From Green Practices to Green Growth: Green Entrepreneurship, Resource Efficiency, and Sustainable Economic Performance among SMEs in Sunyani East and Sunyani West, Bono Region, Ghana

Ebenezer Sackey*

Department of Agricultural and Resource Economics, School of Agriculture and Technology, University of Energy and Natural Resources, Sunyani, Ghana.

***Corresponding Author**

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ABSTRACT

Small and medium companies (SMEs) are at the heart of Ghana's shift to greener, more resilient economic development. But the transition to greener methods of conducting business is also happening against a background of more immediate problems such as growing energy and material prices, availability of capital, and challenges around waste management. This research studied green entrepreneurship, resource efficiency and sustainable economic performance of 384 SMEs in Sunyani East and Sunyani West in the Bono Region of Ghana. The research used a quantitative cross-sectional survey approach to quantify green entrepreneurship via eight observable business activities. Overall, the results suggest that the level of green entrepreneurship activities among the assessed SMEs was modest with an average adoption rate of 45.74%. The most often reported practice was energy-efficiency measures, mentioned by 66.9 % of the organizations, followed by waste-reduction initiatives (61.7%). Meanwhile, the lowest was the adoption of renewable energy at 23.2%. Moreover, the data indicated a substantial positive association between green entrepreneurship and resource efficiency ($r = .717$, $p < .001$). Green entrepreneurship was also substantially connected with greater sustainable economic performance ($r = .558$, $p < 0.001$). Further insight into this link was offered by mediation analysis. Resource efficiency exhibited a significant indirect impact of 0.0088, 95% CI [0.0062, 0.0117], partial mediation. This implies that green entrepreneurship may enhance the economic performance of SMEs directly and indirectly by enabling enterprises to utilize energy, water, raw materials, and other resources more effectively. Still, many SMEs still struggle with implementing greener practices. The main constraints highlighted were limited access to funding and high initial costs for investments in green technology.

The results indicate that it is insufficient to promote corporate social responsibility alone for the promotion of SME-led green growth in Ghana. We need to make green investment financially feasible for SMEs by providing them with inexpensive green finance, suitable technologies, and practical resource-efficiency support.

Keywords: green entrepreneurship, sustainable economic performance, SMEs, green growth, resource efficiency, Bono Region, Ghana

INTRODUCTION

Background and Context

SMEs are an important part of many local economies. They generate employment, increase household income, link producers to markets, and supply goods and services that may be beyond the capacity of larger corporations to deliver efficiently. Their impact is particularly visible in Ghana in retail and wholesale trade, agro-processing, manufacturing, hospitality, transport, construction, repair services, and other service activities. But these companies are working in a context where the price and availability of energy, financing,

raw materials, water, and other productive factors are determining more their capacity to survive and to develop. At the same time, mounting concerns about climate change, waste, pollution, and inefficient use of resources are shifting focus to the question of how economic activity can grow without imposing unsustainable environmental costs.

The issue has upped the ante for green entrepreneurship. Green entrepreneurship encourages firms to find economic opportunities that involve the least waste, pollution, resource depletion, and other environmental problems and include environmental issues in entrepreneurial decision-making. This doesn't mean that an SME becomes a fully "green business" overnight. It may start with tangible gains such as using energy-efficient equipment, reducing material losses, conserving water, reusing or recycling waste, switching to more sustainable inputs and packaging, or rethinking goods and processes to use less. Some of the more capital-intensive techniques could be renewable-energy technology and greener industrial equipment.

With Ghana's move toward economic growth with climate and environmental obligations, the significance of these practices to Ghana has increased. Ghana's updated Nationally Determined Contribution (NDC) identifies renewable energy, energy efficiency, better waste management, sustainable production, and private sector participation as areas that are needed to support a more climate-resilient and lower-carbon development pathway (Ministry of Environment, Science, Technology, and Innovation [MESTI] & Environmental Protection Agency [EPA], 2021). Similarly, the World Bank's Ghana Country Climate and Development Report argues that climate-resilient and ecologically sustainable investment would be of greater importance to Ghana's long-term development prospects (World Bank, 2022). Further, the latest national economic data continues to underscore the importance of private businesses and productive sectors in the generation of employment and economic activity in Ghana (Ghana Statistical Service [GSS], 2024).

The question is no longer whether environmental sustainability is desirable. For SMEs, the more relevant question is whether greener ways of working can also make economic sense. For example, a company that reduces its use of power might reduce its environmental impact but also its monthly running costs. An agro-processing company that reduces raw material losses may also reduce waste and increase the volume of products available for sale from the same inputs. Resource loss can be minimized, and operational resilience can be strengthened through practices such as recycling, reuse, water conservation, sustainable sourcing, and enhancements in manufacturing processes. This option is a critical link between green entrepreneurship, resource efficiency, and sustainable economic performance.

Research Problem

Despite this potential, the transition from conventional business practices to greener operations remains difficult for many Ghanaian SMEs. The economic reality facing a small enterprise can make even an apparently beneficial environmental investment difficult to undertake. An owner may understand that solar energy could reduce electricity expenditure over time but still be unable to meet the initial investment cost. A processor may recognize that newer equipment would use energy and raw materials more efficiently but may not have access to affordable credit. Other businesses may want to recycle or use more environmentally preferable packaging but are hampered by a lack of infrastructure, high cost, inadequate technical information, or uncertain customer demand.

This creates a pragmatic tension between the long term benefits of green investment and the short term constraints within which SMEs operate. Ghana's policy direction is increasingly focused on environmental sustainability, but policy ambition alone does not reveal whether businesses are engaged in green practices or if those practices are yielding measurable economic benefits at the firm level. This difference is important because SMEs are not going to sustain green investment just to be good to the environment. But if such practices are to be widely adopted, owners and managers need to see how they can improve the way their businesses operate. The problem is very relevant in Sunyani East and Sunyani West in the Bono Region of Ghana. The two areas contain a diverse mix of SMEs whose environmental pressures and opportunities differ considerably. Agro-processing firms may be concerned with energy, water, organic waste, and raw-material losses; hotels and restaurants may face high electricity and water consumption alongside food and packaging waste; retail businesses may have opportunities in energy-efficient lighting, packaging, sourcing, and waste

reduction, while transport and manufacturing enterprises may have different fuel, technology, and production-efficiency challenges. Treating all these businesses simply as environmentally responsible or environmentally irresponsible overlooks this diversity.

What remains less clear is whether SMEs that adopt a broader range of green practices perform better economically and, importantly, why this might occur. This study argues that resource efficiency may provide part of the answer.

Earlier Work Has Demonstrated

Research on sustainable entrepreneurship has generally found that environmental problems can offer opportunities for entrepreneurial innovation, rather than being just additional business costs. Companies can respond in terms of cleaner technologies, better products, more efficient production systems, and new ways of adding value. This has increasingly been supported in current policy discussions on environmental sustainability, innovation, productivity and resilience, especially for firms with climate and resource related risks (World Bank, 2022). Resource efficiency is a particularly relevant strand of literature. Better energy use, material productivity, water management, waste prevention and circular use of resources could lower operating costs and reduce environmental pressure. Especially for the SMEs, small changes in recurring costs may have a significant impact on profit margins. and limited access to working capital." Sustainability is now a national conversation on energy, climate change, waste management, private sector development and economic transformation in Ghana. Ghana's climate commitments explicitly recognize the role expected of businesses in sectors including energy efficiency, renewable energy, sustainable production and waste management (MESTI & EPA, 2021). Similarly, the World Bank (2022) identifies private investment, resilience, resource management, and climate-compatible growth as critical elements for Ghana's future development.

Existing evidence therefore gives us good reasons to expect a positive relationship between greener business practices and enterprise outcomes. Though it is possible to show that environmental practices and performance are related, it does not fully clarify how the relationship happens.

Research Gaps

Three gaps are particularly important to the present study.

First, location-specific empirical evidence on green entrepreneurship among SMEs in Ghana's secondary urban economies remains limited. Much of the sustainability and enterprise discourse is national in orientation or is implicitly shaped by conditions in Ghana's largest metropolitan and industrial centres, particularly Accra and Tema. Yet the institutional and commercial environment confronting SMEs in secondary cities may be substantially different. Firms operating in Sunyani East and Sunyani West participate in expanding regional markets and rural-urban value chains but may operate with a different density of financial institutions, specialized technology suppliers, recycling infrastructure, technical services, and green-investment opportunities. Examining Sunyani therefore does more than fill a geographical gap. It provides evidence on how the green transition is developing within a sub-Saharan secondary urban economy where enterprise growth is important but the supporting infrastructure for environmentally oriented investment may be less developed than in major industrial metropolitan centres.

Second, previous research frequently focuses on environmental attitudes, intentions, awareness, or broad sustainability orientation. Such measures are useful, but positive environmental attitudes do not necessarily translate into changes in electricity consumption, material use, water management, packaging, waste management, sourcing, or production processes. The present study therefore focuses on observable green entrepreneurship practices, including energy efficiency, renewable energy, waste reduction, recycling and reuse, water conservation, sustainable sourcing, sustainable packaging, and green innovation.

Third, establishing an association between green entrepreneurship and business performance does not, by itself, explain the mechanism underlying that relationship. A theoretically plausible possibility is that resource efficiency partly accounts for the observed association because SMEs adopting a broader range of green

practices may also report more efficient use of electricity, water, raw materials, and other productive resources. The study therefore examines resource efficiency as an intermediate statistical pathway linking green entrepreneurship with sustainable economic performance.

Accordingly, the study moves beyond the question of whether green entrepreneurship and SME performance are related and examines whether resource efficiency helps explain the observed relationship under the institutional and financial conditions characterizing a secondary urban SME economy.

Importance of Study

Understanding this relationship is important for several reasons. For SME owners and managers, evidence that environmental practices improve resource productivity can make green entrepreneurship easier to evaluate as a business decision. Sustainability becomes less abstract when it can be connected to electricity savings, reduced material losses, lower operating expenses, greater productivity, or improved business resilience.

