al. (2022) define it as the implementation of new elements within production systems to create more environmentally responsible outputs.

Huber (2008) adds that process green innovation enhances eco-efficiency by reducing inputs and outputs that harm the environment. These innovations might take the form of cleaner production technologies, substitution of harmful materials, waste recovery systems, or energy-saving equipment (Xie, 2019).

For this study, process green innovation is defined based on Qi et al. (2010): as the resource-efficient execution of production activities aimed at reducing negative environmental impacts.

Marketing Green Innovation

Marketing green innovation involves embedding environmental values into marketing practices, including branding, advertising, pricing, and product promotion strategies (Seman et al., 2019). It reflects a firm's commitment to sustainability through external communication and customer engagement.

Groening et al. (2018) define marketing green innovation as actions directed to all consumers and encompassing a wide range of marketing activities designed to demonstrate the firm's goal of minimizing the environmental impact of its products and services. This may include eco-labeling, green certification, environmentally conscious pricing strategies, and franchising models that emphasize sustainability.

Chege and Wang (2020) stress the role of green marketing in positioning environmentally friendly products through strategic distribution, packaging, and communication. Kotler (2011) also views green marketing as a broader philosophy, one that balances firm goals with environmental responsibilities by aligning marketing operations with sustainability principles.

Despite being less researched than product or process innovation, marketing green innovation has substantial potential to enhance both brand image and environmental outcomes. It allows firms to differentiate themselves in competitive markets and respond to growing stakeholder expectations for corporate environmental responsibility (Barba-Sánchez and Atienza-Sahuquillo, 2016; del Rosario Reyes-Santiago et al., 2019).

Thus, following Seman et al. (2019), this study defines marketing green innovation as the integration of environmental considerations into promotional strategies, such as eco-labels, green pricing models, and sustainable brand messaging.

Theoretical Review

The Natural Resource-Based View (NRBV) theory, introduced by Hart (1995), has evolved into a foundational theoretical framework in the field of sustainability and green innovation. It extends the traditional resource-based view (RBV) theory by integrating environmental considerations into the firm's strategic assets and capabilities. While the RBV theory emphasizes the role of valuable, rare, inimitable, and non-substitutable (VRIN) resources in building competitive advantage, it has been criticized for overlooking the role of natural environmental challenges in shaping firm competitiveness (Hart, 1995; Asamoah et al., 2023). In response, Hart (1995) proposed the NRBV theory to incorporate ecological constraints and opportunities as sources of strategic advantage.

In sustainable operations literature, the NRBV theory is widely used to explore the link between environmental practices and firm performance (McDougall et al., 2019). Numerous empirical studies have adopted the NRBV theory to demonstrate how integrating sustainability into organizational strategy enables firms to respond to stakeholder expectations, meet regulatory requirements, and build dynamic capabilities that improve environmental and economic outcomes (Agyabeng-Mensah et al., 2020a; Asamoah et al., 2024). The theory posits that firms that engage in proactive environmental strategies, such as green innovation, develop specialized resources that are not only environmentally beneficial but also strategically valuable in enhancing organizational resilience, efficiency, and market positioning.

From the NRBV theory perspective, green innovation, which includes green product design, cleaner production technologies, waste reduction, and energy-efficient processes is viewed as a deliberate strategic response to growing environmental concerns and sustainability demands. As such, green innovation is not just a compliance mechanism but a source of competitive differentiation. The theory suggests that firms that innovate to reduce their ecological footprint often gain access to new markets, improve resource efficiency, enhance brand reputation, and reduce operational risks (Hart, 1995; Banerjee, 2001). These outcomes align with the core tenets of the NRBV theory, which asserts that environmentally-oriented capabilities can generate sustainable competitive advantage when they are embedded within the organizational routines and culture of the firm.

This study adopts the NRBV theory as the theoretical foundation to investigate how the adoption of green innovation by SMEs in Ghana influences their performance. In particular, the NRBV theory helps to explain why and how SMEs across different sectors may pursue green innovation as a strategic asset. Ghanaian SMEs, like many in developing economies, often face institutional and market pressures to improve environmental performance amid limited resources. According to Asamoah et al. (2023), when firms in resource-constrained environments strategically embed eco-friendly practices into their operations, they are more likely to develop internal capabilities that address both sustainability goals and business performance imperatives.

By applying the NRBV theory, this study posits that SMEs that adopt green innovation practices, such as recycling, green product development, energy-efficient technologies, and sustainable supply chain practices are better positioned to improve their performance. The NRBV theory provides the theoretical rationale for expecting a positive relationship between green innovation and performance, especially as firms internalize environmental values and transform them into organizational routines and resources that are difficult for competitors to imitate.

Moreover, the NRBV theory supports the sectoral lens of this study by suggesting that the development and exploitation of green innovative capabilities may vary across different industries depending on the nature of environmental challenges and opportunities present in each sector. For instance, manufacturing SMEs may focus on energy-efficient production technologies, while service-based SMEs may emphasize waste reduction and eco-friendly packaging. Such sector-specific differences in environmental resource deployment and capability development are consistent with the NRBV theory, which acknowledges the contextual nature of strategic resources (Hart, 1995).

In conclusion, the NRBV theory reinforces the argument that green innovation is not merely an environmental compliance requirement but a strategic path toward sustained competitive advantage. It helps frame green innovation as an integral part of the firm's resource system, one that contributes to environmental, economic, and operational performance outcomes. In the context of Ghanaian SMEs, the NRBV theory provides a useful framework for understanding how sectoral adoption of green innovation can enable firms to enhance performance that support long-term sustainability and competitiveness.

Empirical Review

Numerous studies have explored the concept of green-innovation, particularly within the supply chain management context. This section highlights key empirical research that investigates the outcomes of green innovation implementation.

To begin with, Aboelmaged (2018) explored both the direct and indirect effects of eco-innovation, environmental orientation, and collaboration with suppliers on the performance of hotels in the United Arab Emirates. The study utilized data from 182 hotel managers, each representing a separate hotel. Findings revealed that collaboration with environmentally conscious suppliers did not significantly impact eco-innovation practices or overall hotel performance. Nevertheless, both environmental orientation and eco-innovation were found to positively influence hotel performance. One limitation of this study was the lack of control for hotel characteristics such as size and ownership structure.

In a related study, Seman et al. (2019) examined the interplay between green supply chain management (GSCM), green innovation practices, and environmental performance in certified manufacturing firms. Using survey data collected from 123 organizations holding ISO 14001 certification, the study established a strong and positive relationship between GSCM and both green innovation and environmental performance. Moreover, green innovation served as a mediating variable between GSCM and environmental outcomes. Despite these insights, the study focused solely on environmental performance, overlooking other important outcomes such as economic or operational performance that GSCM might influence.

Furthermore, Liao (2018) analyzed how different types of organizational culture, specifically clan, adhocracy, hierarchy, and market cultures influence the three dimensions of environmental innovation: eco-organizational, eco-process, and eco-product innovation. The study also assessed the impact of these innovations on firms' financial performance, with a particular focus on service-sector firms. Using structural equation modeling for analysis, the findings indicated that both adhocracy and market cultures positively influenced all three types of environmental innovation. Clan culture had a favorable impact on eco-organizational innovation, whereas hierarchy culture showed a negative effect. Additionally, all three types of environmental innovation were found to enhance financial performance. However, this study did not account for other influential factors such as firm size or age, which could potentially affect the observed relationships.

Another notable study by Hizarci-Payne et al. (2021) conducted a meta-analysis to synthesize existing empirical research on the relationship between eco-innovation and firm performance, while also investigating the impact of various moderating factors. Drawing on 196 effect sizes derived from 70 studies involving over 25,000 firms, the study found that organizational eco-innovation had the most substantial effect on firm performance. Moreover, the strength of the relationship between eco-innovation and firm performance varied significantly depending on the type of performance measured. Interestingly, the link was more pronounced in developing countries compared to developed ones. Nonetheless, the authors acknowledged certain limitations, including the exclusion of qualitative studies and the potential omission of studies that lacked full disclosure of statistical methodologies.

In Spain, Marín-Vinuesa et al. (2020) investigated the impact of eco-innovation on firms' financial performance within the Resource-Based View (RBV) framework. Using PLS-SEM to analyse data, the authors found a significant positive relationship between investments in eco-innovation and financial performance. The results suggest that eco-innovation initiatives not only yield environmental benefits but can also act as strategic resources that enhance competitive advantage. However, the study's cross-sectional design limits causal inferences, and further longitudinal research was recommended to validate the findings over time.

Similarly, Maldonado-Guzmán (2021) explored the interdependence between eco-innovation and the circular economy in the Mexican automotive industry. Drawing on survey data from 460 firms and employing CFA, descriptive statistics, and SEM, the study revealed that eco-innovation in products, processes, and management significantly enhances circular economy performance. The findings highlight that the adoption of eco-innovative practices facilitates resource efficiency and waste minimisation, thereby advancing circularity. One limitation noted was the industry-specific focus, which may restrict the generalizability of the results to other sectors.

In China, Ali et al. (2023) examined how entrepreneurial leadership influences green innovation through the mediating role of organisational learning culture and the moderating effect of environmental dynamism. Based on survey responses from 248 firms, the study found that entrepreneurial leadership positively impacts green innovation, with organisational learning culture serving as a key mediating factor. Additionally, environmental dynamism strengthened the positive effect of leadership on innovation. These findings underscore the importance of leadership and adaptive organisational cultures in fostering green innovation, particularly in dynamic environments.

Another study by Al Halbusi et al. (2025) examined the role of artificial intelligence (AI) capabilities in driving green innovation and its subsequent influence on sustainable performance and the circular economy (CE). Using multi-sectoral data from various Qatari industries, the researchers employed structural equation modeling (SEM) and artificial neural networks (ANN) to validate the proposed model. The results showed that AI capabilities significantly enhance green innovation, which in turn strongly contributes to improved sustainable performance and CE outcomes. Furthermore, big data analytics and knowledge management systems were identified as key moderating factors that strengthened the positive relationship between AI capabilities and green innovation.

Lastly, Abdallah et al. (2024) investigated the effect of green supply chain management (GSCM) on circular economy (CE) performance in Jordanian manufacturing firms, with green innovation as a mediating variable. Analysing survey data from 278 firms using Hayes PROCESS in SPSS, the study established that GSCM positively influences both CE performance and green innovation, with the latter mediating the relationship. The authors concluded that integrating green innovation into supply chain practices can significantly boost sustainability outcomes. However, the study acknowledged that cultural and institutional factors in Jordan might influence the transferability of results to other contexts.

Al Halbusi, H., Al-Sulaiti, K.I., Alalwan, A.A. and Al-Busaidi, A.S., 2025. AI capability and green innovation impact on sustainable performance: Moderating role of big data and knowledge management. Technological Forecasting and Social Change, 210, p.123897.

A summary of these relevant studies on eco-innovation outcomes is provided in Table 2.1 below.