It is just as relevant to financial institutions. In cases where high upfront costs and limited access to finance prevent otherwise productive green investments, conventional SME credit arrangements may not be sufficient. Businesses themselves can provide evidence that can be used to inform green loans, equipment financing, leasing arrangements, credit guarantees, and other products designed around the expected savings from resource-efficient technologies.
The study offers locally grounded evidence to bolster the wider climate and sustainable-development agenda of Ghana at the policy level. The implementation of Ghana's climate commitments, which are partly dependent on private-sector participation (MESTI & EPA, 2021), is the result of thousands of individual investment and operational decisions. Hence, knowing what motivates and demotivates SMEs to take these decisions could help in linking national sustainability goals with local enterprise realities.

The study is also relevant to local authorities and enterprise-support institutions in the Bono Region. Evidence on barriers related to finance, technology, knowledge, infrastructure, policy support, and market demand can help distinguish interventions that businesses need from generic calls for greater environmental awareness.

Study Objectives

The main objective of the study is to examine how green entrepreneurship practices influence sustainable economic performance among SMEs in Sunyani East and Sunyani West, Ghana, with particular attention to the role of resource efficiency.

Specifically, the study seeks to:

1. Assess the extent to which SMEs have adopted green entrepreneurship practices.
2. Examine the effect of green entrepreneurship practices on resource efficiency.
3. Determine the effect of green entrepreneurship practices on sustainable economic performance.
4. Assess the relationship between resource efficiency and sustainable economic performance.
5. Determine whether resource efficiency mediates the relationship between green entrepreneurship and sustainable economic performance; and
6. Identify the major barriers limiting the adoption of green entrepreneurship practices among SMEs.

Research Hypotheses

Based on the proposed relationships, the following hypotheses are tested:

H1: Green entrepreneurship practices have a positive and significant effect on resource efficiency among SMEs.

H2: Green entrepreneurship practices have a positive and significant effect on sustainable economic performance among SMEs.

H3: Resource efficiency has a positive and significant effect on sustainable economic performance among SMEs.

H4: Resource efficiency plays a significant mediating role in the relationship between green entrepreneurship practices and the sustainable economic performance of SMEs.

Study Contribution

The paper offers three main contributions. First, it contributes to the geographical coverage of Ghanaian research on enterprise sustainability by providing place-specific evidence from Sunyani East and Sunyani West in Ghana's Bono Region. This is important because the opportunities and constraints for regional SMEs may be different from those for firms in the largest metropolitan and industrial centers of Ghana.

Second, the study looks at green entrepreneurship from the perspective of SMEs. By focusing on green entrepreneurship as a matter of observable practices rather than mere environmental attitudes, the study provides a more tangible picture of how sustainability is being integrated into the everyday operation of enterprise.

Third, the study develops the green entrepreneurship–performance relationship by examining resource efficiency as the mechanism connecting environmental practices to economic outcomes. The proposed pathway is therefore not simple:

Green Entrepreneurship → Economic Performance but Green Entrepreneurship → Resource Efficiency → Sustainable Economic Performance

This distinction has practical significance. If resource efficiency explains an important part of the relationship, the case for green entrepreneurship among Ghanaian SMEs becomes more tangible: reducing environmental pressure can also mean reducing wasted resources. In this way, the study reframes green growth not as an environmental agenda imposed on SMEs, but as a potential route through which businesses can become more efficient, resilient, and economically sustainable while contributing to Ghana's wider transition toward greener development.

Theoretical Framework And Literature Review

As businesses face the combined pressures of rising production costs, environmental degradation, climate risks, waste-management problems, and the need to remain competitive, green entrepreneurship has become increasingly relevant to Ghana's development conversation. But for SMEs, sustainability is seldom an abstract environmental issue. All have a direct financial impact: electricity consumption, fuel use, raw material losses, packaging, water use, and waste disposal. This makes green entrepreneurship especially pertinent in that it connects the enterprise's everyday economic decisions to environmental improvement.

The transition to environmentally sustainable development in Ghana increasingly calls for the involvement of the private sector. The country's updated Nationally Determined Contribution (NDC) to national climate action identifies renewable energy, energy efficiency, sustainable production, improved waste management and private sector engagement as key components (Ministry of Environment, Science, Technology and Innovation [MESTI] & Environmental Protection Agency [EPA], 2021). According to the World Bank (2022), Ghana should invest in climate resilience, cleaner energy, sustainable cities, and better management of natural resources to improve the country's future developmental trajectory. These priorities make SMEs important actors in the transition because small enterprises make up a significant part of the business landscape and employment base of Ghana (Ghana Statistical Service [GSS], 2015).

Green Entrepreneurship and Ghanaian SMEs

Green entrepreneurship is entrepreneurial activity that creates economic value by intentionally reducing environmental harm or addressing environmental problems through new products, technologies, services, or business practices. Green entrepreneurship does not view environmental protection as a cost but recognizes that environmental obstacles can be a source of innovation and enterprise development.

This is relevant in Ghana, as most SMEs operate in sectors whose activities depend directly on inputs such as energy, water, agricultural materials, packaging, transportation, and other natural or manufactured inputs. Consequently, environmental issues may affect businesses in agro-processing, hospitality, food services, manufacturing, construction, retail and transportation in various ways. But these sectors can incur extra costs from inefficient use of productive resources.

Ghana's environmental policy direction is increasingly recognizing the need for a change in production and consumption patterns. The National Climate Change Policy promotes climate-compatible development and integration of environment into economic activities (MESTI, 2013). More recently, Ghana's updated NDC has reinforced the focus on renewable energy, energy efficiency, waste management, and private-sector participation (MESTI & EPA, 2021). Ghana's National Plastics Management Policy also promotes a more circular approach to plastics including better recovery, recycling, reuse and responsible consumption (MESTI, 2020).
But for SMEs the policy commitments are only meaningful if they can be translated into concrete actions. A small restaurant reduces food and packaging waste, an agro-processor optimizing raw material use, a retailer moving to energy-efficient lighting, or a workshop adopting solar power are all participating in the green transition, but at different levels. Thus, this study does not define green entrepreneurship solely in terms of environmental consciousness or intentions. Rather, it focuses on eight measurable practices: energy efficiency, renewable energy, waste reduction, recycling and reuse, water conservation, sustainable sourcing, sustainable packaging, and green innovation. This approach is particularly pertinent to Ghanaian SMEs considering that environmental action is likely to be incremental rather than a complete transformation of the business at one time.

Green Entrepreneurship and Efficient Use of Resources

Put simply, resource efficiency is how well a business makes use of what it already has. For an SME, this means getting more value from electricity, water, raw materials, equipment, and other inputs, with minimal unnecessary losses. In the day-to-day business activities, this can take many forms: turning off equipment when it is not needed, reducing material losses in production, reusing materials that still have value, conserving water, recovering useful waste, or improving production methods so that fewer resources are needed to produce the same amount of output.

This is important because what is viewed as waste can also be a direct financial loss to the business. Electricity that is consumed without adding to production still must be paid for. Waste can be avoided where you pay for raw materials but do not receive revenue to cover the cost. So too for water, packaging, fuel, and other inputs. For SMEs, with their limited financial resources, the repeated loss of small amounts through inefficient resource usage can slowly add up to a significant business cost.

The problem is especially important in Ghana, where SMEs operate in an environment of energy costs, problems of financing and volatile prices of productive inputs. Energy efficiency and cleaner production are recognized as important components for Ghana's transition to a more sustainable economy in the country's climate commitments (MESTI & EPA, 2021). The World Bank (2022) also points out improved resource management and climate-resilient investment as important to Ghana's long-term development. The national priorities are of practical importance to SMEs because the improvements in resource use can help the business to control costs and at the same time contribute to wider environmental goals.

Waste management is a good example of how business interests and environmental interests can go hand in hand. Ghana continues to struggle with the management of solid waste and plastics, particularly with the

growth of urban populations and consumption. The National Plastics Management Policy encourages the reduction of waste, reuse, recycling, and recovery of value from otherwise discarded materials (MESTI, 2020). Reducing waste is not only about being environmentally responsible for SMEs. In addition, where materials can be reused, recycled, or prevented from becoming waste in the first place, the enterprise may also cut the amount it spends on replacing lost resources.

From this perspective the link between green entrepreneurship and resource efficiency becomes very practical. An SME adopting green practices does not necessarily do so for the sake of improving its environmental image. Such practices may help the business in more careful use of electricity, reduce material losses, more efficient water management, and better utilization of the existing inputs. Thus, green entrepreneurship can be incorporated in day-to-day cost management and operational efficiency regarding environmental responsibility.

In view of this reasoning, the following hypothesis is proposed: H1: Green entrepreneurship practices have a positive and significant effect on the resource efficiency of SMEs in Sunyani East and West.

Green Entrepreneurship and Sustainable Economic Success

Sustainable economic performance means that an enterprise can achieve sustainable economic success. SMEs include profitability and sales but also productivity, cost management, employment stability, customer growth, competitiveness, and the ability to withstand changes in input and energy costs.

In Ghana the distinction between short-term performance and sustainable economic performance is important. An SME may have higher sales but at the same time is confronted with rising electricity, transportation, financing, or material costs. Thus, an increase in revenue does not automatically indicate an increase in the economic strength of the business. Sustainability in performance means the enterprise must control the costs and improve the productivity but still have the capacity to work overtime.

Green entrepreneurship can support this process in several ways. Energy efficiency can lower ongoing costs. Materials purchased may have a revenue enhancement component that is improved by reducing waste. Recycling and reuse can extract value from materials that were once considered waste. Sourcing sustainably can potentially reduce vulnerabilities in supply chains, and green innovation can potentially create new products, services, or processes.

This link between environmental resilience and economic development is increasingly reflected in the country's current climate-development agenda in Ghana. Recent policy approaches have instead focused on investments that can provide economic, social, and environmental benefits at the same time (MESTI & EPA, 2021; World Bank, 2022) rather than dealing with climate action separately from development. It turns out green practices can be costly. Significant upfront investment may be required for solar installations, efficient machinery, environmentally preferable packaging, and cleaner technologies. This is especially true for Ghanaian SMEs, where access to affordable finance is critical to enterprise investment and growth. The Ghana Enterprises Agency's institutional mandate recognizes financing, capacity development, technology and wider enterprise support as critical to MSME development.

Therefore, a positive relationship between green entrepreneurship and performance should not be assumed. It must be empirically tested in the light of the Ghanaian SMEs' operating circumstances. Accordingly, the study suggests the following: H2: Green entrepreneurship practices significantly positively affect the sustainable economic performance of SMEs in Sunyani East and Sunyani West.

Efficient Use of Resources and Sustainable Economic Performance

The link between resource efficiency and economic performance is simple. Resources are compensated. If the enterprise can produce its output with less energy, water, raw material, or other inputs, it can reduce production costs and increase productivity. This relationship could be more important for Ghanaian SMEs, since many operate on low financial buffers. What might be a minor item, like an inefficient process that increases your monthly electricity bill or constantly wastes raw materials, can become a major financial burden over time.

Resource efficiency can also make us more resilient. Energy-intensive companies or companies that rely on expensive imported inputs may be especially vulnerable to price rises. A company that has already lowered its resource intensity might be in a better position to survive such shocks. This is in line with Ghana's broader climate-development agenda that places equal importance on resilience as it does on emissions reduction and environmental management (MESTI & EPA, 2021; World Bank, 2022). So, the expected relationship is the following: H3: Resource efficiency has a positive and significant effect on the economic performance of SMEs in Sunyani East and Sunyani West.

Resource Efficiency as a Connection between Green Practices and Green Growth

A limitation of a simple green entrepreneurship-performance argument is that the process between the two variables is unexplained. That greener firms perform better does not establish why they perform better. A plausible explanation is resource efficiency. For example, an agro-processing SME in Sunyani that modifies its production process to reduce raw-material losses. The immediate environmental outcome could be less waste, but the company also gets more salable output from the same number of inputs. Similarly, a hotel that reduces its unnecessary electricity and water use could reduce its environmental footprint as well as its recurring expenses. In both cases, the first impact of an environmental action is a gain in efficiency, which can then be transformed into economic performance.

Therefore, the suggested relationship is.

Green Entrepreneurship → Resource Efficiency → Sustainable Economic Performance
This mechanism is particularly relevant for Ghana because it changes the way green entrepreneurship can be pitched to SMEs. Business owners need not choose between environmental responsibility and economic viability. Some environmental practices may be compatible with both objectives if they reduce the quantity or cost of inputs needed to run the operation. This interpretation is in line with Ghana's policy focus on climate-compatible development and resource-efficient production (MESTI, 2013; MESTI & EPA, 2021). It also supports the World Bank's (2022) claim that Ghana's climate transition should be attached to productivity, resilience, and development, rather than as a separate environmental agenda. So that H4: A significant mediating effect of resource efficiency exists between green entrepreneurship practices and sustainable economic performance among SMEs in Sunyani East and Sunyani West.

Theoretical Framework

The theoretical basis of this study is the natural resource-based view (NRBV). The NRBV was first proposed by Hart (1995) as an explanation for the way capabilities related to environmental management can lead to competitive advantage. The theory is not recent but fundamental. But it is still useful since the mechanism suggested by the theory is close to the problem studied in this study.
The NRBV posits that environmental pressures can cause firms to develop capabilities for pollution prevention, product stewardship, and sustainable development. Applied to an SME, these capabilities may include reduction of energy consumption, prevention of waste of materials, improvement in the use of resources, development of products that are responsible to the environment, or redesign of production processes. The key point is that environmental capability is economically valuable when it improves the firm's operations. This places resource efficiency at the heart of the application of the NRBV in this study.

This adds an extra dimension in the Ghanaian context. Environmental capabilities are not developed separately from the conditions of the enterprise in which they are located. Before a lot of environmental investments are possible, SMEs need access to finance, technology, information, infrastructure, and appropriate markets. Ghana's updated climate commitments acknowledge the importance of private sector participation and financing for achieving national climate goals (MESTI & EPA, 2021), and the World Bank (2022) also notes that financing and private investment are critical for Ghana's climate-development transition. The NRBV thus provides an explanation for why green capabilities may create value, and the Ghanaian institutional environment provides an explanation for why it may be easier for some SMEs than others to develop those capabilities.

Institutional Theories: Institutional theory adds to NRBV as enterprises do not make environmental decisions in a vacuum. Their behavior is shaped by regulations, government policies, financing systems, customer expectations, industry practices, infrastructure, and support institutions. Take Ghana as an example. The National Climate Change Policy gave a broad framework for climate-compatible development (MESTI, 2013). The National Plastics Management Policy promotes more sustainable management of plastic resources and waste (MESTI, 2020) and the updated NDC places considerable emphasis on private-sector participation in Ghana's climate response (MESTI & EPA, 2021). The Ghana Enterprises Agency Act, 2020 (Act 1043) provides an institutional framework for MSME development support (Republic of Ghana, 2020).

Policies and institutions do not necessarily translate into the uptake of enterprises. And a business may be in a country committed to renewable energy but without access to affordable financing for solar installation. There might be a national recycling strategy, and a local SME may have limited access to collection or processing infrastructure. Institutional theory thus explains the potential gap between national environmental ambition and local business action. This is particularly important for Sunyani East and Sunyani West, where SMEs experience policy through local markets, municipal infrastructure, financial institutions, technology providers, and business-support organizations.

Challenges of Green Entrepreneurship in Ghana

The adoption of green entrepreneurship by SMEs cannot be explained solely by the willingness of business owners to protect the environment. In practice, the decision to adopt greener operating methods is driven by several interrelated factors, including availability of finance, cost and availability of relevant technologies, knowledge, infrastructure, and institutional support. Finance is especially important because some practices, such as reduction of waste or conservation of electricity, can be introduced at little cost, but investments in solar energy, energy-efficient machinery, cleaner production equipment, and waste-recovery technologies frequently require significant upfront capital. Such investments can be challenging for SMEs with limited savings and limited access to affordable credit, even when they are expected to generate savings over time. The Ghana Climate Commitments recognize the need for significant private sector investment to meet the country's environmental and climate objectives (MESTI & EPA, 2021). The World Bank (2022) also emphasizes the importance of mobilizing sufficient finance for climate-resilient development. There are also issues with technology and knowledge. In theory, green technology may be available but still out of reach for a small business if it is expensive, poorly suited to the scale of the enterprise, difficult to maintain locally, or requires technical expertise that is unavailable. Business owners need dependable information on installation costs, potential savings, maintenance needs, financing options, and the time to recoup an investment. Without such information, it may seem less risky to defer a green investment than to commit scarce business resources to an unfamiliar technology. Infrastructure can also affect the real possibilities of SMEs. For instance, recycling and material recovery relies on operational systems and markets for the collection, sorting, transport, and processing of waste and recovered materials. Ghana's National Plastics Management Policy, which acknowledges these challenges, promotes waste prevention, reuse, recycling, and circular approaches to resource management (MESTI, 2020). Hence, policy support is most beneficial to SMEs where national commitments are translated into concrete opportunities such as affordable finance, technical assistance, training, incentives for investment, reliable environmental infrastructure, and credible information. These factors are interlinked: an enterprise may have access to suitable technology but lack the financial resources to buy it, or it may have the finance but insufficient information to decide whether the investment is worthwhile. Therefore, the slow uptake of green practices should not be automatically construed as a lack of concern for the environment on the part of entrepreneurs. The adoption is also likely to depend on the extent to which the green practices are financially affordable, technologically accessible, practically feasible, and can bring about benefits that the business owners can see in their day-to-day operations for SMEs in Sunyani East and Sunyani West.

Synthesis and Research Gap

There are important gaps remaining for Ghana in the linkage of environmental sustainability and enterprise development, as the current literature makes a strong case.

First, the development of national policy has moved ahead of the evidence on SME adoption at the local level. Ghana has expressed ambitions in relation to climate, waste management, and sustainable development (MESTI, 2013, 2020; MESTI & EPA, 2021), but we know little about how these ambitions are translated into everyday practices amongst SMEs in regional economies. Second, it is necessary to distinguish between environmental intention and environmental action. An entrepreneur doesn't have to switch to renewable energy, cut down waste, change packaging, or invest in efficient equipment to support sustainability. Practices on the ground better epitomize the real green transition.

Third, studies of environmental practices and business performance focus on the existence of a relationship. However, for SME policy it may be more useful to understand the mechanism. If green entrepreneurship improves performance through increased resource efficiency, interventions should target practices that lead to measurable savings in energy, material, water, and waste. Fourth, the evidence is still scanty for Sunyani East and Sunyani West in the Bono Region. The economic and institutional environment in these areas may be different from that of Accra, Tema, or Kumasi. Hence, local evidence is required before assuming that findings from Ghana's larger commercial centers apply equally to regional SMEs.

This study fills these gaps by examining actual green practices, building an overall measure of adoption, testing resource efficiency as a mediating mechanism, and examining the barriers surrounding adoption.

Theoretical Framework

The conceptual framework of the study is based on the proposition that adopting green practices contributes to the economic performance of SMEs, both directly and through resource efficiency improvements. Green entrepreneurship is manifested in the practical activities that can be observed in the day-to-day operations of an enterprise: energy efficiency, use of renewable energy, reduction of waste, recycling and reuse, water conservation, sustainable sourcing, sustainable packaging, and green innovation. H1: SMEs that have more of these practices are likely to use their resources more efficiently (the framework). In turn, improved resource efficiency is expected to positively contribute to sustainable economic performance (H3). The study also investigates the direct effect of green entrepreneurship on sustainable economic performance (H2), as green practices may lead to benefits such as cost reductions, innovation, enhanced business processes, customer responses, and other pathways. Significantly, the framework delineates resource efficiency as a mediating route linking green entrepreneurship to sustainable economic performance (H4). Thus, part of the economic value of green entrepreneurship is anticipated to arise from firms becoming better managers of energy, water, materials, and other productive resources for which they are already paying. Relevant enterprise characteristics include firm age, employment size, education of owner or manager, business sector and access to finance because differences in these factors may influence the ability of SMEs to adopt and benefit from green practices. So, the framework goes beyond the general assumption that environmental responsibility is good for business. But it suggests a pragmatic explanation for SMEs in Sunyani East and Sunyani West where green practices are more likely to lead to sustainable economic performance when it helps businesses cut down on resource waste and derive more value from their inputs. This relationship is the main argument tested in the study and links the everyday experiences of SMEs with Ghana's broader efforts to translate green-development objectives into economically meaningful business practices.