Table 2.1: Empirical Review Table

Author(s) and Year	**Country**	**Purpose of the Study/Research Objectives**	**Construct(s)/Concept(s) Used Underlying Theoretical Framework**	**Methodology**	**Findings**
Aboelmaged (2018)	UAE	To examine the direct and indirect effects of eco-innovation, environmental orientation, and supplier collaboration on hotel performance.	Eco-innovation, environmental orientation, supplier collaboration, and hotel performance (Relational theory and NRBV)	Survey of 182 hotel managers; PLS-SEM	Environmental orientation and eco-innovation positively influence hotel performance; Supplier collaboration effect not supported

Seman et al. (2019)	Malaysia	To investigate the relationship between GSCM and green innovation and the influence of these practices on environmental performance.	Green supply chain management, green innovation, and environmental performance	Survey of 123 ISO 14001 certified manufacturing firms; PLS-SEM	GSCM positively relates to green innovation and environmental performance; Green innovation mediates the relationship
Liao (2018)	China	To examine the effect of corporate culture on environmental innovation and its impact on financial performance.	Corporate culture, environmental innovation, and financial performance	Survey of 366 firms; Structural equation modeling	Adhocracy and market cultures enhance all types of eco-innovation; All types of eco-innovation positively affect financial performance
Hizarci-Payne et al. (2021)	Turkey	To aggregate empirical research on eco-innovation and firm performance via meta-analysis.	Eco-innovation and firm performance	Meta-analysis of 196 effects from 70 studies (25,412 firms)	Organizational eco-innovation strongly influences firm performance; Effects vary by country and performance type
Marín-Vinuesa et al. (2020)	Spain	To examine the impact of eco-innovation on financial performance within the RBV framework.	Eco-innovation and firms' financial performance (Resource-Based View)	PLS-SEM	Positive relationship between eco-innovation investment and financial performance
Maldonado-Guzman (2021)	Mexico	To explore the interdependence between eco-innovation and circular economy.	Eco-innovation and circular economy	Survey of 460 automotive firms; CFA, descriptive statistics, SEM	Eco-innovation in products, processes, and management positively impacts circular economy performance
Ali et al. (2023)	China	To examine how entrepreneurial leadership affects green innovation through organizational	Entrepreneurial leadership, green innovation, organizational learning culture, environmental	Survey of 248 firms	Entrepreneurial leadership positively impacts green innovation via learning culture;

		learning culture and environmental dynamism.	dynamism (Upper echelons theory)		Environmental dynamism moderates this relationship
Al Halbusi et al. (2025)	Qatari	To examine the role of artificial intelligence (AI) capabilities in driving green innovation and its subsequent influence on sustainable performance and the circular economy (CE).	Artificial intelligence (AI) capabilities, green innovation, sustainable performance and circular economy (CE).	Multi-sectoral data from various Qatari industries	The results showed that AI capabilities significantly enhance green innovation, which in turn strongly contributes to improved sustainable performance and CE outcomes. Furthermore, big data analytics and knowledge management systems were identified as key moderating factors that strengthened the positive relationship between AI capabilities and green innovation.
Abdallah et al. (2024)	Jordan	To investigate the impact of GSCM on CE performance and the mediating role of green innovation.	GSCM, circular economy performance, green innovation	Survey of 278 manufacturing firms; Hayes PROCESS in SPSS	GSCM positively affects CE performance and green innovation; Green innovation mediates the relationship

RESEARH DESIGN

Introduction

This chapter outlines the methodological framework adopted to address the research objectives. It presents the research philosophy that underpins the study, the methodological approach employed, and the overall research strategy. Additionally, it discusses the data collection methods used, along with procedures undertaken to ensure the reliability and validity of the data. Ethical considerations that guided the research process are also

highlighted. The choices made in this chapter are aligned with the nature of the research problem and are intended to ensure the rigor, credibility, and integrity of the study.

Research Philosophy

Research philosophy refers to the underlying assumptions and beliefs regarding the nature of knowledge and the process through which it is developed (Saunders et al., 2009). These philosophical assumptions influence how a researcher frames their inquiry, chooses their methodology, and interprets findings. Central to research philosophy are ontology, which is concerned with the nature of reality, and epistemology, which addresses the nature and scope of knowledge (Kumar, 2018).

In this study, an objectivist ontological stance is adopted. Objectivism posits that reality exists independently of the observer and can be measured without being influenced by the researcher (Saunders et al., 2009). This is appropriate given the study's reliance on secondary data, which has already been collected and is not subject to the researcher's direct interaction or interpretation. Thus, the analysis will be based on observable and measurable indicators of green innovation adoption and business performance among SMEs in Ghana.

From an epistemological perspective, the study aligns with positivism. Positivism holds that knowledge is derived from empirical observation and logical reasoning, often through hypothesis testing and statistical analysis (Kumar, 2018). This approach is well-suited for examining large datasets and identifying relationships between variables. It also supports the development and testing of theoretical models based on quantifiable evidence (Saunders et al., 2019).

Given the research objectives, to assess the extent of green innovation adoption, identify its key drivers, and analyze its relationship with business performance, positivism enables the use of structured, theory-driven analysis. Furthermore, the use of secondary data, which is objective, standardized, and previously validated, fits well within this philosophical paradigm.

By adopting an objectivist and positivist position, this research aims to produce generalizable findings through the rigorous analysis of empirical data. These philosophical choices help ensure that the study maintains methodological consistency, enhances the reliability of the findings, and contributes to evidence-based understanding of green innovation adoption among SMEs in Ghana.

Research Strategy

A research strategy refers to the overall approach taken to answer the research questions and achieve the stated objectives (Kumar, 2018). It provides a systematic plan for data collection, analysis, and interpretation, ensuring that the study is methodologically sound and aligned with its philosophical underpinnings. Research strategies typically vary depending on the nature of the research questions, data availability, and the type of evidence needed.

Given the nature of this study and its reliance on secondary data, an explanatory research strategy has been adopted. Explanatory research is aimed at identifying and analyzing causal relationships between variables (Saunders et al., 2009). This approach is appropriate for the current study, which seeks to assess how green innovation adoption affects the business performance of SMEs across various sectors in Ghana. Specifically, the strategy allows the researcher to test hypotheses and explain patterns within the data by statistically examining associations and potential causal links.

The use of secondary data enables the researcher to draw on existing, reliable datasets that capture relevant indicators such as levels of green innovation adoption, business performance metrics, and contextual factors influencing SME behaviour. This approach supports the explanatory strategy by allowing for empirical investigation of the research objectives.

Since secondary data often encompasses large and diverse samples, it enhances the generalizability of findings and facilitates robust statistical analysis. This aligns with the positivist and objectivist orientation of the study, which emphasizes factual, evidence-based inquiry.

Overall, the explanatory research strategy, combined with the use of secondary data offers a structured and efficient method to explore and test the influence of green innovation practices on SME performance outcomes in Ghana.

Research Method

Research methods refer to the specific techniques and procedures used to collect and analyze data to address research objectives. There are three main types of research methods: quantitative, qualitative, and mixed methods (Creswell, 2013). The quantitative method involves the use of numerical data to examine relationships between variables and to test hypotheses in a structured and systematic way. In contrast, qualitative methods aim to explore phenomena in depth, often through non-numerical data such as interviews and observations, while mixed methods combine both approaches to offer a more comprehensive understanding of complex research problems (Creswell, 2013; Saunders et al., 2009).

For this study, a quantitative research method was adopted. This choice is driven by the study's objective to statistically examine relationships between variables such as green innovation adoption, performance indicators, and influencing factors among SMEs in Ghana. The research seeks to provide empirical evidence regarding the objectives of the study

The quantitative approach is particularly suitable because it allows for generalization of results using statistical tools. The use of secondary data, which consists of structured, numerical datasets, aligns well with this method. Such data enables the researcher to quantify the level of green innovation, identify statistically significant patterns, and measure the impact on firm performance.

By employing a quantitative method, the study is able to generate objective, evidence-based insights into the behaviour of SMEs in relation to green innovation. This method supports the positivist paradigm adopted in the study and facilitates the use of statistical techniques to test theories and draw generalizable conclusions relevant to policy makers, practitioners, and researchers.

Population of the Study

According to Creswell (2013), a population refers to the entire set of objects, subjects, or members that meet specific criteria established for a study. In a similar vein, Saunders et al. (2009) describe the target population as the complete group of cases, which may include individuals, organizations, or entities, from which a representative sample is drawn for analysis. Clearly defining the population is a critical step in research, as it provides the foundation for determining the scope of the study and ensures that the findings can be appropriately generalized. For the purpose of this study, the population comprises Small and Medium-sized Enterprises (SMEs) operating within Ghana's business environment. SMEs form the backbone of the Ghanaian economy, contributing significantly to employment creation, poverty reduction, and national output. These enterprises are broadly categorized into service-oriented firms, such as those in hospitality, trade, and finance, and non-service firms, which include those in agriculture, agro-processing, construction, and manufacturing. Collectively, SMEs engage in diverse economic activities that span agriculture, industry, and services, reflecting their vital role in driving innovation, promoting inclusive economic growth, and supporting sustainable development.

Data Collection Method

Data collection is a critical component of the research process, as it provides the foundation upon which conclusions are drawn and research questions are answered (Saunders et al., 2009; Kumar, 2019). The method of data collection is influenced by the research objectives, the chosen methodology, the availability and reliability of data, and ethical considerations. While common primary data collection techniques include interviews, surveys, and observations, the use of secondary data is also a well-established and valid approach, particularly in quantitative research (Creswell, 2013).

This study relies on secondary data as its source of data. Secondary data refers to data that has already been collected, processed, and made available by other researchers, institutions, or organizations. The use of secondary data is appropriate given the quantitative and explanatory nature of the study, as well as the research

objectives, which aim to assess existing patterns and relationships between green innovation adoption and business performance among SMEs in Ghana.

The data used in this study was extracted from reputable, publicly available sources, such as Ghana Statistical Service (GSS 2024a, GSS 2024b), World Bank Enterprise Surveys ((World Bank Enterprise Survey, 2023), and United Nations Development Programme (UNDP, 2022) reports. These sources provided relevant indicators on SME characteristics, green innovation activities, performance metrics, and contextual variables necessary to fulfill the study's objectives. The decision to use secondary data also ensured greater efficiency, cost-effectiveness, and access to a broader and more diverse sample than would have been possible through primary data collection alone.

Moreover, the use of secondary data aligns with the study's positivist paradigm, which emphasizes objectivity, empirical measurement, and replicability. The data was carefully selected based on its reliability, validity, and relevance to the study's research questions, and it was subjected to additional screening and preprocessing to ensure consistency and suitability for analysis.

Validity and Reliability

In this study, reliability and validity are two important criteria that must be satisfied for the results to be trusted (Hair et al., 2019). Given that the research is based on secondary data, it is essential to critically evaluate the quality, consistency, and appropriateness of the data sources used. Reliability refers to the degree to which the data are consistent, dependable, and free from random error, while validity pertains to the extent to which the data accurately represent the constructs being studied, in this case, green innovation adoption among SMEs.

To ensure reliability, the secondary data sources selected were obtained from reputable and authoritative institutions such as the Ghana Statistical Service (GSS), World Bank Enterprise Surveys, and United Nations Development Programme (UNDP) reports. These sources are known for employing standardized data collection procedures, rigorous data verification processes, and robust sampling techniques, which help to reduce the likelihood of measurement errors or inconsistencies. Where possible, variables were cross-validated across multiple datasets to confirm internal consistency and temporal reliability.

Regarding validity, special attention was paid to the construct validity of the variables representing green innovation. This involved evaluating whether the indicators used in the secondary datasets align with widely accepted definitions of green innovation, such as green product innovation, green process innovation and green marketing innovation. Efforts were made to ensure that the operationalization of these variables reflected the theoretical dimensions outlined in existing literature (OECD, 2009; Kemp and Pearson, 2008). Additionally, content validity was assessed by reviewing the scope and coverage of the data, confirming that it included SMEs across various sectors and regions in Ghana, thereby supporting generalizability. The study also considered the external validity of the findings by examining the representativeness of the sample and the data collection context.

Ethical Consideration

Ethical considerations are essential in all research activities to ensure the protection of data, the integrity of the research process, and the respect for the rights of individuals and organizations involved (Saunders et al., 2009; Kumar, 2018). Although this study relied on secondary data, which typically poses fewer ethical risks than primary data collection, appropriate ethical protocols were still observed.

Firstly, the secondary data sources used in this study were obtained from reputable and publicly available databases or reports, ensuring that the data was collected and published in accordance with relevant ethical standards. No personal or identifiable information was used, and all datasets were anonymized prior to analysis.

Secondly, the researcher ensured proper citation and acknowledgment of all data sources to avoid issues of plagiarism and intellectual property infringement. All literature, models, and datasets referenced in the study were appropriately credited to their original authors or institutions.

Thirdly, as part of academic integrity, the research process adhered to principles of transparency, objectivity, and honesty. The data was not manipulated, and findings were reported accurately.

In summary, the study was conducted in a manner that respected ethical standards in the use of secondary data, ensured academic integrity, and promoted the credibility and transparency of the research findings.

RESEARCH RESULTS

Introduction

This chapter presents the results of the study in Ghana. The analysis is based entirely on secondary data drawn from credible sources, including the Ghana Statistical Service (GSS), World Bank Enterprise Surveys, and United Nations Development Programme (UNDP) reports, covering the period of 2014 and 2024.

The chapter is structured around the study's specific objectives. First, it presents the characteristics of the SMEs and persons involved. Second, it examines the extent of green innovation adoption across different SME sectors in Ghana, identifying variations in uptake and sector-specific trends. Third, it analyzes the key drivers influencing the adoption of green innovations. Last, it evaluates the relationship between green innovation adoption and SME performance.

Use this

Demographic Information

This section presents the demographic profile of the number of persons engaged in Small and Medium-sized Enterprises (SMEs) in Ghana, drawing comparisons between the years 2014 and 2024. The analysis provides insights into how SME participation has evolved over the decade, reflecting both quantitative growth and structural shifts in the sector. By examining the data across these two periods, the study highlights not only the absolute increase in the number of people engaged in SMEs but also the underlying dynamics influencing this growth, including gender distribution, sectoral shifts, and the gradual adoption of sustainable practices such as green innovation.