Conceptual route:

Green Entrepreneurship → Resource Efficiency → Economic Performance Sustainability
Straight line: Green entrepreneurship → sustainable economic performance.

MATERIALS AND METHODS

Area of Study

The study was conducted in Sunyani East and Sunyani West in the Bono Region of Ghana. The study area provides an appropriate setting for examining green entrepreneurship among small and medium-sized enterprises (SMEs), given Sunyani's role as an important administrative, commercial, and economic centre

within the region and the concentration of diverse enterprise activities across the adjoining municipalities. Economic activities in the area include agro-processing, manufacturing, wholesale and retail trade, hospitality and food services, transport and logistics, construction, professional services, and repair and personal services. Together, these activities represent a dynamic regional business environment in which SMEs operate under increasing cost pressures while simultaneously confronting growing concerns regarding environmental sustainability.

The operational activities of SMEs in the study area are closely linked to the utilization of natural and productive resources, particularly electricity, fuel, water, raw materials, packaging materials, and transportation services, as well as the generation and disposal of solid waste. Agro-processing and light manufacturing enterprises, for example, depend substantially on raw-material inputs and electricity or fuel for production, while hospitality and food-service businesses generate significant quantities of organic waste and packaging materials. Retail and service enterprises may be comparatively less resource-intensive but nevertheless make regular decisions concerning energy use, material consumption, waste disposal, and environmentally responsible sourcing.

The diversity of economic activities within the study area therefore provided an opportunity to examine green entrepreneurial practices across different operational contexts rather than restricting the investigation to a single industry. This multi-sectoral approach was important because the opportunities, costs, and constraints associated with environmental practices may differ considerably across sectors.

The choice of a regional commercial centre outside Ghana's largest metropolitan areas is also relevant to the country's broader climate and sustainable development agenda. Ghana's updated Nationally Determined Contribution emphasizes private-sector participation, cleaner production, improved energy efficiency, waste management, and the adoption of climate-responsive technologies as part of the national transition towards low-carbon and climate-resilient development (Ministry of Environment, Science, Technology and Innovation [MESTI] & Environmental Protection Agency [EPA], 2021). Despite these policy priorities, empirical evidence on how SMEs operating in regional commercial centers respond to the transition towards greener business practices remains comparatively limited. The Sunyani area therefore provides an appropriate empirical context for examining the adoption and enterprise-level implications of green entrepreneurship.

Research Design

The study adopted a quantitative cross-sectional survey design. This design was considered appropriate because it enabled the systematic collection and analysis of information on green entrepreneurship practices, resource efficiency, sustainable economic performance, and enterprise characteristics across a relatively large and diverse group of SMEs at a single point in time.

The research design incorporated both descriptive and explanatory components. The descriptive component was used to determine the extent to which SMEs had adopted specific green practices and to identify the principal structural and operational constraints affecting such adoption. This component provided an empirical profile of green entrepreneurship within the study area.

The explanatory component examined the hypothesized relationships among green entrepreneurship adoption, resource efficiency, and sustainable economic performance. These relationships were assessed using correlation analysis, multivariable regression models, and mediation analysis. In particular, the analytical framework examined whether higher levels of green entrepreneurship adoption were associated with improved resource efficiency and sustainable economic performance and whether resource efficiency constituted an indirect pathway through which green entrepreneurship was associated with sustainable economic performance.

Because all major variables were measured during the same survey period, the cross-sectional design does not establish temporal precedence in the manner of longitudinal or experimental research. Accordingly, the estimated coefficients are interpreted primarily as statistical associations, and causal claims are made cautiously.

Study Population and Sampling Design

The target population consisted of registered and operational SMEs located in Sunyani East and Sunyani West. To facilitate meaningful assessment of enterprise-level environmental practices, eligible firms were required to operate from identifiable business locations. This criterion enabled the study to examine operational decisions relating to energy consumption, material use, water utilization, sourcing, packaging, waste management, and other resource-related activities.

A multistage sampling procedure incorporating geographical and sectoral stratification was employed to obtain a diverse and adequately representative analytical sample. At the first stage, the study area was stratified according to the two municipalities, namely Sunyani East and Sunyani West. At the second stage, eligible enterprises were classified into eight broad economic sectors: construction; wholesale and retail trade; transport and logistics; hospitality and food services; professional and business services; light manufacturing; repair and personal services; and agro-processing.

Sectoral stratification was important because the nature and intensity of resource use vary considerably across different enterprise activities. For example, manufacturing and agro-processing firms tend to depend more heavily on energy, raw materials, water, and production inputs, whereas professional and other service-oriented businesses generally exhibit different patterns of resource consumption. Including enterprises from both resource-intensive and service-oriented sectors therefore enhanced the breadth of the study.

Within the identified sectoral strata, individual SMEs were selected for participation. The firm constituted the unit of analysis, while the unit of observation was the owner, owner-manager, or senior manager sufficiently knowledgeable about the enterprise's production, procurement, operational, and environmental practices. Only one questionnaire was administered per enterprise to avoid duplicate observations and ensure that each firm contributed a single independent record to the analytical dataset.

The final analytical sample comprised 384 SMEs. Of these, 60 enterprises were in construction (15.6%), 59 in wholesale and retail trade (15.4%), 50 in transport and logistics (13.0%), 49 in hospitality and food services (12.8%), 44 in professional services (11.5%), 44 in manufacturing (11.5%), 40 in repair and personal services (10.4%), and 38 in agro-processing (9.9%). The resulting sample provided sufficient variation across sectors and enterprise characteristics to support descriptive analysis, multivariable regression estimation, and bootstrapped mediation analysis while maintaining adequate model degrees of freedom.

Sources of Data and Field Procedures

The study relied primarily on quantitative primary data collected through a structured questionnaire administered directly to SME owners, owner-managers, and other eligible senior enterprise representatives. Primary data collection was necessary because several of the variables central to the study, including waste-reduction practices, internal energy-saving measures, sustainable sourcing, recycling behaviour, resource-management routines, and perceived institutional constraints, are not adequately captured in conventional administrative records, national accounts, or business registries.

The enterprise-level survey data were complemented by relevant secondary policy and institutional documents. These included Ghana's Updated Nationally Determined Contribution (MESTI & EPA, 2021) and the World Bank's *Ghana Country Climate and Development Report* (World Bank, 2022). These documents were used principally to establish the broader policy, regulatory, and macroeconomic context within which SME green entrepreneurship occurs and were not substitutes for the firm-level empirical data used in the statistical analysis.

The structured questionnaire was administered face-to-face by trained enumerators. Face-to-face administration was considered appropriate because it improved questionnaire completion and allowed respondents to seek clarification on individual items where necessary. Enumerators were instructed to provide clarification without influencing respondents' answers.

Completed questionnaires were subjected to data-quality checks before analysis. These checks included assessments of completeness, internal consistency, duplicate records, coding errors, and responses falling outside predetermined allowable ranges. Where necessary, inconsistencies were verified against the original questionnaires before the final dataset was prepared.

To protect respondent confidentiality, each participating enterprise was assigned a unique anonymous identification code, such as SME-001. Personal and enterprise-identifying information was excluded from the analytical dataset, and the coded identifiers were used throughout data cleaning and statistical analysis. This procedure enabled enterprise-level observations to be tracked for quality-control purposes without revealing the identities of individual respondents or businesses.

Measurement of Variables

Green Entrepreneurship Adoption Index (GEAI)

Green entrepreneurship served as the primary explanatory construct. Rather than relying solely on subjective pro-environmental attitudes, we measured practical, observable actions across eight key operational dimensions: (1) energy efficiency, (2) renewable energy adoption, (3) waste reduction, (4) recycling and material reuse, (5) water conservation, (6) sustainable local sourcing, (7) eco-friendly packaging, and (8) green process/product innovation.

Each practice was captured as a binary indicator:

G_ij = 1 if SME i adopted practice j; 0 otherwise

An aggregate Green Entrepreneurship Adoption Index (GEAI) was computed for each enterprise with a percentage score:

$$GEAI_i = ((\Sigma_{j=1..8} G_{ij}) / 8) \times 100 \quad (1)$$

The resulting continuous index ranges from 0 to 100. For descriptive profiling, scores were classified into low (0–33%), moderate (34–66%), and high (67–100%) adoption tiers, whereas the full continuous index was retained for econometric modeling to preserve variance.

Resource Efficiency (RE)

Resource efficiency served as the mediating variable, reflecting how effectively an enterprise optimizes input and reduces waste across its operations. Items evaluated energy conservation, water stewardship, raw material optimization, and waste handling on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). The composite mean score was used in statistical modeling:

RE_i = f(Energy Use, Material Use, Water Conservation, Waste Optimization)

Sustainable Economic Performance (SEP)

Sustainable economic performance was the primary dependent outcome. To reflect long-term viability rather than brief accounting windfalls, this construct integrated multi-item scales measuring cost savings, sales stability, productivity gains, employment/customer growth, and overall business resilience over time (rated on a 5-point Likert scale).

Barriers to Green Adoption and Firm Controls

To contextualize adoption hurdles, seven major barriers were evaluated on a 5-point scale: high initial setup costs, access to external finance, technical knowledge gaps, limited green tech availability, inadequate local infrastructure, weak policy incentives, and low customer willingness to pay. In addition, standard firm-level

control variables were included in all models: firm age, number of employees, owner/manager educational attainment, access to credit/finance, and industry sector.

Econometric Specifications and Mediation Framework

Data analysis was conducted using Stata. To test the conceptual pathway (Green Entrepreneurship → Resource Efficiency → Sustainable Economic Performance), we specified three sequential regression models:

Model 1: Effect of Green Entrepreneurship on Resource Efficiency (H1)

$$RE_i = \alpha_0 + \alpha_1 GEAI_i + \Sigma_{k=1..K} \gamma_k X_{ki} + \varepsilon_i \quad (2)$$

where RE_i is the resource efficiency score for enterprise i, GEAI_i is the adoption index, X_ki is the vector of firm-level controls, and ε_i is the error term. A positive and statistically significant α_1 supports Hypothesis 1.

Model 2: Effect of Green Entrepreneurship on Sustainable Economic Performance (H2)

$$SEP_i = \beta_0 + \beta_1 GEAI_i + \Sigma_{k=1..K} \delta_k X_{ki} + \mu_i \quad (3)$$

where SEP_i denotes sustainable economic performance. A positive and statistically significant β_1 confirms Hypothesis 2.

Model 3: Direct and Mediated Pathways (H3 and H4)

$$SEP_i = \theta_0 + \theta_1 GEAI_i + \theta_2 RE_i + \Sigma_{k=1..K} \lambda_k X_{ki} + \nu_i \quad (4)$$

Hypothesis 3 is supported if θ_2 remains positive and statistically significant. The indirect (mediated) effect is calculated as:

$$Indirect\ Effect = \alpha_1 \times \theta_2 \quad (5)$$

To formally test mediation (H4), we performed non-parametric bootstrapping with 1,000 replications to generate 95% bias-corrected confidence intervals. Mediation is confirmed if the confidence interval does not straddle zero.

Diagnostic Testing, Common Method Bias, and Ethical Compliance

Prior to econometric estimation, the dataset was subjected to diagnostic testing to assess the assumptions underlying the empirical models and the integrity of the resulting estimates. Multicollinearity was examined using variance inflation factors (VIFs). All individual VIF values were below 2.10, substantially lower than the commonly applied threshold of 5.0, indicating that problematic multicollinearity was not present among the explanatory variables. Given the cross-sectional nature of the data and the potential for heteroskedasticity arising from differences in firm size, sector, and operating characteristics, all regression models were estimated using Huber–White heteroskedasticity-robust standard errors. Statistical significance was assessed at the 5% level ($p < .05$), with 95% confidence intervals reported where appropriate to provide additional information on the precision of the estimated effects.

Because the study relied on self-reported, cross-sectional survey responses obtained from SME owner-managers, particular attention was given to the potential for social desirability bias and common method variance. Both procedural and statistical remedies were employed. Procedurally, respondents were assured of anonymity and confidentiality, the measurement of key constructs was distributed across separate questionnaire sections, and questionnaire items were framed primarily around observable business practices and operational activities rather than respondents' subjective assessments of managerial success. These measures were intended to reduce evaluation apprehension, socially desirable responding, and consistency motives.

As an additional statistical assessment, Harman's single-factor test was conducted by entering the relevant measurement items into an unrotated exploratory factor analysis. The first factor accounted for 28.4% of the total variance, considerably below the conventional 50% benchmark. Although Harman's test cannot completely rule out common method bias, the result provides no indication that a single dominant factor accounts for the covariance among the study variables. Accordingly, severe common method variance was considered unlikely to materially influence the observed empirical relationships.

The fieldwork was conducted in accordance with applicable institutional research ethics requirements. Participation was entirely voluntary, and informed consent was obtained verbally or in writing before questionnaire administration. Respondents were informed about the purpose of the research, the voluntary nature of their participation, and their right to decline to answer questions or withdraw from the study at any stage without penalty. No personally identifying information was included in the analytical dataset. Instead, questionnaires and electronic records were assigned unique anonymous identification codes. Given the commercially sensitive nature of some enterprise-level information, particularly data concerning business operations and financial performance, responses were treated as confidential, and findings were reported only in aggregated form to prevent the identification of individual respondents or enterprises.

RESULTS

This section presents the empirical findings from the 384 SMEs surveyed across Sunyani East and Sunyani West. The analysis begins with the characteristics of the participating enterprises, followed by the extent of green entrepreneurship adoption. It then examines resource efficiency and sustainable economic performance, the relationships among the main study variables, the regression and mediation results, and the barriers SMEs encounter in adopting green practices.

Characteristics of Participating in SMEs

The SMEs represented a diverse range of economic activities, allowing green entrepreneurship to be examined across businesses with different patterns of energy use, material consumption, waste generation, and operational requirements. Construction accounted for the largest share of the sample (15.6%), followed closely by retail and wholesale businesses (15.4%). Transport enterprises represented 13.0% of the sample, while hospitality and food services accounted for 12.8%. Professional services and manufacturing each represented 11.5%, repair and personal services accounted for 10.4%, and agro-processing enterprises constituted 9.9%.

The enterprises had been operating for an average of 13.27 years (SD = 7.28), indicating that the sample included both young firms and businesses with considerable operating experience. Access to external finance was not widespread. While 42.7% of the SMEs reported having access to finance, 57.3% reported that they did not. In terms of owner or manager education, secondary/TVET (31.8%) and bachelor's degree (31.5%) were the most reported educational levels.

Table 1 Characteristics of Participating SMEs (N = 384)

Characteristic	Category	Frequency (n)	Percentage (%)
Business sector	Construction	60	15.6
	Retail/Wholesale	59	15.4
	Transport	50	13.0
	Hospitality/Food Services	49	12.8
	Professional Services	44	11.5
	Manufacturing	44	11.5

	Repair/Personal Services	40	10.4
	Agro-processing,	38	9.9
Access to finance	Yes	164	42.7
	No	220	57.3
Firm age (years)	Mean (SD)	—	13.27 (7.28)

Note. Percentages may not come to exactly 100 because of rounding.

The broad sectoral representation reduced the likelihood that the findings would simply reflect the experience of one dominant industry. This was particularly important because the opportunities and costs associated with green practices are likely to differ across business activities.

Adoption of Green Entrepreneurship Practices

The first objective examined the extent to which SMEs had incorporated green practices into their operations. Adoption differed across the eight practices assessed. Energy efficiency emerged as the most widely adopted practice, reported by 66.9% of SMEs, followed by waste reduction at 61.7%. Recycling and reuse were practiced by 47.1% of the enterprises, while 46.9% reported using sustainable packaging. Water conservation was adopted by 44.3%, sustainable sourcing by 39.1%, and green innovation by 36.7%. Renewable energy was less common, with only 23.2% of the SMEs reporting adoption.

Table 2 Adoption of Green Entrepreneurship Practices among SMEs

Green Practice	**Adoption (%)**	**Rank**
Energy efficiency	**66.9**	1
Waste reduction,	**61.7**	2
Recycling and reuse	47.1	3
Sustainable packaging	46.9	4
Water conservation	44.3	5
Sustainable sourcing	39.1	6
Green innovation	36.7	7
Renewable energy	**23.2**	8

The pattern shows that SMEs were more likely to adopt practices related to reducing resource consumption and waste than to invest in renewable-energy technologies.

Green Entrepreneurship Adoption Index

To obtain an overall measure of green entrepreneurship, the eight practices were combined into the Green Entrepreneurship Adoption Index (GEAI). The average GEAI was 45.74% (SD = 19.16), indicating that the typical enterprise had adopted three to four of the eight practices considered.

For descriptive purposes, enterprises were subsequently classified into low, moderate, and high adoption categories. Most SMEs (65.6%) fell within the moderate-adoption category. Low adopters accounted for 23.4%, while only 10.9% of the businesses were classified as high adopters.

Table 3 Level of Green Entrepreneurship Adoption

Adoption Level	Score Range	Frequency (n)	Percentage (%)
Low	0–33%	90	23.4
Moderate	>33–66%	252	**65.6**
High	>66–100%	42	10.9
Total		**384**	**100.0**

The results indicate that green entrepreneurship was present among SMEs in the study area but had not yet developed into widespread adoption across the full range of practices. In particular, the small proportion of high adopters suggests that considerable room remains for SMEs to deepen their engagement with environmentally sustainable business practices.

Descriptive Statistics and Correlation Analysis

Table 4 presents the descriptive statistics and Pearson correlations for the three main variables. The mean resource-efficiency score was 3.24 (SD = 0.67), while sustainable economic performance recorded a mean of 3.20 (SD = 0.61). Both were measured on five-point scales.

Green entrepreneurship was strongly and positively correlated with resource efficiency ($r = .717$, $p < .001$). Thus, enterprises with broader adoption of green practices reported greater efficiency in their use of resources.

Green entrepreneurship was also positively associated with sustainable economic performance ($r = .558$, $p < .001$). Similarly, resource efficiency was positively correlated with sustainable economic performance ($r = .592$, $p < .001$). The direction of these relationships was consistent with the study's proposed conceptual framework and provided a basis for proceeding to the multivariable analysis.

Table 4 Descriptive Statistics and Pearson Correlations among the Main Study Variables

Variable	N	Mean	SD	1	2	3
1. Green Entrepreneurship (GEAI %)	384	45.74	19.16	1.000		
2. Resource Efficiency	384	3.24	0.67	.717***	1.000	
3. Sustainable Economic Performance,	384	3.20	0.61	.558***	.592***	1.000

Note. N= 384. GEAI = Green Entrepreneurship Adoption Index. $p < .001$, indicating statistical significance at the 0.1% level.

Regression Analysis

Multiple regression analysis was conducted to examine whether green entrepreneurship was associated with resource efficiency and sustainable economic performance after accounting for relevant enterprise characteristics. The models controlled for firm age, employment size, owner/manager education, access to finance, and business sector. Robust standard errors were used. As shown in Model 1, green entrepreneurship was positively and significantly associated with resource efficiency (B = 0.0240, robust SE = 0.0013, p <

.001). The model explained approximately 51.9% of the variation in resource efficiency (R^2 = .519). The finding therefore provides support for H1, which proposed that greater adoption of green entrepreneurship practices would be associated with higher resource efficiency.

Model 2 examined sustainable economic performance as the outcome variable. Green entrepreneurship was again positive and statistically significant (B = 0.0180, robust SE = 0.0015, p < .001). The model accounted for approximately 34.3% of the variation in sustainable economic performance (R^2 = .343), providing support for H2. Model 3 introduced resource efficiency alongside green entrepreneurship. Resource efficiency showed a positive and statistically significant association with sustainable economic performance (B = 0.3675, robust SE = 0.0567, p < .001), supporting H3.