Persons Engaged in SMEs

Based on the data retrieved, it was observed that approximately 3,383,206 individuals were engaged in Small and Medium-sized Enterprises (SMEs) in Ghana in 2014. Over the course of a decade, this figure witnessed a remarkable increase, reaching an estimated 6,901,719 individuals in 2024. This upward trajectory highlights the growing importance of SMEs as a critical source of employment and livelihood opportunities in the Ghanaian economy. The increase not only reflects the rapid expansion of SME activities across various sectors but also signals the increasing reliance of the Ghanaian labor force on this sector for sustainable economic engagement.

This significant growth in SME participation can be attributed to several factors, including government policies aimed at promoting entrepreneurship, the rise of youth-led enterprises, technological adoption that lowers barriers to entry, and the growing demand for locally produced goods and services. The expansion also underscores the role of SMEs in reducing unemployment and addressing socio-economic challenges such as poverty and income inequality. Moreover, as globalization and digitalization continue to reshape business practices, SMEs in Ghana have become more dynamic and adaptable, creating room for innovation and competitiveness both locally and internationally.

Figure 4.1 below provides a pictorial view of this distribution, offering a visual representation of the drastic increase in SME engagement between 2014 and 2024. This graphical illustration not only reinforces the numerical evidence but also provides a clearer understanding of the pace and scale of SME growth over the last decade.

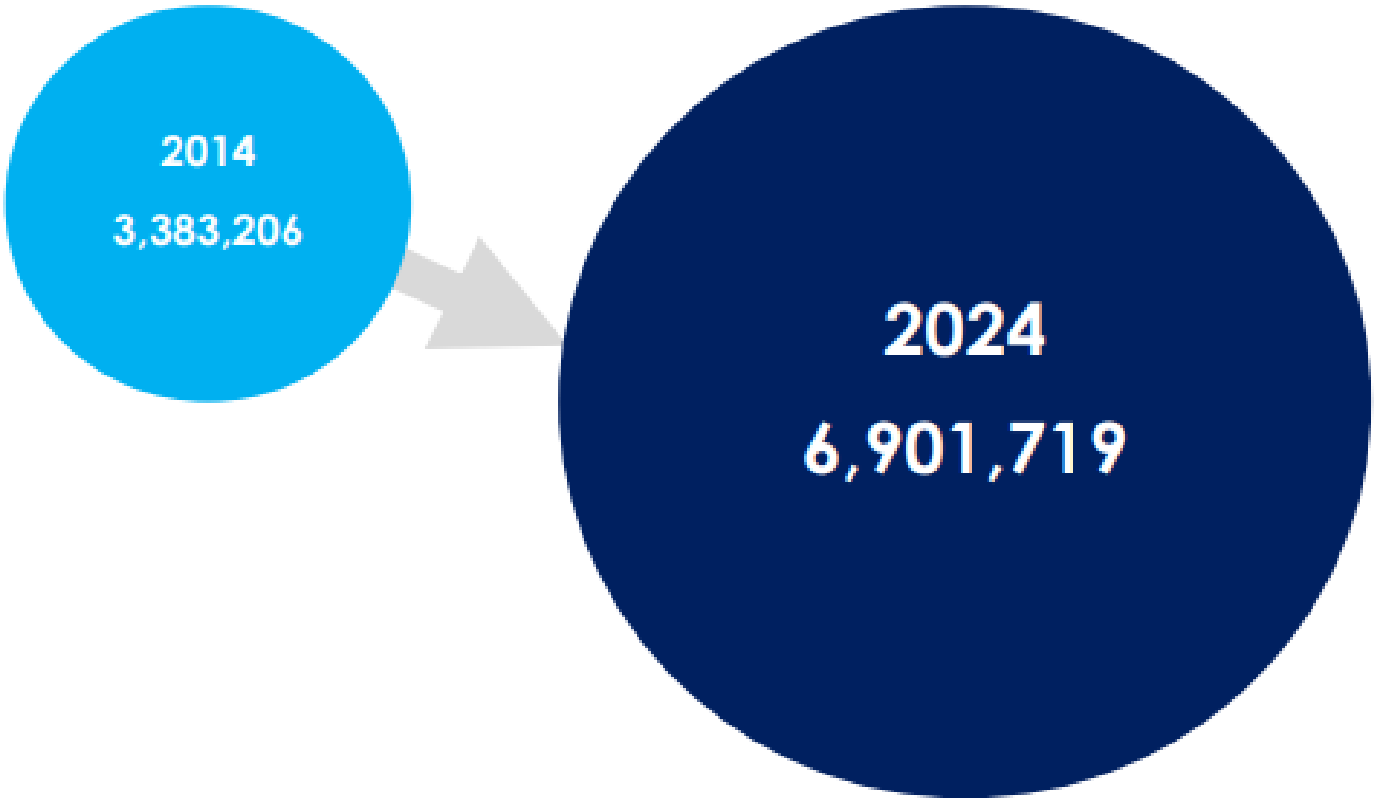

Figure 4.1: Persons engaged in SMEs in 2014 and 2024

Source: GSS (2024)

Gender of Persons Engaged in SMEs

Based on the gender distribution of individuals engaged in SMEs, the data revealed notable shifts over the ten-year period. In 2014, the majority of participants were males, representing 60.3% of the SME workforce, while females accounted for 39.7%. This indicates that, at the time, SME participation was largely male-dominated, reflecting broader socio-cultural and structural barriers that often, limited women's involvement in entrepreneurial and business activities.

However, by 2024, the trend had shifted significantly, with more females entering and actively participating in the SME sector. Females represented 50.9% of the SME workforce, surpassing their male counterparts, who accounted for 49.1%. This reversal highlights a critical transformation in gender dynamics within Ghana's SME sector. The increasing female participation can be attributed to several factors, including growing advocacy for women's empowerment, targeted government and non-governmental interventions such as women-focused entrepreneurial programs, improved access to microfinance and credit schemes, and broader societal acceptance of women in leadership and business roles.

This shift also underscores the importance of SMEs as a platform for enhancing gender inclusivity and promoting equitable economic participation. The rising involvement of women in SMEs not only contributes to household income and poverty reduction but also strengthens the resilience and diversity of the sector, as women are increasingly engaging in innovative and sustainable business practices.

Figure 4.2 below presents a pictorial view of this gender distribution, illustrating the transition from male dominance in 2014 to a more female-driven SME sector by 2024. The visual representation underscores the magnitude of change and reinforces the importance of gender as a key dimension in understanding SME development trends in Ghana.

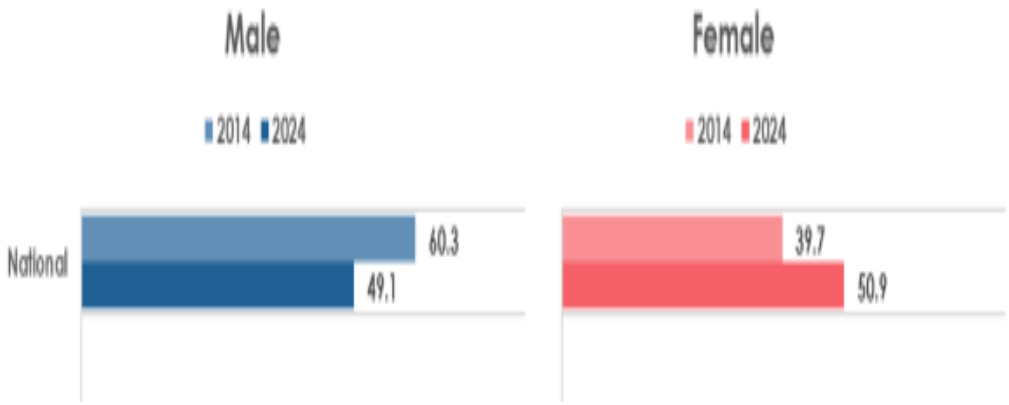

Figure 4.2: Gender of Persons engaged in SMEs in 2014 and 2024

Source: GSS (2024)

Sectors of SMEs

Based on the data, the SME sector in Ghana was categorized into three broad areas: industry, services, and agriculture. These sectors represent the key domains of economic activity where SMEs operate and contribute significantly to national development. In 2014, the service sector overwhelmingly dominated SME engagement, constituting 82.6% of total participation. This was followed by the industrial sector, which accounted for 17.0%, while agriculture recorded the least engagement, with only 0.4% of SME actors. The dominance of the service sector during this period can be attributed to the relatively lower entry barriers, the rise in demand for retail, hospitality, transportation, and financial services, and the increasing urbanization of Ghana's population.

By 2024, while the service sector still remained the largest employer of SME actors, notable changes in the distribution were observed. The share of SMEs in the service sector declined slightly to 76.7%, indicating a gradual diversification of SME activities into other sectors. The industrial sector experienced growth, rising to 21.1%, reflecting Ghana's broader industrialization agenda and government initiatives aimed at promoting value addition, manufacturing, and small-scale processing. Likewise, agriculture witnessed a significant, though still modest, increase to 2.2%. This shift in agricultural participation may be linked to renewed policies and programs encouraging agribusiness, agro-processing, and youth participation in modern farming, particularly under initiatives such as "Planting for Food and Jobs" and other value chain support programs.

The observed trend suggests a slow but steady rebalancing of SME engagement across sectors. While services continue to dominate, the growing presence of SMEs in industry and agriculture underscores the sector's potential in driving economic diversification, employment creation, and sustainable development. The rising share of industry highlights SMEs' increasing role in Ghana's efforts toward industrial transformation, while the modest growth in agriculture reflects the gradual modernization of the sector and the push to reduce overdependence on imports.

Figure 4.3 below provides a pictorial view of this distribution, clearly illustrating the sectoral shifts between 2014 and 2024. The visual representation emphasizes the dominance of the service sector but also makes evident the emerging significance of both industry and agriculture in Ghana's SME landscape.

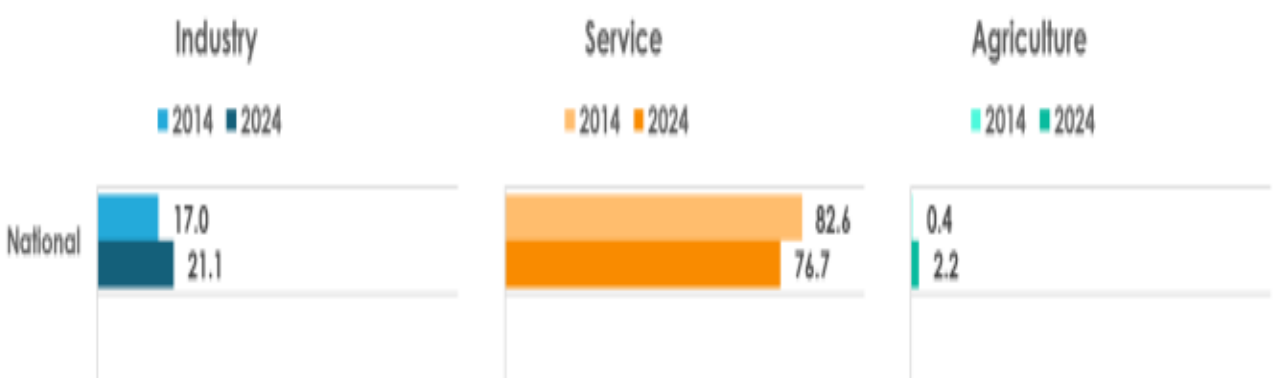

Figure 4.3: Sectors of SMEs in 2014 and 2024

Source: GSS (2024)

Sectors of SMEs with Green Innovation

Based on the available data, it was indicated that by 2024, the adoption of green innovation among SMEs in Ghana varied significantly across sectors. The agricultural sector recorded the highest proportion of green innovation practices, with 28.5% of SMEs engaging in such initiatives, compared to 71.5% that had not yet integrated green innovation into their operations. This relatively high adoption rate in agriculture can be attributed to the growing awareness of the sector's environmental footprint and the increasing emphasis on sustainable farming practices, organic production, and agro-processing. Policies promoting climate-smart agriculture, coupled with donor support and government interventions such as Planting for Food and Jobs and One District One Factory, may have encouraged SMEs in this sector to embrace green solutions to improve efficiency, reduce waste, and enhance competitiveness.

The industrial sector followed, with 20.6% of SMEs reported as engaging in green innovation, while 79.4% had not adopted such practices. Although the proportion is lower than in agriculture, the growth in this sector highlights a gradual shift toward more sustainable industrial processes. Factors driving this adoption may include increasing global and local pressure on manufacturing and processing firms to reduce emissions, minimize waste, and comply with environmental regulations. Additionally, SMEs within this sector may be motivated by cost-saving opportunities through energy efficiency, waste recycling, and the adoption of cleaner production technologies.