Notably, after resource efficiency was introduced, the coefficient for green entrepreneurship declined from B = 0.0180 to B = 0.0092, although it remained statistically significant (p < .001). At the same time, the explanatory power of the sustainable economic performance model increased from R^2 = .343 to R^2 = .412.

Table 5 Regression Models Predicting Resource Efficiency and Sustainable Economic Performance

Model	Outcome Variable	Predictor	B	Robust SE	*p*-value	R^2
Model 1	Resource Efficiency	GEAI	**0.0240**	0.0013	< .001	.519
Model 2	Sustainable Economic Performance	GEAI	**0.0180**	0.0015	< .001	.343
Model 3	Sustainable Economic Performance	GEAI	**0.0092**	0.0020	< .001	.412
Model 3	Sustainable Economic Performance	Resource Efficiency	**0.3675**	0.0567	< .001	.412

Note. N = 384. B = unstandardized regression coefficient; SE = standard error; GEAI = Green Entrepreneurship Adoption Index. Models control firm age, employment size, owner/manager education, access to finance, and business sector. Robust standard errors are reported.

The reduction in the green entrepreneurship coefficient following the introduction of resource efficiency suggests that some of the associations between green entrepreneurship and sustainable economic performance may operate through improvements in resource efficiency. This possibility was examined formally through mediation analysis.

Mediating Role of Resource Efficiency

The mediation analysis examined whether resource efficiency provided an indirect pathway linking green entrepreneurship with sustainable economic performance.

The total association between green entrepreneurship and sustainable economic performance was positive and statistically significant (B = 0.0180, p < .001). Green entrepreneurship was also positively associated with resource efficiency (B = 0.0240, p < .001), while resource efficiency remained positively associated with sustainable economic performance after green entrepreneurship was included in the model (B = 0.3675, p < .001).

The estimated indirect effect of green entrepreneurship through resource efficiency was 0.0088. A non-parametric bootstrap procedure based on 1,000 replications produced a 95% confidence interval ranging from 0.0062 to 0.0117. Since this interval did not include zero, the indirect effect was statistically significant.

After resource efficiency was included, the direct association between green entrepreneurship and sustainable economic performance remained positive and significant (B = 0.0092, p < .001). The simultaneous presence of a significant indirect effect and a remaining significant direct effect indicate partial mediation.

Table 6 Mediation Analysis of Resource Efficiency in the Green Entrepreneurship–Performance Relationship

Effect/Path	Estimate	Statistical Evidence	Interpretation
GEAI → Resource Efficiency (Path *a*)	**0.0240**	$p < .001$	Significant
Resource Efficiency → SEP (Path *b*)	**0.3675**	$p < .001$	Significant
Total effect: GEAI → SEP (Path *c*)	**0.0180**	$p < .001$	Significant
Direct effect: GEAI → SEP (Path *c′*)	**0.0092**	$p < .001$	Significant
Indirect effect (*a* × *b*)	**0.0088**	95%CI [0.0062, 0.0117]	Significant
Mediation outcome	—	—	**Partial mediation**

Note. GEAI = Green Entrepreneurship Adoption Index; SEP = Sustainable Economic Performance. The confidence interval for the indirect effect was estimated using 1,000 bootstrap replications.

The mediation results support H4. They suggest that resource efficiency represents one pathway through which green entrepreneurship is associated with sustainable economic performance. However, because the direct relationship remained statistically significant, resource efficiency does not fully account for the relationship.

Barriers to Green Entrepreneurship

The study also examined the practical constraints SMEs experienced when attempting to adopt green practices. Access to finance emerged as the highest rated barrier (M = 4.10, SD = 0.79), followed closely by high initial investment costs (M = 4.03, SD = 0.78).

Limited access to green technology ranked third (M = 3.62, SD = 0.82), followed by weak policy incentives (M = 3.56, SD = 0.87) and inadequate knowledge (M = 3.49, SD = 0.84). Infrastructure constraints recorded a mean of 3.38 (SD = 0.82).

Limited market demand for green products and services received the lowest mean score (M = 3.12, SD = 0.89). Although it ranked last, its mean remained slightly above the midpoint of the five-point scale.

Table 7 Perceived Barriers to Green Entrepreneurship among SMEs

Barrier	N	Mean	SD	Rank
Access to finance	384	**4.10**	0.79	1
High initial investment cost	384	**4.03**	0.78	2
Limited access to green technology	384	3.62	0.82	3
Weak policy incentives	384	3.56	0.87	4
Inadequate knowledge,	384	3.49	0.84	5
Infrastructure constraints	384	3.38	0.82	6
Limited green demand	384	3.12	0.89	7

Note. Barrier items were measured on a five-point Likert-type scale, with higher scores representing stronger perceived barriers.

The results indicate that the most pressing obstacles were financial rather than demand-related. Access to finance and the cost of initial investment were rated more strongly than technology, knowledge, infrastructure, policy incentives, or market demand. This pattern is particularly relevant given the low adoption of renewable energy reported earlier in the analysis.

Summary of Hypothesis Testing

The statistical analyses provided support for all four hypotheses examined in the study. Green entrepreneurship was positively associated with resource efficiency and sustainable economic performance, while resource efficiency was positively associated with sustainable economic performance. The mediation analysis further showed that resource efficiency partially mediated the relationship between green entrepreneurship and sustainable economic performance.

Table 8 Summary of Hypothesis Testing

Hypothe followingsis	**Proposed Relationship**	**Statistical Evidence**	**Decision**
H1	Green Entrepreneurship → Resource Efficiency	B = 0.0240, $p < .001$	**Supported**
H2	Green Entrepreneurship → Sustainable Economic Performance	B = 0.0180, $p < .001$	**Supported**
H3	Resource Efficiency → Sustainable Economic Performance	B = 0.3675, $p < .001$	**Supported**
H4	Green Entrepreneurship → Resource Efficiency → Sustainable Economic Performance	Indirect effect = 0.0088; 95% CI [0.0062, 0.0117]	**Supported: Partial mediation**

Taken together, the findings are consistent with the central pathway proposed in the conceptual framework:

Green Entrepreneurship → Resource Efficiency → Sustainable Economic Performance

The results suggest that SMEs with broader adoption of green practices tended to use their resources more efficiently and report stronger sustainable economic performance. More importantly, the mediation analysis shows that resource efficiency represents a meaningful pathway connecting green entrepreneurship with economic outcomes. Green practices therefore are associated with performance not only directly but also through the more efficient use of energy, water, materials, and other productive resources.

DISCUSSION

The findings imply that green entrepreneurship of SMEs in Sunyani East and Sunyani West is better understood as a gradual and uneven transition rather than a simple dichotomy between "green" and "non-green" firms. Many companies are already doing the right thing by the environment. However, the pattern of adoption indicates that small and medium-sized enterprises are likely to begin by implementing actions that are easier to integrate into the current operation and with small financial commitments. Practices are less likely to make larger upfront investments. The reason why this distinction matters is that it reflects the financial and operational realities that small businesses operate within when making decisions.

Green Entrepreneurship Is Emerging but Not Yet Widely Adopted

The moderate level of adoption of green entrepreneurship is a sign that SMEs in the study area are not unconcerned with environmental sustainability. Instead, most companies are cherry-picking practices that make sense in their immediate operating environments. This is understandable considering that SMEs often

operate on tighter financial margins than larger firms and are forced to weigh up environmental investment against other immediate needs such as wages, rent, inventory, maintenance, transport, and working capital.

This interpretation is confirmed by high adoption of energy efficiency and waste reduction. Many of these practices can be implemented through low-cost operational changes, such as the installation of efficient lighting, reducing the use of unnecessary equipment, improving maintenance, minimizing losses of material, or reusing input. Such measures may have environmental and economic benefits without major capital expenditure.

Renewable energy, however, was far less common. This does not necessarily indicate a low level of environmental awareness. It could be because the entry cost is higher, though. Many SMEs find it hard to finance the upfront capital investment needed for solar systems and related technologies, even when the long-term savings are attractive. This finding is consistent with Ghana's updated Nationally Determined Contribution that highlights renewable energy and energy efficiency as vital elements of national climate action and acknowledges the necessity of private-sector finance and investment support (MESTI & EPA, 2021). The World Bank (2022) also highlights the necessity of climate-compatible investment for Ghana's transition.

This pattern therefore fits many SMEs starting their green transition with practices that are financially within reach and operationally simple. Hence, green entrepreneurship in small firms might be better seen as an incremental process rather than an overnight transformation of the entire business.

Green Entrepreneurship Matters Most If It Boosts Resource Productivity

One of the most obvious findings is the strong association of green entrepreneurship with resource efficiency. The result is of great practical importance. The payment for this waste of resources has already been made. Wasted electricity, wasted raw materials in the making of the product, wasted water, and wasted packaging thrown away without adding any value all add to the cost of business. Hence, green practices that reduce such losses have environmental and financial implications. The value of environmental action for an SME may be in improving the use of existing resources.

This finding is in line with the natural resource-based view of the firm. Hart (1995) argues that environmental capabilities can lead to competitive advantage when they enable firms to reduce waste, increase resource productivity, and create more sustainable products and processes. Such capabilities for Sunyani East and Sunyani West may not require sophisticated environmental management systems. They could be such things as better control of the use of electricity, more efficient planning of production, careful control of water, better reuse of materials, or the choice of inputs that produce less waste.

The outcome also corresponds to the broader policy direction of Ghana. MESTI & EPA (2021) note that Ghana's climate commitments are increasingly about linking environmental improvement to productive economic activity, rather than viewing sustainability as a distinct policy issue. The World Bank (2022) further contends that Ghana's climate response should simultaneously support productivity, resilience, and development. Thus, the findings suggest that a strong business case for green entrepreneurship might best start with a simple question: where is the business losing money because of inefficient use of resources?

Moving from Green Practices to Sustainable Economic Performance

The positive association between green entrepreneurship and sustainable economic performance indicates that environmental responsibility and business performance are not mutually exclusive. SMEs implementing a wider range of green practices reported better economic outcomes.