In the services sector, the adoption of green innovation was relatively lower, with only 19.5% of SMEs engaging in such practices, compared to 80.5% that had not. This outcome is unsurprising, as the service sector generally has a lower direct environmental impact compared to agriculture and industry. Nevertheless, the modest level of adoption reflects growing awareness of sustainability practices in areas such as eco-friendly hospitality, green logistics, digital services that reduce paper use, and the adoption of energy-efficient technologies in retail and office-based operations.

In summary, the agricultural sector emerged as the leading domain for green innovation adoption among SMEs in Ghana, followed by industry and services. This trend underscores the centrality of agriculture in the country's sustainability agenda, given its role in food security, rural employment, and environmental stewardship. The higher level of adoption in agriculture also demonstrates the responsiveness of SMEs to both market incentives (e.g., consumer demand for organic and sustainable products) and policy drivers (e.g., agricultural modernization initiatives). Figure 4.4 below provides a pictorial representation of the distribution, offering a clearer view of the comparative sectoral engagement in green innovation.

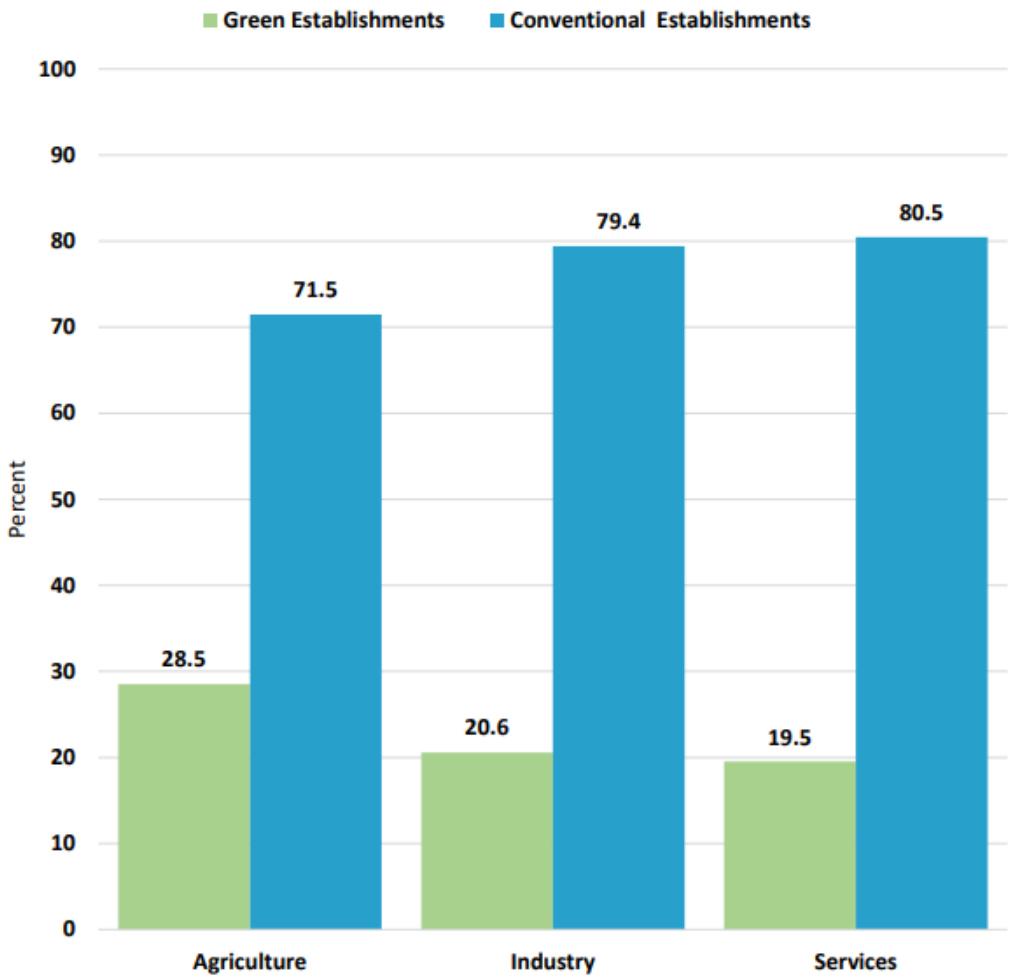

Figure 4.4: Sectors of SMEs with Green Innovation in 2014 and 2024

Source: GSS (2024)

Proportion of SMEs by Type of Trade and Status of Green Innovation

Based on the data available, it was indicated that by 2024, approximately 31% of SMEs engaged in external trade had implemented green innovations. This suggests that firms with access to international markets are more inclined to adopt sustainable practices, possibly due to exposure to global environmental standards, consumer demand for eco-friendly products, and the need to comply with international trade requirements. Many export markets, particularly in Europe and North America, have increasingly strict environmental regulations and certifications (such as ISO 14001 and eco-labeling schemes), which may push Ghanaian SMEs engaged in external trade to align their operations with green innovation practices. The relatively high adoption rate in this group also reflects the competitive advantage that green innovation provides in accessing and sustaining participation in global value chains.

In contrast, among SMEs that do not participate in external trade, only 18.9% reported engaging in green innovation. This lower adoption rate may be attributed to the fact that SMEs serving mainly domestic markets face less pressure to meet stringent environmental standards compared to export-oriented firms. Furthermore, limited financial resources, low awareness of sustainability benefits, and the absence of strict local enforcement of environmental regulations may also hinder domestic-focused SMEs from prioritizing green innovation. Nevertheless, the fact that nearly one-fifth of such SMEs have embraced green practices is encouraging, as it signals a gradual shift in awareness and recognition of the long-term benefits of sustainable operations, even in the absence of external trade pressures.

Figure 4.5 below provides a pictorial representation of the distribution, offering a clearer comparative view of green innovation adoption between SMEs engaged in external trade and those that are not.

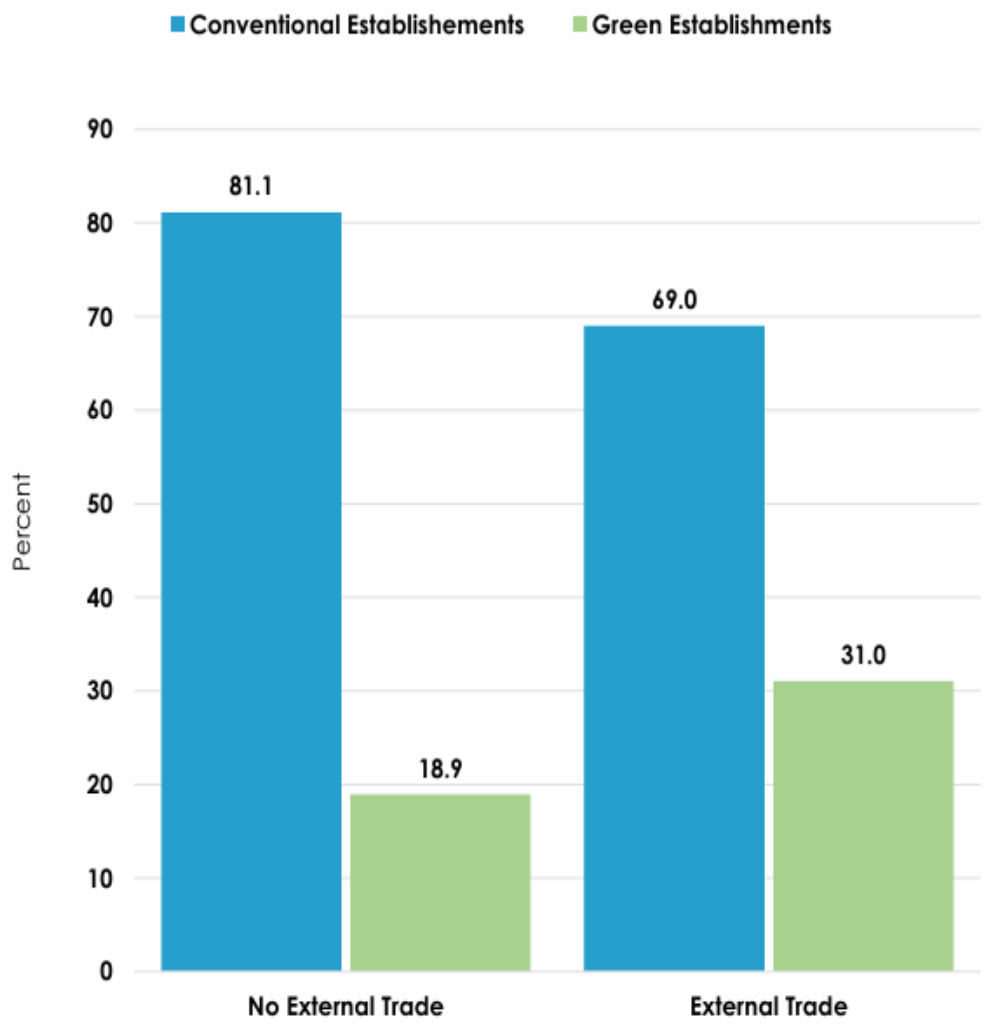

Figure 4.5: Proportion of SMEs by Type of Trade and Status of Green Innovation

Source: GSS (2024)

Objective One: The Extent of Green Innovation Adoption Among SMEs in Various Sectors in Ghana.

The Ghana Statistical Service has begun classifying "green" businesses in its economic census to capture sustainable business practices (GSS, 2024b). These sources confirm that, while green adoption is increasing overall, it remains concentrated in sectors with higher environmental footprints and stronger market or regulatory incentives to "go green" (Halonen, 2024).

Analysis of compiled SME data from 2014 to 2024 reveals a varying trend in the uptake of green innovations across Ghana's SME landscape. Agriculture SMEs consistently exhibit the highest green innovation adoption levels, followed by industry and services respectively (GSS, 2024a).

By 2024, green innovation adoption rates across all SMEs were relatively low, with most sectors reporting fewer than one in four firms implementing any environmentally friendly product or process. These patterns align with recent official statistics (GSS, 2024a).

Industrial and agricultural SMEs lead this transformation. Common innovations include the installation of energy-efficient machinery, water treatment and recycling systems, and the redesign of products for

biodegradability or recyclability. Adoption in these sectors has been encouraged by renewable energy subsidies, donor-funded programs promoting sustainable agriculture and industry, and export market requirements for environmental certification (Cooper, 2020) particularly in cocoa, cashew, and shea value chains.

The most frequent innovations include energy-efficient cement kilns, improved site waste management, and, to a lesser extent, the use of low-carbon building materials. Renewable energy integration, particularly small-scale solar systems, has been expanding in the utilities segment, aided by the Renewable Energy Act (2011) and subsequent energy efficiency campaigns (PURC, 2011).

SMEs in the service sector remain the least engaged in green innovation. Most initiatives in these sectors are limited to waste sorting, energy-efficient lighting, or basic energy conservation measures. These firms face persistent barriers, including limited financing for technological upgrades, minimal customer demand for certified green services, and relatively weak regulatory oversight compared to industry and agriculture (UNDP, 2022).

The trends between 2014 and 2024 indicate that Ghana's green transition within the SME sector is advancing, but unevenly. Relatively medium, more capital-intensive firms in high-impact sectors are driving adoption, while smallest businesses remain on the periphery. According to IMF and UNDP assessments, this reflects both the economic structure of Ghana, where SMEs account for approximately 90 percent of businesses, and the reality that only a subset of these enterprises possess the resources, market incentives, or regulatory pressures necessary to integrate sustainable practices.

Objective Two: Key Drivers Influencing Green Innovation Adoption Across SME Sectors

The determinants of green innovation adoption among Ghanaian SMEs between 2014 and 2024 reflect a combination of external pressures and internal capabilities. The literature reveals that regulatory requirements, market expectations, financial access, and firm characteristics are among the most influential drivers of green innovation adoption (Donbesuur et al., 2020; Odoom et al., 2025). SMEs exposed to stricter environmental regulations or serving environmentally conscious customer bases are more likely to invest in eco-friendly technologies and practices. This result resonates with earlier studies indicating that Ghanaian enterprises face "constant pressure" from regulators, local communities, and customers to minimize their environmental footprint. For instance, manufacturing SMEs supplying foreign markets frequently adopt cleaner production processes in order to meet buyer-imposed environmental standards, such as reduced carbon emissions, waste minimization, and compliance with eco-labeling schemes (Donbesuur et al., 2020).

Regulatory and market pressures act as both a push and a pull. On one hand, firms respond to formal environmental laws enforced by agencies such as the Environmental Protection Agency (EPA), which has increased its monitoring and enforcement activities since the mid-2010s. On the other hand, industry norms and buyer expectations, particularly in export-oriented value chains serve as strong incentives for adoption. ISO 14001 certification requirements, increasingly sought by international buyers, have also compelled many SMEs in industry and agriculture to integrate sustainability measures into their operations (Odoom et al., 2025). These compliance-driven innovations often take the form of energy-efficient machinery, wastewater treatment facilities, and pollution control systems.

Access to finance and technical support emerges as another decisive factor in green innovation uptake. SMEs that obtained dedicated "green finance" through bank loans, microfinance institutions, or donor-funded sustainability grants were between 1.5 and 2 times more likely to implement green innovations (GSS, 2024a). This finding underscores the importance of affordable and accessible financing mechanisms, as emphasized in policy briefs from agencies such as the UNDP and the International Finance Corporation (UNDP, 2022). Technical assistance also plays a pivotal role. Firms that participated in donor- or government-sponsored training, covering topics such as renewable energy deployment, waste management systems, and eco-product design recorded measurably higher adoption rates (Donbesuur et al., 2020). In many cases, such training is linked to tangible follow-up support, including subsidized equipment or demonstration projects, which reduced the perceived risk of adopting new technologies.

Firm-level characteristics further differentiate the likelihood of green innovation adoption. Relatively "larger" SMEs, both in terms of workforce and turnover are more inclined to integrate green innovation, owing to greater capital reserves, more structured management systems, and dedicated staff for compliance or corporate social responsibility (CSR) initiatives (UNDP, 2022). The personal values and orientation of management also matter. SMEs led by managers with a strong commitment to sustainability or active CSR engagement tend to be more proactive in seeking out and implementing green innovations. In contrast "smaller" SMEs, particularly those in the informal sectors, face persistent barriers such as inadequate access to credit, limited technical expertise, and low awareness of environmental issues (GSS, 2024b). These constraints not only delay adoption but, in some cases, prevent any consideration of green practices.

Overall, the period from 2014 to 2024 has seen a gradual strengthening of the drivers of green innovation adoption in Ghana's SME sector. Regulatory enforcement, market incentives, financing opportunities, and supportive training programs have together created a more enabling environment for sustainability-oriented change. However, without targeted interventions to overcome the structural barriers faced by smaller firms, adoption is likely to remain uneven across sectors and firm sizes.

Objective Three: The Influence of Green Innovation Adoption on Performance of SMEs

Evidence from secondary sources between 2014 and 2024 consistently shows that green innovation adoption is positively associated with improved performance among Ghanaian SMEs. Comparative findings from the World Bank Enterprise Survey (2023), Ghana Statistical Service (2024), and UNDP (2022) indicate that SMEs that have implemented green product or process innovations tend to achieve higher revenue growth, greater labor productivity, and stronger environmental compliance records compared to their non-adopting counterparts. For example, data from the 2023 Ghana Enterprise Survey reveal that industry and agriculture SMEs adopting green innovations recorded annual revenue growth rates in the range of 10–12%, compared to 4–6% for similar firms without such innovations (World Bank Enterprise Survey, 2023). These higher growth rates are often attributed to operational cost savings from energy efficiency, improved access to eco-sensitive markets, and enhanced brand reputation (UNDP, 2022; Singh et al., 2014).

Productivity gains also appear substantial. The World Bank Enterprise Survey (2023) reports that SMEs with active green innovations generate approximately 20–30% higher revenue per employee than firms without such initiatives, even when controlling for sector and size in their analysis. This aligns with literature suggesting that eco-efficiency measures, such as waste minimisation and resource optimisation, tend to reduce input costs and streamline production processes (Zhang et al., 2019). In addition, firms adopting green innovations are significantly more likely to comply with formal environmental standards. Ghanaian EPA compliance records and ISO 14001 certification data show that over 80% of green-innovating SMEs meet or exceed regulatory requirements, compared to roughly 45% of other SMEs (EPA Ghana, 2023). This suggests that compliance and innovation are mutually reinforcing, which means firms committed to sustainability are more proactive in aligning with environmental regulations, while the process of compliance itself often spurs further innovation (OECD, 2021). These patterns are consistent with the natural resource-based view (NRBV) theory, which posits that proactive environmental strategies can provide a source of competitive advantage (Hart, 1995; Hart and Dowell, 2011). In Ghana's context, the performance benefits associated with green innovation likely stem from a mix of cost reduction, improved productivity, access to environmentally conscious markets, and reputational capital (UNDP, 2022; World Bank Enterprise Survey, 2023). As highlighted by the UNDP (2022) and environmental policy reports, promoting green innovation among SMEs offers a "win–win" pathway, aligning economic performance with environmental stewardship. These findings lend support to Ghana's policy emphasis on green entrepreneurship, suggesting that scaling up green innovation could enhance both the competitiveness and environmental compliance of the SME sector (World Bank Enterprise Survey, 2023).

DISCUSSION OF RESULTS

Introduction

This chapter discusses the study's findings in relation to the reviewed literature, the natural resource-based view (NRBV) theory, and the stated research objectives. The purpose is to interpret the results presented in Chapter

Four, evaluate their implications, and situate them within the broader scholarly and policy context. The discussion addresses the research questions sequentially, drawing comparisons with relevant empirical studies and conceptual models.

Discussion of Results

This section presents and discusses the results of the study in direct relation to the stated research objectives. Each objective serves as a guide for organizing the findings, ensuring that the analysis remains aligned with the overall purpose of the research. By structuring the results around these objectives, the study provides a clear and systematic interpretation of the data, highlighting not only the descriptive statistics but also the underlying patterns and implications that emerge.

Objective One: The Extent of Green Innovation Adoption Among SMEs in Ghana

The first objective of this study was to assess the extent of green innovation adoption among small and medium-sized enterprises (SMEs) in Ghana across different sectors. The findings indicate that, although adoption has grown over the ten-year period (from 2014 to 2024), progress has been relatively modest, and the level of uptake remains uneven across sectors. Agriculture-based SMEs consistently recorded the highest levels of adoption, followed by those in the industrial or manufacturing sectors, while service-oriented SMEs lagged behind with comparatively minimal implementation of eco-friendly practices (GSS, 2024a). By 2024, fewer than one in four SMEs across most sectors had embraced green innovation in any substantial form, whether through eco-friendly products, resource-efficient processes, or sustainable management practices. This suggests that, despite increasing global and national emphasis on sustainability, green innovation has not yet become a mainstream operational feature of SMEs in Ghana.

These sectoral patterns are consistent with wider regional and international evidence. The OECD (2021) and UNDP (2022) both report that in developing economies, green innovation adoption tends to be concentrated in resource-intensive sectors where environmental footprints are more visible and regulatory oversight is stronger. For instance, agricultural SMEs across sub-Saharan Africa have been at the forefront of sustainability initiatives, largely due to donor-led sustainable farming programs and external trade requirements. Studies by Mbo and Adjasi (2017) and Mutoko et al. (2015) similarly demonstrate that agricultural enterprises are more likely to adopt green practices when international buyers demand certifications or when climate-smart agriculture is integrated into national policies. Ghana's trajectory therefore mirrors this continental trend, where adoption is driven not so much by voluntary strategic choice but rather by external pressures, trade-related requirements, donor influence, and sector-specific regulatory frameworks.

Interestingly, the Ghanaian findings diverge from experiences in more industrialized economies, particularly in relation to service-sector adoption. For example, Chao and Shih (2018) documented that service-oriented enterprises in Taiwan, especially those in tourism and hospitality, actively integrate sustainability practices, motivated both by eco-conscious consumer preferences and by stringent environmental regulations. Such enterprises invest in green buildings, eco-label certifications, and advanced waste management systems as part of their market positioning strategies. The contrast with Ghana underscores the influence of contextual factors such as consumer awareness, regulatory enforcement, and financing options. In Ghana, consumers of service-sector products often lack strong demand for green-certified options, and regulatory oversight in informal service industries remains weak, thereby reducing the incentives for SMEs in this sector to make sustainability a priority.

The findings also reinforce the theoretical propositions of the natural resource-based view (NRBV) theory. Hart (1995) argues that firms are more likely to develop and deploy environmental capabilities when such capabilities can be directly translated into competitive advantages, such as operational efficiency, cost savings, improved market access, or enhanced legitimacy. Within Ghana's SME landscape, medium-scale, capital-intensive enterprises, especially in agriculture and manufacturing appear to fulfill these conditions. For these firms, green innovation is not merely a compliance requirement but a strategic tool for competitiveness, enabling them to cut input costs, access export markets, and differentiate themselves from less innovative competitors (Hu et al., 2021).

On the other hand, micro and small enterprises, particularly in the service sector, often lack both the resources and the strategic incentives to adopt substantive environmental practices. Their participation in green innovation tends to be reactive rather than proactive, limited to meeting minimal compliance or engaging in symbolic gestures that do not translate into competitive advantage. This finding suggests that, without stronger policy frameworks, targeted financial incentives, and awareness campaigns to stimulate consumer demand, the diffusion of green innovation across Ghana's SME sector will remain highly uneven and concentrated in a few industries.

In sum, the result reveal both progress and persistent gaps in the adoption of green innovation by Ghanaian SMEs. While agriculture and industry have shown notable, though still limited, engagement, the service sector remains underdeveloped in this regard. The Ghanaian case highlights the importance of structural, regulatory, and market-based drivers in shaping adoption trajectories, and it suggests that unless broader enabling conditions are created, green innovation will remain confined to specific pockets of the SME sector rather than becoming a widespread business practice (Mensah, 2022). For policymakers, this underscores the need for sector-specific interventions by enhancing export-linked certifications in agriculture, scaling renewable energy incentives in industry, and creating consumer awareness and financing opportunities in services. By addressing these gaps, Ghana can accelerate the mainstreaming of green innovation across its SME landscape, positioning the sector to contribute more meaningfully to national sustainability and competitiveness goals.

Objective Two: Drivers Influencing Green Innovation Adoption

The second objective of the study focused on examining the key drivers influencing the adoption of green innovation among SMEs in Ghana. The findings revealed that regulatory pressures, market expectations, access to finance, technical support, and firm-level characteristics were the most significant determinants of adoption (Donbesuur et al., 2020; Odoom et al., 2025). Each of these drivers played a unique yet interrelated role in shaping the extent and nature of green practices among SMEs, reflecting both external institutional pressures and internal resource capabilities.

Regulatory and market pressures emerged as some of the strongest motivators for adoption. The results indicate that SMEs engaged in export-oriented activities were particularly influenced by stringent international environmental standards, such as ISO 14001 certification, fairtrade standards, and EU market compliance requirements (Odoom et al., 2025). Firms in agro-processing and horticulture, for instance, were compelled to adopt eco-friendly packaging, efficient water use, and waste management practices to meet European market entry requirements. This aligns closely with the propositions of the natural resource-based view (NRBV) theory, which emphasizes the importance of external stakeholder pressures in pushing firms towards environmentally responsible strategies (Hart, 1995; Hart and Dowell, 2011). The Ghanaian context mirrors patterns observed in other emerging economies; for instance, Ha and Ha and Bush (2010) reported that Vietnamese seafood exporters complied with international sustainability standards largely to retain access to foreign markets. Similarly, Mulaessa and Lin (2021) innovation-offset hypothesis supports the idea that well-designed environmental regulation can drive firms to adopt more efficient and competitive green practices, a dynamic also evident in Ghana's agro-processing SMEs serving global value chains.

Domestic market pressures also mattered. Consumer awareness of sustainability, though still nascent in Ghana compared to developed markets, is gradually increasing. Middle- and upper-class urban consumers, especially in Accra and Kumasi, show growing preference for eco-friendly products such as organic food, solar-powered appliances, and sustainably produced textiles (GSS, 2024b). SMEs that responded to these market signals were more likely to differentiate themselves and secure niche market segments. This shows that consumer-driven green demand, although weaker than export-driven regulation, is beginning to shape innovation choices in Ghanaian SMEs.

In addition to external pressures, financial and technical support were found to be indispensable enablers of green innovation. SMEs that accessed green credit schemes, subsidies under Ghana's Renewable Energy Master Plan, or donor-led initiatives such as climate-smart agriculture programs were significantly more likely to adopt eco-friendly technologies (PURC, 2011). Green financing reduced the high upfront costs associated with renewable energy systems, energy-efficient machinery, and waste recycling infrastructure. For instance, SMEs in the construction sector adopting compressed earth blocks or solar roofing systems were largely those that accessed concessional loans or grants from development partners.