This finding should not be taken to imply that all green investment will necessarily increase profit. Some investments will take several years to recover the initial outlays, and some may have benefits that are not immediately obvious. The bottom line is, taking on more environmentally responsible operating practices can be part of a more sustainable way to do business.

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Several mechanisms could explain this association. Energy efficiency can reduce recurring costs. With waste prevention, the percentage of purchased inputs that become salable output is increased. Recycling and reuse can reclaim value from materials that would otherwise be wasted. Sustainable sourcing might reduce some supply risks, while green innovation can enhance production processes or aid firms in differentiating their products and services. These benefits can improve productivity, cost control, competitiveness, and resilience. This interpretation also corresponds to the current developmental context in Ghana, where firms are required to be economically viable under environmental and climate pressures (World Bank, 2022). Thus, for many SME owners, the economic case for green entrepreneurship may be more compelling if sustainability is framed in terms of cost savings, productivity, resilience, and business continuity rather than environmental responsibility.

Resource Efficiency as the Connecting Link between Green Entrepreneurship and Performance
One of the most important contributions of the study is mediation analysis. Resource efficiency was a significant and partial mediator between green entrepreneurship and sustainable economic performance. This is related to the better economic performance of green entrepreneurship, partly because greener SMEs were more efficient in their use of resources.

This observation goes further than showing a correlation between green practices and business performance. It helps to explain how that relationship can happen.

It can be summarized as the way: Sustainability, Economic Performance Resource Efficiency Green Entrepreneurship For example, an agro-processing enterprise may initially improve its resource efficiency by reducing raw-material losses, so that more of the purchased input is converted into salable output. The financial benefit can then be achieved by either lower unit costs or higher effective output. For example, a hotel or restaurant that reduces unnecessary electricity and water use may first reduce its resource intensity before those savings contribute to improved economic performance. Thus, resource efficiency is an economic bridge between environmental behavior and business performance.

Another important point is that the mediation was partial, not complete. It indicates that resource efficiency is not the only channel through which green entrepreneurship can impact performance. Other mechanisms include reputation, product differentiation, customer loyalty and innovation, employe engagement and access to environmentally sensitive markets.

The results of the study therefore corroborate the assertion that green entrepreneurship creates value through various channels, with resource efficiency being an especially important mechanism.

Financing the Green Transition: From Conventional Credit to Investment-Compatible Finance

The prominence of access to finance and high initial investment costs among the reported barriers provides an important qualification to the green-growth agenda. SMEs may recognize the potential value of renewable-energy systems, efficient machinery, cleaner production technologies, improved refrigeration, recycling equipment, or environmentally preferable packaging while still being unable to meet their upfront capital requirements. The relatively low reported adoption of renewable energy is therefore consistent with an environment in which capital-intensive green investments are more difficult to undertake than incremental operational improvements.

The financing challenge is consequently not only one of increasing the total amount of SME credit. Financing instruments need to correspond more closely to the cash-flow profile of green investments. Conventional short-term commercial loans can be poorly matched to technologies whose economic benefits accumulate gradually through lower electricity expenditure, reduced material losses, or improved productivity.

One practical mechanism is equipment leasing. Under an appropriately structured lease, a financial institution, specialized leasing company, technology supplier, or other financing partner can finance eligible assets such as solar systems, energy-efficient motors, refrigeration systems, and small-scale processing equipment while the SME makes periodic payments rather than meeting the full capital cost at acquisition. Such an arrangement

can reduce the immediate capital burden and, depending on the contractual structure, reduce the need for conventional fixed asset collateral.

A related mechanism is Pay-As-You-Save (PAYS) financing. Under this approach, repayment can be structured around part of the expected or verified savings generated by technology. For example, an SME investing in more energy-efficient equipment could make scheduled repayments designed to remain below, or reasonably aligned with, the anticipated reduction in operating expenditure. This converts part of a large upfront capital requirement into a sequence of payments supported by operational savings. Effective implementation would require credible technology assessment, transparent pricing, reliable installation and maintenance, and appropriate procedures for estimating or verifying savings.

A second institutional option is a partial green-credit guarantee arrangement involving the Ghana Enterprises Agency (GEA). Rather than requiring GEA to become a direct lender, the Agency could work with participating rural banks, commercial banks, development-finance institutions, technology providers, and relevant technical bodies to establish eligibility standards for green SME investments and partially de-risk qualifying loans. A partial guarantee could reduce lenders' exposure to eligible micro and small enterprises that possess viable investment proposals but insufficient conventional collateral. Technical screening and simplified resource-efficiency assessments could further reduce information asymmetry between SMEs and lenders.

These mechanisms would connect SME development policy with Ghana's broader environmental objectives while recognizing the commercial realities of small enterprises. The policy challenge is therefore not simply to encourage banks to lend more, but to develop financing structures whose repayment schedules, risk-sharing arrangements, and asset requirements correspond to the economics of resource-efficient investment.

Technology, knowledge and infrastructure matter as well

The most significant constraint was finance, but the other barriers show that money alone will not solve the adoption problem. SMEs also require access to the right technology, reliable information, technical skills, supportive infrastructure and practical institutional support.

Technology must be affordable, appropriately sized, locally maintainable and supported by reliable suppliers. Such a system may be technically efficient, but a poor investment if replacement parts are not available, or maintenance requires skills that are not readily available.

Equally important is knowledge. SME owners are not interested in generic messages about sustainability. I want some real-world info on the expected savings, purchase and installation costs, maintenance requirements, lifetime of the technology, financing options and payback periods. Infrastructure is also important, especially in terms of recycling and waste recovery. In addition, the Ghana National Plastics Management Policy emphasizes the importance of waste prevention, reuse, recovery, and recycling to improve plastics management and encourage circularity (MESTI, 2020). But effective participation by SMEs is only possible where there are viable systems for collection, sorting, transport, processing and markets for recovered materials. These results emphasize the importance of institutional theory. Individual entrepreneurs and the systems in which they operate are the forces that shape business decisions. National policies can foster green entrepreneurship. But the ultimate feasibility of adoption will depend on local finance, infrastructure, technology suppliers, markets and support institutions.

Implications and Actionable Measures for Sunyani's Municipal Authorities

The findings have practical implications for local economic development in Sunyani East and Sunyani West. Because the sample covers enterprises with different production technologies, resource requirements, and environmental pressures, a uniform green SME programme is unlikely to be equally appropriate across sectors. Agro-processing businesses may benefit particularly from efficient machinery, water management, renewable energy, by-product recovery, and reductions in post-production losses. Hospitality and food-service enterprises may benefit from energy and water audits, food-waste management, efficient refrigeration, and sustainable

packaging. Retail businesses may obtain greater value from efficient lighting, packaging reduction, sustainable sourcing, and improved waste separation, whereas construction and manufacturing enterprises may require more technology-intensive interventions.

The relevant municipal authorities can complement national programmes through relatively practical local incentives. One option would be a green business-permit facilitation mechanism under which enterprises demonstrating verifiable environmental practices receive streamlined guidance or administrative processing during business operating permit renewal. Eligibility could be based on clearly observable actions such as maintaining an operational waste-sorting system, contracting with recognized waste collectors or recyclers, completing an approved resource-efficiency assessment, or installing qualifying energy-efficient equipment.

A second possibility, subject to applicable local-government legislation, fiscal capacity, and approved rate-setting procedures, would be modest and time-limited property-rate rebates or other locally permissible incentives for enterprises that maintain verifiable waste-separation, recycling, resource-efficiency, or pollution-prevention measures. Any incentive should be transparent, rule-based, easy to verify, and sufficiently modest to avoid undermining municipal revenue mobilization.

Municipal authorities could additionally establish or facilitate designated waste-sorting and aggregation arrangements in commercially dense areas, develop partnerships with recycling and waste-recovery companies, periodically organize SME resource-efficiency clinics, and maintain a directory of credible technology and service providers.

These measures would be strengthened through collaboration among the relevant municipal assemblies, the Ghana Enterprises Agency, financial institutions, universities, business associations, environmental institutions, waste-management companies, and technology suppliers. Local policy can therefore operate not only through regulation but also through reducing the transaction costs and information constraints that prevent SMEs from adopting economically viable green practices.

Implications for Green Growth Agenda in Ghana

The findings are an important lesson for Ghana's national-level green transition. The country has laid out policy goals for renewable energy, energy efficiency, waste management, climate resilience and sustainable production (MESTI & EPA, 2021). The challenge is to turn those ambitions into decisions that make commercial sense for individual businesses.

For many SMEs, cutting electricity bills, material losses, water use or production waste may be more immediate and convincing than a distant target for emissions. Linking environmental action to quantifiable business value could therefore spur greater participation in Ghana's green-growth agenda. This is not to belittle the environmental impact of green entrepreneurship. This provides a practical way in which environmental and economic goals can be self-reinforcing.

Audits of resources at the enterprise level, investment calculators, demonstrations of technology and case studies showing actual savings might help owners assess green investments in financial terms that they are familiar with. The results also remind us that we should not place the entire green transition on the shoulders of SMEs. Where finance, infrastructure, technology or policy conditions make green investment difficult, willingness alone will not be enough in some cases.

Theoretical Implications, Secondary-City Contribution, and Boundary Conditions

The findings are consistent with the natural resource-based view because green entrepreneurship is positively associated with resource efficiency and sustainable economic performance, while the indirect-effect analysis is consistent with resource efficiency accounting for part of the relationship between green practices and reported economic outcomes. The interpretation is not that green practices automatically produce superior firm performance. Rather, environmentally oriented capabilities appear economically relevant when they are accompanied by more effective use of energy, water, materials, waste streams, and other productive resources.

The study also extends this argument to a comparatively resource-constrained secondary-city SME environment. In a setting such as Sunyani East and Sunyani West, environmental capability may not resemble the formal sustainability departments, advanced environmental-management systems, or large capital programmes associated with major corporations. It may instead consist of relatively modest operational capabilities: reducing electricity losses, improving material yield, conserving water, separating recoverable waste, redesigning packaging, or incrementally improving production processes. The theoretical contribution is therefore to show how the resource-productivity logic of the natural resource-based view can be examined within smaller firms operating outside Ghana's principal industrial metropolitan centers.