This finding resonates with Fuso Nerini et al. (2019), who argue that dedicated green financing instruments and knowledge transfer mechanisms reduce the uncertainty and risk perception associated with green investments in low- and middle-income countries. Within Ghana, initiatives supported by organizations such as UNDP, and the World Bank have provided technical training, grants, and capacity-building workshops, which in turn facilitated SME adoption of renewable energy technologies, waste management practices, and energy-efficient production processes (World bank enterprise survey, 2023; UNDP, 2022). For example, through the Ghana Climate Innovation Centre, SMEs received seed funding, mentorship, and market linkages, helping them commercialize sustainable products. Without such interventions, adoption would have been limited to larger, financially capable firms, leaving most SMEs behind.

The results also suggest that firm size and managerial orientation play a decisive role in determining the likelihood of green innovation adoption. Relatively "larger" SMEs, typically with formalized structures, better record-keeping systems, and dedicated managerial oversight, were more proactive in adopting sustainable practices. This aligns with Cassells and Lewis (2011), who argue that environmental management systems are more feasible in firms with sufficient administrative capacity and skilled managers. In Ghana, medium-sized enterprises in manufacturing and agro-processing sectors tended to show greater commitment to environmental audits, renewable energy adoption, and waste reduction programs compared to micro-enterprises.

Conversely, micro and small enterprises, especially those operating informally, faced structural barriers including limited financial resources, lack of awareness, and insufficient technical expertise. Informal mechanics in Suame Magazine, for instance, often continue using environmentally harmful practices such as open-air spray painting and poor waste disposal due to lack of training and financing. The OECD (2021) similarly reported that microenterprises across developing countries lag in adopting green practices due to resource constraints, confirming that structural limitations persist in Ghana's SME landscape.

A particularly novel insight from this study is the interactive effect among the identified drivers. Regulatory and market pressures were most effective in stimulating green innovation only when coupled with access to finance and technical support. Without adequate enabling infrastructure, regulatory requirements often risked being perceived as punitive compliance burdens rather than innovation opportunities (World bank enterprise survey, 2023). For example, SMEs that were required to meet environmental standards but lacked access to affordable financing or technical expertise often failed to comply, exited export markets, or engaged in superficial compliance without meaningful innovation.

This finding extends the NRBV theory by highlighting that while external pressures can act as important triggers, their effectiveness depends on the internal availability of complementary resources and capabilities. Thus, adoption is not solely dependent on external requirements or internal resources but rather on the synergy between the two.

Overall, the findings reinforce the argument that successful adoption of green innovation in Ghanaian SMEs is contingent on both push and pull factors, which include push from regulators and markets, and pull through financial, technical, and managerial capacities (Oduro, 2020). This suggests that policies designed to promote green innovation should adopt a holistic and integrated approach, ensuring that compliance demands are matched with accessible support mechanisms. For Ghana, this means strengthening SME-targeted financing schemes, scaling up technical training, and creating enabling policy frameworks that encourage innovation rather than impose unmanageable costs on already resource-constrained firms.

Moreover, sector-specific interventions may yield greater impact. For instance, agro-processing SMEs could benefit from targeted support in waste-to-energy technologies, while construction SMEs might be incentivized through green building codes and subsidized access to eco-materials. Similarly, textiles and fashion SMEs could be supported with eco-labeling schemes to capture sustainability-conscious consumer segments locally and abroad.

In conclusion, the adoption of green innovation among Ghanaian SMEs is driven by a combination of regulatory requirements, market incentives, financial and technical support, and firm-level capabilities. However, the interaction between these drivers is what truly determines the extent and effectiveness of adoption. Recognizing this interplay allows policymakers, development partners, and SME associations to design interventions that not only create external pressure but also build the internal capacity of SMEs to respond, thereby ensuring that green innovation becomes both a compliance necessity and a strategic advantage.

Objective Three: The Influence of Green Innovation Adoption on Performance of SMEs

The third objective of this study focused on assessing the relationship between the adoption of green innovation and the performance of SMEs in Ghana, with performance measured through three main indicators: revenue growth, productivity, and environmental compliance. The results reveal a striking performance differential between adopters and non-adopters. SMEs that adopt green innovations consistently outperform non-adopters across all three dimensions, indicating that environmentally sustainable practices contribute directly to the growth and competitiveness of small firms (UNDP, 2022; World bank enterprise survey, 2023). Specifically, adopting SMEs reported revenue growth rates nearly double those of their non-adopting counterparts and productivity advantages ranging between 20–30% in terms of revenue per employee (UNDP, 2022). These findings demonstrate that, even in resource-constrained environments such as Ghana, green innovation transcends being a mere compliance requirement; instead, it functions as a deliberate performance-enhancing strategy.

From a theoretical standpoint, these results strongly reinforce the central claim of the natural resource-based view (NRBV) theory. Hart (1995) argues that environmental capabilities represent valuable, rare, inimitable, and non-substitutable resources that firms can leverage to achieve sustained competitive advantage. In the Ghanaian SME context, this theory finds empirical support which argues that firms that integrate eco-friendly processes not only differentiate themselves but also build capabilities that competitors find difficult to replicate. In this sense, adopting green innovation allows SMEs to strengthen their market position while addressing environmental challenges.

The evidence also aligns with Porter's Hypothesis (Porter and van der Linde, 1995), which challenges the traditional view that environmental regulation or innovation imposes an economic burden. Instead, the hypothesis argues that well-designed environmental practices generate "win–win" outcomes by reducing waste, improving efficiency, and opening new market opportunities. For Ghanaian SMEs, the gains appear to emerge from several interconnected channels. First, operational efficiency improves through reduced energy and raw material consumption, lowering production costs. Second, SMEs that adopt green practices gain improved market access, especially where compliance with international sustainability standards is a precondition for participating in global value chains. Third, green innovators enjoy reputational benefits, as environmentally responsible practices enhance brand value and credibility, particularly among urban and export-oriented consumers. These results echo findings from Zhang et al. (2020) in Chinese manufacturing SMEs and Sanni (2018) in Nigerian agribusinesses, both of which highlight efficiency gains, compliance advantages, and reputational benefits as major performance drivers of green innovation adoption.

More than 80% of innovating SMEs meet or exceed environmental regulatory requirements compared to only 45% of non-innovators (GSS, 2024b). This suggests that innovation and compliance reinforce one another. SMEs that proactively integrate eco-friendly processes are not only more resilient to policy changes but are also better positioned to capitalize on opportunities arising from evolving sustainability frameworks. For example, Ghana's increasing alignment with international environmental standards, coupled with stricter enforcement of domestic environmental laws, creates a business environment where proactive compliance is rewarded. This observation mirrors OECD (2021) research, which found that firms adopting proactive green strategies are less likely to face compliance-related penalties and more likely to achieve legitimacy in both domestic and international markets.

However, the Ghanaian case reveals important sectoral variations that nuance this relationship. The benefits of green innovation adoption are more pronounced among SMEs operating in export-oriented industries such as agro-processing, textiles, and light manufacturing, where compliance with international environmental standards is often a prerequisite for accessing global supply chains. These firms not only gain market legitimacy but also secure long-term contracts, which drive revenue growth. Similarly, SMEs participating in donor-funded sustainability initiatives often report improved productivity and competitiveness, partly due to financial support and capacity-building opportunities that accompany such programs (Fayyaz et al., 2017). Conversely, SMEs in purely domestic, low-margin sectors, particularly informal service providers and small-scale traders report weaker financial returns from green innovation, despite recognizing its environmental benefits (Makate et al., 2019). For these firms, limited consumer willingness to pay for sustainable products and the absence of export incentives reduce the financial motivation for adoption.

In theoretical terms, the findings extend the NRBV by demonstrating that environmental capabilities indeed function as a source of competitive advantage, but this advantage is not uniform across all sectors. Instead, it is contingent upon the existence of supportive ecosystems, including regulatory frameworks, market incentives, and institutional support structures. This suggests the need for a more context-sensitive application of NRBV theory, particularly in developing economies where institutional voids and market imperfections are more prevalent.

Moreover, reputational benefits played a role in strengthening the performance outcomes of adopters. SMEs engaging in green innovation often reported enhanced brand image, which helped in attracting environmentally conscious customers, investors, and partners (Khan et al., 2023). This reputational effect is particularly important in sectors such as food processing and export manufacturing, where credibility with international buyers depends heavily on compliance with sustainability standards. Reputational gains thus represent an intangible but strategically valuable resource that further reinforces the competitive advantage of green innovators.

Despite the positive outcomes, it is important to acknowledge that adoption costs remain a significant barrier, particularly for SMEs operating in sectors with limited profitability. Initial investments in green technologies, waste management systems, or certification processes can be substantial. Without external support, many SMEs may struggle to finance these innovations, even when long-term benefits are apparent. This explains the uneven distribution of performance benefits across sectors and underscores the importance of enabling conditions such as financing mechanisms, capacity-building programs, and policy incentives.

In conclusion, this study underscores that green innovation adoption significantly enhances SME performance in Ghana across revenue growth, productivity, and environmental compliance. The findings validate both NRBV theory and Porter's Hypothesis, while also emphasizing the critical role of contextual factors in shaping outcomes. Thus, while green innovation is a viable pathway for performance improvement, its success depends on a synergy between firm-level strategies and broader institutional and policy support.

CONCLUSION

Introduction

This chapter draws together the findings, theoretical implications, and practical relevance of this research. It provides a synthesis of the evidence presented in earlier chapters, highlighting the contribution this study makes to existing knowledge, the implications for policy and practice, and the broader relevance of its conclusions. In addition, the chapter reflects critically on the limitations of the study and proposes areas for future research.

Conclusion of the Study

This study set out to examine the extent, drivers, and performance implications of green innovation adoption among small and medium-sized enterprises (SMEs) in Ghana over the period 2014–2024, relying on credible secondary data from sources such as the Ghana Statistical Service, World Bank Enterprise Survey, and UNDP. The analysis revealed that adoption of green innovation has been progressive but uneven across sectors. Agriculture and industry have consistently led the way in implementing eco-friendly practices, while the service sector has shown relatively slower progress, pointing to sector-specific challenges and opportunities.

The findings show that adoption is not random but influenced by a blend of external pressures and internal capacities. Among the external drivers, regulatory enforcement, environmental certification demands, and market requirements, particularly from eco-conscious consumers and international buyers played decisive roles. On the internal side, firms with better access to finance, availability of technical training, and strong leadership committed to sustainability were more likely to embrace green practices. The interplay of these external and internal factors indicates that green innovation thrives where institutional pressure aligns with organizational readiness.

With respect to performance outcomes, the results demonstrated a consistent advantage for SMEs that have adopted green innovation. Firms that implemented green innovations reported superior revenue growth, higher

productivity, and stronger compliance with environmental standards compared to non-adopters. These performance gains were largely attributable to resource efficiency (such as reduced energy and input costs), expanded market opportunities, and improved legitimacy with regulators and stakeholders. The pattern reinforces the idea that environmental practices are not merely compliance-driven but can yield tangible business value.

Moreover, the study underscores the relevance of the natural resource-based view (NRBV) theory, which argues that environmental capabilities can be harnessed for long-term competitive advantage. In the Ghanaian SME context, green innovation adoption emerges as both a survival strategy in increasingly regulated markets and a growth strategy in markets, where environmental credentials influence buyer preferences.

Taken together, the evidence suggests that while adoption levels differ across sectors, the benefits for performance are clear and measurable. Green innovation adoption is therefore not peripheral to SME growth but a core strategic pathway that aligns business success with sustainable development objectives.

Contributions of the Study

This study makes several original contributions to academic knowledge and practical policy-making, advancing both theoretical understanding and real-world application. On the academic front, it adds to the limited body of literature on green innovation adoption among SMEs in developing economies, particularly within the Ghanaian context, where research remains relatively scarce. At the same time, it offers practical value by generating evidence-based insights that can guide policymakers, development agencies, and SME managers in designing and implementing strategies that promote sustainable business practices while enhancing competitiveness and long-term growth.

Theoretical Contribution

This study makes several important contributions to theory, particularly through the application and extension of the natural resource-based view (NRBV) theory within the context of a developing economy. The findings confirm that environmental capabilities, such as the ability to adopt green innovations, can serve as strategic resources that yield competitive advantages for SMEs in Ghana. Whereas most applications of NRBV have been situated in developed economies, this study provides empirical evidence that the same strategic logic holds in emerging markets. However, it also highlights that the pace and breadth of adoption are influened by sectoral characteristics and persistent resource constraints, suggesting that NRBV's assumptions must be contextualized when applied in developing-country settings.

Beyond advancing NRBV, the study enriches the broader literature on innovation diffusion by uncovering sectoral differences in adoption. Agriculture and industry were found to exhibit relatively higher levels of green innovation adoption compared to the service sector. This variation underscores the role of environmental impact intensity, export orientation, and regulatory exposure as critical determinants of adoption. By identifying these patterns, the study argues for a refinement of generic innovation diffusion models to account for industry-level dynamics, which are often overlooked in universalist frameworks.

Furthermore, the study extends theoretical models by explicitly integrating the interplay of "push" and "pull" factors as joint drivers of green innovation adoption. While many prior frameworks treat regulatory enforcement and environmental laws (push factors) separately from market demand and export requirements (pull factors), the evidence here shows that their combined influence is particularly potent in resource-constrained environments like Ghana. This integrated perspective helps advance theory by demonstrating how institutional pressures and market opportunities reinforce each other to accelerate adoption.

The findings also contribute to behavioural theories of the firm by showing that firm-level agency, particularly leadership commitment to sustainability, is central in shaping adoption decisions. Even in the face of external constraints, SMEs with sustainability-oriented leaders, stronger financial capacity, trained staff, and structured management systems were significantly more likely to adopt green innovations. This supports theoretical claims

that organizational routines and leadership behaviours act as filters through which external pressures are translated into strategic action.

Taken together, these contributions provide a more nuanced theoretical understanding of green innovation adoption in developing economies. They extend NRBV by contextualizing its assumptions, enrich diffusion theory with sector-sensitive insights, integrate push–pull dynamics into adoption models, and reaffirm the behavioural dimensions of firm-level decision-making.

Practical Implications

The findings also carry significant practical implications for policymakers, business leaders, and other practitioners who are concerned with advancing sustainability through SME participation. For policymakers, the evidence underscores the importance of designing sector-specific interventions rather than adopting one-size-fits-all policies. Agriculture and industry, which already demonstrate relatively higher levels of adoption, could be further supported through export-oriented environmental standards, fiscal incentives such as tax reliefs, and targeted investment schemes in eco-friendly technologies. Conversely, the service sector which lags behind in adoption requires interventions that prioritize awareness creation and technical empowerment. Awareness campaigns, professional training programs, and targeted subsidies can help service-oriented SMEs overcome their relatively low knowledge base and technical capacity barriers, thereby bringing them into the green innovation landscape.

A second practical implication concerns the critical role of financing mechanisms. The study finds that access to finance acts as a decisive enabler of adoption, reinforcing the need for innovative green financing models. Governments, financial institutions, and international development partners should collaborate to expand the range and accessibility of dedicated financial instruments, such as low-interest green loans, specialized credit lines, and sustainability-linked grants. These instruments would allow SMEs to adopt environmentally friendly technologies without jeopardizing liquidity, profitability, or business continuity. In addition, risk-sharing mechanisms such as loan guarantees and insurance schemes could further reduce the perceived risks of investing in green innovations, especially in volatile market environments.

Another pressing implication relates to capacity-building and knowledge transfer. Many SMEs lack the technical know-how to adopt and sustain complex green innovations, even when financial resources are made available. To address this, multi-stakeholder partnerships between government agencies, universities, technical training institutes, industry associations, and donor organizations could be developed. Such collaborations could deliver tailored training programs, demonstration projects, and advisory services that provide hands-on exposure to sustainable practices. Over time, these initiatives would help to build an ecosystem of technical expertise that SMEs could readily access, reducing their dependency on external consultants or imported solutions.

The study also emphasizes the importance of market-driven incentives. Export markets and environmentally conscious domestic consumers represent powerful sources of demand that can accelerate the uptake of green innovations. SMEs could therefore be supported in obtaining international eco-certifications, such as ISO 14001 or related sustainability standards, which would not only strengthen regulatory compliance but also enhance competitiveness in both local and global markets. Governments and trade promotion agencies could facilitate this process by subsidizing certification costs, offering training on compliance procedures, and negotiating trade agreements that reward environmentally sustainable practices.

Finally, the practical lessons of this study extend beyond Ghana. Since many African and lower-middle-income countries share similar SME structures, institutional constraints, and sustainability challenges, the strategies identified here are highly transferable. Adapting these measures to comparable contexts could contribute to a broader regional or continental transition toward sustainable economic development. By simultaneously strengthening financial access, building technical capacity, and aligning market incentives, policymakers and practitioners can create a more enabling environment that supports SMEs in becoming active agents of green innovation and long-term sustainability.

Limitations and Recommendations for Future Research

While this study provides valuable insights into the adoption of green innovations among SMEs in Ghana, certain limitations must be acknowledged, each of which points to opportunities for further research.

First, the study relied exclusively on secondary data from reputable sources such as the Ghana Statistical Service, World Bank Enterprise Surveys, and UNDP reports. While these datasets are robust and reliable, the absence of primary data collection limits the ability to capture nuanced firm-level experiences, motivations, and challenges that may not be reflected in aggregated statistics. This also restricts the contextual richness that could be derived from first-hand perspectives of SME owners and managers. Future research should therefore incorporate primary data collection methods, such as surveys, interviews, and focus groups to provide a more holistic understanding of adoption behaviours, organizational cultures, and managerial attitudes toward green innovation.

Second, the scope of the study was confined to SMEs operating in Ghana. Although the findings may be relevant to economies with similar structures and institutional frameworks, differences in regulatory regimes, cultural attitudes toward sustainability, and financial market conditions mean that the results should not be generalized too broadly. Future studies could expand the scope by adopting cross-country comparative analyses across Sub-Saharan Africa or other developing regions to examine similarities and differences in adoption drivers. Such comparative research would help determine whether the Ghanaian experience represents a broader pattern or is country-specific.

Third, the study focused mainly on adoption drivers and performance outcomes, but it did not sufficiently account for firm heterogeneity. SMEs vary widely in terms of size, ownership structure, sector, technological orientation, and market engagement, which may significantly influence their ability to implement green practices. Future studies could adopt a disaggregated approach, exploring how firm characteristics (e.g., micro vs. small vs. medium enterprises, family-owned vs. corporate-owned SMEs) shape the nature and extent of green innovation adoption.

Fourth, the study did not consider the role of external shocks and dynamic market conditions in influencing adoption behaviour. For instance, global supply chain disruptions, energy crises, or pandemics such as COVID-19 may accelerate or hinder green innovation investments. Future research should investigate how SMEs navigate green innovation adoption during periods of crisis or uncertainty, and whether resilience-building strategies can strengthen environmental performance.

Fifth, the analysis was limited to environmental innovation adoption without considering the broader dimensions of sustainability such as social and governance practices. Future studies could integrate social sustainability measures, such as labour rights, employee well-being, and community engagement into the framework, thereby providing a more comprehensive view of SME contributions to sustainable development.

In sum, while this study sheds light on an underexplored but critical issue, future research should address these limitations by broadening methodological approaches, expanding geographical scope, incorporating firm heterogeneity, considering dynamic market conditions, and integrating wider sustainability dimensions. This would provide a richer and more comprehensive understanding of how SMEs in developing economies can successfully transition toward environmentally sustainable practices.

REFERENCE

1. Abdallah, A.B., Al-Ghwayeen, W.S., Al-Amayreh, E.A.M. and Sweis, R.J., 2024. The impact of green supply chain management on circular economy performance: The mediating roles of green innovations. Logistics, 8(1), p.20.
2. Aboelmaged, M., 2018. The drivers of sustainable manufacturing practices in Egyptian SMEs and their impact on competitive capabilities: A PLS-SEM model. Journal of Cleaner Production, 175, pp.207-221.
3. Afum, E., Agyabeng-Mensah, Y., Baah, C., Acquah, I.S.K. and Osei, M.B., 2024. Empirical evidence of SMEs' ecopreneurship posture, green competitiveness and community-based performance: the neglected missing linkages of green practices. International Journal of Emerging Markets, 19(10), pp.2691-2711.

4. Ali, A., Jiang, X., Ali, A. and Qadeer, A., 2023. A moderated mediation model linking entrepreneurial leadership to green innovation: An upper echelons theory perspective. Creativity and Innovation Management, 32(1), pp.41-57.
5. Alraja, M.N., Imran, R., Khashab, B.M. and Shah, M., 2022. Technological innovation, sustainable green practices and SMEs sustainable performance in times of crisis (COVID-19 pandemic). Information Systems Frontiers, 24(4), pp.1081-1105.
6. Asamoah, D., Acquah, I.N., Nuertey, D., Agyei-Owusu, B. and Kumi, C.A., 2024. Unpacking the role of green absorptive capacity in the relationship between green supply chain management practices and firm performance. Benchmarking: An international journal, 31(8), pp.2793-2818.
7. Asare, D., Abubakari, M. and Mahama, M., 2025. How much is enough? Understanding the Sustainable Financing Model of Green Businesses in Developing Countries–Focusing on Green Enterprises in Ghana. Climate Action in Ghana, p.201.
8. Banerjee, S.B., 2001. Managerial perceptions of corporate environmentalism: Interpretations from industry and strategic implications for organizations. Journal of management studies, 38(4), pp.489-513.
9. Barba-Sánchez, V. and Atienza-Sahuquillo, C., 2016. Environmental proactivity and environmental and economic performance: Evidence from the winery sector. Sustainability, 8(10), p.1014.
10. Carrillo-Hermosilla, J., Del Río, P. and Könnölä, T., 2010. Diversity of eco-innovations: Reflections from selected case studies. Journal of cleaner production, 18(10-11), pp.1073-1083.
11. Cassells, S. and Lewis, K., 2011. SMEs and environmental responsibility: do actions reflect attitudes?. Corporate Social Responsibility and Environmental Management, 18(3), pp.186-199.
12. Chao, M. and Shih, C.T., 2018. Customer service-focused HRM systems and firm performance: evidence from the service industry in Taiwan. The International Journal of Human Resource Management, 29(19), pp.2804-2826.
13. Chege, S.M. and Wang, D., 2020. The impact of technology transfer on agribusiness performance in Kenya. Technology analysis and strategic management, 32(3), pp.332-348.
14. Chen, C.W., 2024. A framework of hybrid method for developing optimal sustainable product strategies and sustainable product roadmap. Sustainability, 16(4), p.1374.
15. Chen, Y.S., Lai, S.B. and Wen, C.T., 2006. The influence of green innovation performance on corporate advantage in Taiwan. Journal of business ethics, pp.331-339.
16. Cooper, R., 2020. Donor support for climate change initiatives in the Middle East and North Africa.
17. Creswell, J.W., 2013. Steps in conducting a scholarly mixed methods study.
18. Dangelico, R.M., Pujari, D. and Pontrandolfo, P., 2017. Green product innovation in manufacturing firms: A sustainability-oriented dynamic capability perspective. Business strategy and the Environment, 26(4), pp.490-506.
19. del Rosario Reyes-Santiago, M., Sánchez-Medina, P.S. and Díaz-Pichardo, R., 2019. The influence of environmental dynamic capabilities on organizational and environmental performance of hotels: Evidence from Mexico. Journal of cleaner production, 227, pp.414-423.
20. Donbesuur, F., Ampong, G.O.A., Owusu-Yirenkyi, D. and Chu, I., 2020. Technological innovation, organizational innovation and international performance of SMEs: The moderating role of domestic institutional environment. Technological Forecasting and Social Change, 161, p.120252.
21. EPA Ghana. 2023. Annual Progress Report. Available at: https://cmo.epa.gov.gh/wp-content/uploads/2024/02/Article-6-Annual-Progress-Report-2023_final.pdf
22. Fayyaz, A., Lund-Thomsen, P. and Lindgreen, A., 2017. Industrial clusters and CSR in developing countries: The role of international donor funding. Journal of Business Ethics, 146(3), pp.619-637.
23. Fuso Nerini, F., Sovacool, B., Hughes, N., Cozzi, L., Cosgrave, E., Howells, M., Tavoni, M., Tomei, J., Zerriffi, H. and Milligan, B., 2019. Connecting climate action with other Sustainable Development Goals. Nature Sustainability, 2(8), pp.674-680.
24. García-Granero, E.M., Piedra-Muñoz, L. and Galdeano-Gómez, E., 2018. Eco-innovation measurement: A review of firm performance indicators. Journal of cleaner production, 191, pp.304-317.
25. Ghana Statistical Service (GSS) (2022). Ghana Statistical Service. Accessed from; https://www.statsghana.gov.gh/
26. Ghana Statistical Service (GSS). 2024a. Ghana 2024 integrated business establishment survey I (IBES I). Available at

https://statsghana.gov.gh/gssmain/fileUpload/pressrelease/IBES%20I_Volume%202%20report_Final.pdf
27. Ghana Statistical Service (GSS). 2024b. Ghana 2024 integrated business establishment survey I (IBES I). Available at https://statsghana.gov.gh/gssmain/fileUpload/pressrelease/IBES%20I_Volume%203%20main%20report_Final.pdf
28. Gomez-Trujillo, A.M., Gonzalez-Perez, M.A. and Baena-Rojas, J.J., 2024. Sustainable strategy as a lever for corporate legitimacy and long-term competitive advantage: an examination of an emerging market multinational. European Business Review, 36(1), pp.112-139.
29. Groening, C., Sarkis, J. and Zhu, Q., 2018. Green marketing consumer-level theory review: A compendium of applied theories and further research directions. Journal of cleaner production, 172, pp.1848-1866.
30. Ha, T.T.T. and Bush, S.R., 2010. Transformations of Vietnamese shrimp aquaculture policy: empirical evidence from the Mekong Delta. Environment and Planning C: Government and Policy, 28(6), pp.1101-1119.
31. Hair, J.F., Risher, J.J., Sarstedt, M. and Ringle, C.M., 2019. When to use and how to report the results of PLS-SEM. European business review, 31(1), pp.2-24.
32. Hall, P.V., O'Brien, T. and Woudsma, C., 2013. Environmental innovation and the role of stakeholder collaboration in West Coast port gateways. Research in Transportation Economics, 42(1), pp.87-96.
33. Halonen, H., 2024. Why do companies go green? Examining the drivers of sustainable self-regulation.
34. Hart, S.L. and Dowell, G., 2011. Invited editorial: A natural-resource-based view of the firm: Fifteen years after. Journal of management, 37(5), pp.1464-1479.
35. Hart, S.L., 1995. A natural-resource-based view of the firm. Academy of management review, 20(4), pp.986-1014.
36. Hart, S.L., 1995. A natural-resource-based view of the firm. Academy of management review, 20(4), pp.986-1014.
37. Herzallah, A.M., Iriqat, R.A.M., Zaki, K., Khalifa, G.S., Abdelfadel, T.A.A., Hamed, M.H. and Elnagar, A.K., 2025. Sustainable innovation as a catalyst: linking green supply chain practices to corporate reputation in emerging markets. Cleaner Logistics and Supply Chain, p.100245.
38. Hizarci-Payne, A.K., İpek, İ. and Kurt Gümüş, G., 2021. How environmental innovation influences firm performance: A meta-analytic review. Business Strategy and the Environment, 30(2), pp.1174-1190.
39. Hofstra, N. and Huisingh, D., 2014. Eco-innovations characterized: a taxonomic classification of relationships between humans and nature. Journal of Cleaner Production, 66, pp.459-468.
40. Horbach, J., 2008. Determinants of environmental innovation—New evidence from German panel data sources. Research policy, 37(1), pp.163-173.
41. Hu, Y., Sun, S. and Dai, Y., 2021. Environmental regulation, green innovation, and international competitiveness of manufacturing enterprises in China: From the perspective of heterogeneous regulatory tools. PLoS One, 16(3), p.e0249169.
42. Huber, J., 2008. Technological environmental innovations (TEIs) in a chain-analytical and life-cycle-analytical perspective. Journal of Cleaner Production, 16(18), pp.1980-1986.
43. Jain, S., Kalapurackal, J.J. and Balaji, V., 2024. Green Manufacturing and Performances in Apparel Export Industry: Mediating Role of Green Innovation. Environmental Research, Engineering and Management, 80(3), pp.99-110.
44. Kemp, R. and Pearson, P., 2007. Final report MEI project about measuring eco-innovation. UM Merit, Maastricht, 10(2), pp.1-120.
45. Kemp, R. and Pearson, P., 2008. Policy brief about measuring eco-innovation and Magazine/Newsletter articles. Maastricht: Um Merit.
46. Khan, A., Hussain, S. and Sampene, A.K., 2023. Investing in green intellectual capital to enhance green corporate image under the Influence of green innovation climate: A Case of Chinese Entrepreneurial SMEs. Journal of Cleaner Production, 418, p.138177.
47. Klewitz, J. and Hansen, E.G., 2014. Sustainability-oriented innovation of SMEs: a systematic review. Journal of cleaner production, 65, pp.57-75.
48. Kotler, P., 2011. Reinventing marketing to manage the environmental imperative. Journal of marketing, 75(4), pp.132-135.

49. Kumar, R., 2018. Research methodology: A step-by-step guide for beginners.
50. Le, T.T. and Ikram, M., 2022. Do sustainability innovation and firm competitiveness help improve firm performance? Evidence from the SME sector in Vietnam. Sustainable Production and Consumption, 29, pp.588-599.
51. Li, D., Zheng, M., Cao, C., Chen, X., Ren, S. and Huang, M., 2017. The impact of legitimacy pressure and corporate profitability on green innovation: Evidence from China top 100. Journal of cleaner production, 141, pp.41-49.
52. Liao, Z., 2018. Corporate culture, environmental innovation and financial performance. Business Strategy and the Environment, 27(8), pp.1368-1375.
53. López Pérez, G., García Sánchez, I.M. and Zafra Gómez, J.L., 2024. A systematic literature review and bibliometric analysis of eco-innovation on financial performance: Identifying barriers and drivers. Business Strategy and the Environment, 33(2), pp.1321-1340.
54. Makate, C., Makate, M., Siziba, S. and Sadomba, Z., 2019. The impact of innovation on the performance of small-to-medium informal metal-trade enterprises in Zimbabwe. Cogent Business and Management, 6(1), p.1625095.
55. Maldonado-Guzmán, G., Garza-Reyes, J.A. and Pinzón-Castro, Y., 2021. Eco-innovation and the circular economy in the automotive industry. Benchmarking: An International Journal, 28(2), pp.621-635.
56. Marín-Vinuesa, L.M., Scarpellini, S., Portillo-Tarragona, P. and Moneva, J.M., 2020. The impact of eco-innovation on performance through the measurement of financial resources and green patents. Organization and Environment, 33(2), pp.285-310.
57. Mbo, M. and Adjasi, C., 2017. Drivers of organizational performance in state owned enterprises. International journal of productivity and performance management, 66(3), pp.405-423.
58. Mensah, I., 2022. Entrepreneurial networking, innovation and sustainable growth of small enterprises in Ghana (Doctoral dissertation, University of Cape Coast).
59. Ministry of Employment and Labour Relations (MoELR) (2022). Ghana Green Jobs Strategy. Accra: Government of Ghana. Accessed from; https://www.melr.gov.gh
60. Mulaessa, N. and Lin, L., 2021. How do proactive environmental strategies affect green innovation? The moderating role of environmental regulations and firm performance. International Journal of Environmental Research and Public Health, 18(17), p.9083.
61. Mutoko, M.C., Ritho, C.N., Benhin, J.K. and Mbatia, O.L., 2015. Technical and allocative efficiency gains from integrated soil fertility management in the maize farming system of Kenya.
62. Nketsiah, I. and Van der Westhuizen, T., 2025. Sustainable Decision-Making for SME Resilience: The Role of Governance and Leadership in Ghana. In Building a Green Future Through Essential Decision-Making Competencies (pp. 527-552). IGI Global Scientific Publishing.
63. Odoom, R., Odoom, P.T., Amu, P.Y. and Adams, M., 2025. Sustainable digital marketing practices and consumer brand engagement–a brand reputation mediation investigation. Journal of Strategic Marketing, 33(2), pp.254-270.
64. Oduro, S. and Haylemariam, L.G., 2025. Effect of social and environmental sustainability on SME competitiveness: a meta-analytic review. Management Review Quarterly, pp.1-32.
65. Oduro, S., 2020. Exploring the barriers to SMEs' open innovation adoption in Ghana: A mixed research approach. International Journal of Innovation Science, 12(1), pp.21-51.
66. OECD, P.B., 2009. Sustainable manufacturing and eco-innovation: towards a green economy. Policy Brief-OECD Observer.
67. OECD. 2021. OECD Economic Outlook, Volume 2021 Issue 1. Available at: https://www.oecd.org/en/publications/2021/05/oecd-economic-outlook-volume-2021-issue-1_88e062cf.html
68. Omowole, B.M., Olufemi-Phillips, A.Q., Ofodile, O.C., Eyo-Udo, N.L. and Ewim, S.E., 2024. The role of SMEs in promoting urban economic development: A review of emerging economy strategies. Journal Name Unspecified.
69. Pan, X., Sinha, P. and Chen, X., 2021. Corporate social responsibility and eco-innovation: The triple bottom line perspective. Corporate Social Responsibility and Environmental Management, 28(1), pp.214-228.

70. Porter, M.E. and Linde, C.V.D., 1995. Toward a new conception of the environment-competitiveness relationship. Journal of economic perspectives, 9(4), pp.97-118.
71. Prabhakar, A. (2025). A Sustainable and Inclusive Economic Development: A Global Imperative: A Global Imperative. Journal of Recycling Economy and Sustainability Policy, 4(1), 1-16.
72. Prieto-Sandoval, V., Jaca, C. and Ormazabal, M., 2018. Towards a consensus on the circular economy. Journal of cleaner production, 179, pp.605-615.
73. PURC. 2011. Renewable Energy Act, 2011 (Act 832). Available at: https://www.purc.com.gh/attachment/631538-20201207031245.pdf
74. Qi, G.Y., Shen, L.Y., Zeng, S.X. and Jorge, O.J., 2010. The drivers for contractors' green innovation: an industry perspective. Journal of cleaner production, 18(14), pp.1358-1365.
75. Rennings, K., 2000. Redefining innovation—eco-innovation research and the contribution from ecological economics. Ecological economics, 32(2), pp.319-332.
76. Rodríguez-García, M., Guijarro-García, M. and Carrilero-Castillo, A., 2019. An overview of ecopreneurship, eco-innovation, and the ecological sector. Sustainability, 11(10), p.2909.
77. Rodríguez-Rebés, L., Navio-Marco, J. and Ibar-Alonso, R., 2021. Influence of organisational innovation and innovation in general on eco-innovation in European companies. Journal of Intellectual Capital, 22(5), pp.840-867.
78. Sanni, M., 2018. Drivers of eco-innovation in the manufacturing sector of Nigeria. Technological Forecasting and Social Change, 131, pp.303-314.
79. Saunders, M., Lewis, P. and Thornhill, A., 2009. Research methods for business students. Pearson education.
80. Saunders, M., Lewis, P. and Thornhill, A., 2009. Research methods for business students. Pearson education.
81. Seman, N.A.A., Govindan, K., Mardani, A., Zakuan, N., Saman, M.Z.M., Hooker, R.E. and Ozkul, S., 2019. The mediating effect of green innovation on the relationship between green supply chain management and environmental performance. Journal of cleaner production, 229, pp.115-127.
82. Singh, N., Park, Y.H., Tolmie, C.R. and Bartikowski, B., 2014. Green firm-specific advantages for enhancing environmental and economic performance. Global Business and Organizational Excellence, 34(1), pp.6-17.
83. Tsai, K.H. and Liao, Y.C., 2017. Innovation capacity and the implementation of eco-innovation: Toward a contingency perspective. Business Strategy and the Environment, 26(7), pp.1000-1013.
84. Ullah, A., 2025. Community and Institutional Drivers of Deforestation, Environmental Impacts, and Extension Interventions for Forest Management in the Hindu Kush Himalaya. Land Degradation and Development, 36(10), pp.3575-3586.
85. United Nations Conference on Trade and Development (2023). The potential of Africa to capture technology-intensive global supply chains. Accessed from:https://unctad.org/system/files/official-document/aldcafrica2023_en.pdf
86. United Nations Development Programme (UNDP). 2022. Annual Report. Available at: https://www.undp.org/sites/g/files/zskgke326/files/2023-04/Annual-Report-2022.pdf
87. Vence Deza, X. and PEREIRA, Á., 2018. Eco-innovation and Circular Business Models as drivers for a circular economy.
88. World Bank Enterprise Survey. 2023. Explore what businesses experience across the world Available at: https://www.enterprisesurveys.org/en/enterprisesurveys
89. Xie, X., Zhu, Q. and Wang, R., 2019. Turning green subsidies into sustainability: How green process innovation improves firms' green image. Business strategy and the environment, 28(7), pp.1416-1433.
90. Zhang, D., Rong, Z. and Ji, Q., 2019. Green innovation and firm performance: Evidence from listed companies in China. Resources, conservation and recycling, 144, pp.48-55.
91. Zhang, J., Adu Sarfo, P., Amankwah, O., George, N., Mohamed Wasaf, M., Appiah, A. and Bonzo, J.K., 2025. Harnessing the synergy between green organizational strategy and technological capability for sustainable development in SMEs in Sub-Saharan Africa. Business Process Management Journal.
92. Zhang, Y., Sun, J., Yang, Z. and Wang, Y., 2020. Critical success factors of green innovation: Technology, organization and environment readiness. Journal of cleaner production, 264, p.121701.