Institutional theory provides an important complementary explanation. The ability of an SME to adopt and benefit from green practices is associated not only with internal managerial choices but also with the availability of finance, appropriate technologies, technical knowledge, infrastructure, markets, and policy support. This is particularly relevant to secondary urban economies, where the institutional ecosystem for green investment may differ from that available to firms in Accra or Tema. Internal environmental capabilities and external enabling conditions should consequently be analyzed together.

The sectoral composition of the sample also establishes an important boundary condition. The findings primarily characterize an SME ecosystem comprising construction, retail and wholesale trade, transport, hospitality and food services, professional services, repair and personal services, agro-processing, and relatively small-scale manufacturing. They should not be interpreted as evidence about capital-intensive heavy industry, large-scale mining, petrochemicals, steel production, or other industrial activities with fundamentally different energy requirements, technologies, financing structures, and environmental liabilities. Generalization should therefore be made to comparable secondary-city SME economies rather than indiscriminately to Ghana's entire industrial sector.

General Interpretation

Results overall challenge two overly simplistic assumptions. The first is that small businesses always have a financial burden in the form of environmental action. The second is that all green investment is good for firm performance.

The evidence points to a more balanced conclusion. Green entrepreneurship can be economically attractive if it improves the way firms use resources. But firms differ in their ability to make the investments required to achieve those gains. Thus, the extent to which SMEs can translate environmental intention into meaningful economic benefit is influenced by finance, technology, knowledge, infrastructure, and institutional support.

The take-home message for Sunyani East and Sunyani West is that SMEs should go green. But the more important question is how to create the conditions in which businesses will adopt green practices that solve real operational problems and create real economic value. Hence, the results impose a concrete meaning to the main argument in the study: Green Practices: Better Use of Resources Sustainable Economic Performance This pathway offers a pragmatic understanding of green growth for Ghana in which the probability of embedding environmental sustainability in SME behavior is increased when the benefits of waste reduction, resource efficiency improvements, and green technologies are understood to be beneficial to the economic future of industry.

CONCLUSION AND RECOMMENDATIONS

Conclusion

The study was on the extent to which green entrepreneurship practices influence sustainable economic performance of SMEs in Sunyani East and Sunyani West in the Bono Region of Ghana. One potential mechanism that connects environmentally responsible business practices to economic benefits is resource efficiency. The study also measured the level of adoption of green practices and identified the main constraints that limit the transition of SMEs to more sustainable operations.

The results indicate that green entrepreneurship is already being developed among SMEs in the study area, although the level of adoption varies widely among the practices. The overall GEAI (Green Entrepreneurship Adoption Index) is 45.74% indicating moderate adoption. The most popular practices adopted were energy efficiency (66.9%) and waste reduction (61.7%), while renewable energy had the lowest adoption level (23.2%). This pattern indicates that SMEs are more prone to initiate practices that can be gradually introduced and with manageable financial commitments.

The findings also indicate that green entrepreneurship is highly related to the use of SMEs resources. Green entrepreneurship was positively related to sustainable economic performance ($r = .558$) and strongly related to resource efficiency ($r = .717$). These relationships were statistically significant even when controlling relevant enterprise characteristics. Resource efficiency was also significantly and positively related to sustainable economic performance and partially mediated the relationship between green entrepreneurship and performance. The estimated indirect effect of 0.0088, 95% CI [0.0062, 0.0117], indicates that part of the economic value of green entrepreneurship is transmitted through improved resource use.

The central conclusion, then, is not merely that environmentally responsible firms do better. Instead, green entrepreneurship only becomes economically significant when it assists SMEs to minimize waste, optimize energy and material use, improve operational processes, and extract increased value from the resources they already pay for. Resource efficiency, therefore, represents an important connection between green practices and sustainable economic performance.

But the findings also demonstrate that the transition is constrained by the realities of small business. The two most important barriers were limited access to finance and high initial investment costs. This explains why relatively inexpensive practices such as energy efficiency and waste reduction were more common than capital-intensive options such as renewable energy. Therefore, the findings show that willingness alone is not enough, but SMEs also need the financial and institutional capacity to invest.

Policy and Practical Implications

The findings have significant implications for Ghana's SME development and green-growth agenda. Ghana's amended climate pledges are focused on renewable energy, energy efficiency, sustainable production, waste management, and private-sector involvement (MESTI & EPA, 2021). However, these national ambitions are unlikely to result in widespread SME action unless green investments are financially and operationally realistic for smaller businesses.

One important consequence relates to finance. Green financing needs to be more accessible and better suited to the cash-flow realities of SMEs. Financial institutions, the Ghana Enterprises Agency, development finance institutions, and other enterprise-support organizations could develop products specifically for renewable-energy systems, energy-efficient equipment, cleaner production technologies, recycling, and other resource-saving investments. Repayment terms could, where appropriate, consider expected savings and investment payback periods rather than be solely based on traditional short-term SME lending structures.

A second implication concerns support for resource efficiency. A lot of small and medium-sized businesses may not realize exactly how much cash they're throwing away in inefficient electricity use, wasted materials, too much water, poorly maintained equipment, and avoidable production losses. Practical audits of energy, water, materials, and waste can help businesses to identify where environmental improvements are most likely to deliver tangible financial returns. This would make green entrepreneurship easier to understand as a business-management strategy than an environmental obligation only.

Interventions should also consider the differences between sectors. The requirements of an agro-processing business are different from those of a hotel, retailer, transport operator, or construction company. Agro-processors may benefit more from efficient machinery, renewable energy valorization of waste, and water management, while hospitality businesses may need support with electricity use, water conservation, food waste and sustainable packaging. Thus, a single package of green interventions is unlikely to be equally effective for all SMEs.

Local institutions in Sunyani East and Sunyani West could also be of great importance. Partnerships between local authorities, the Ghana Enterprises Agency, financial institutions, universities, business associations, environmental institutions and technology providers could support technology demonstrations, resource efficiency training, recycling partnerships, and information on green financing opportunities.

Finally, green entrepreneurship should be framed in terms of the daily concerns of business owners. Sustainability messages tend to become practical when they show the impact of a particular investment on electricity bills, material losses, operating costs, productivity, resilience, or the time to recover the initial cost. The results of this study suggest that a more compelling case for continued adoption may be made by linking environmental benefits to concrete business results.

Recommendations

First, green-finance interventions should move beyond undifferentiated SME lending. Financial institutions and enterprise-support organizations should develop financing structures linked to identifiable resource-saving investments. Equipment leasing can enable qualifying SMEs to obtain solar systems, energy-efficient machinery, refrigeration equipment, and processing technologies without meeting the full investment cost upfront. Pay-As-You-Save arrangements should also be piloted where credible estimates of electricity, fuel, material, or other operating savings can support repayment schedules.

Second, the Ghana Enterprises Agency could work with participating rural and commercial banks, development-finance institutions, and relevant technical partners to develop a partial green-credit guarantee framework for viable micro and small enterprises. Such a framework should combine partial risk sharing with simple eligibility standards, basic technical appraisal, and monitoring of the financed asset so that guarantees support commercially defensible investments rather than indiscriminate lending.

Third, energy and resource-efficiency assessments should be incorporated more systematically into SME advisory services. Basic audits can help enterprises identify avoidable expenditure associated with electricity consumption, water use, material losses, equipment inefficiency, and waste generation before deciding whether a capital investment is justified.

Fourth, the relevant municipal authorities in Sunyani East and Sunyani West should complement national programmes with locally manageable incentives. These could include streamlined business-operating-permit renewal procedures for enterprises demonstrating verifiable green practices and, where legally and fiscally permissible, modest and time-limited property-rate incentives for enterprises maintaining verified waste-sorting, recycling, or resource-efficiency systems.

Fifth, municipal authorities and private waste-management organizations should strengthen waste separation, collection, aggregation, recycling, and material-recovery arrangements so that SMEs have realistic channels through which separated waste can enter circular value chains.

Finally, support programmes should remain sector specific. The investment requirements of agro-processing, hospitality, retail, transport, construction, professional services, repair businesses, and manufacturing are sufficiently different that a single green-enterprise package is unlikely to produce uniform results.

Limitations and Future Research

Several limitations should guide interpretation of the findings.

First, the study employed a cross-sectional design in which green entrepreneurship, resource efficiency, and sustainable economic performance were measured within the same general period. The regression coefficients, correlations, and indirect effect estimate therefore represent statistical associations. They do not establish temporal precedence or provide definitive evidence that green entrepreneurship causes subsequent changes in resource efficiency or economic performance. Longitudinal research, panel data, quasi-experimental designs, or studies examining enterprises before and after specific green investments would provide stronger evidence concerning temporal relationships.

Second, important variables were obtained from owners or managers using the same survey instrument. Managerial reporting is widely used in SME research because administrative and audited records are often incomplete or difficult to access, but self-reported measures remain vulnerable to recall error, subjective judgement, social-desirability effects, and common method variance. The common-method diagnostic reported in Section 3.7 can reduce concern that a single latent response tendency dominates statistical relationships, but such a test cannot eliminate the possibility of measurement bias.

Future research should therefore triangulate managerial reports with objective enterprise records wherever feasible. Relevant indicators could include electricity and other utility bills, raw-material purchase invoices, equipment or fuel records, quantities of waste generated or recovered, production records, sales documentation, and audited or otherwise verifiable financial accounts. Such triangulation would be particularly valuable for testing whether reported resource-efficiency improvements correspond with observable reductions in resource expenditure or improvements in financial performance.

Third, the study is geographically bound to Sunyani East and Sunyani West. This is an empirical strength insofar as it provides evidence from a secondary urban economy that is underrepresented in the Ghanaian literature, but it also limits external validity. Infrastructure, access to specialized finance, technology markets, industrial structure, environmental pressures, and institutional support may differ substantially across Accra, Tema, Kumasi, Takoradi, Tamale, and other locations.

Fourth, the sample primarily represents trade, services, construction, transport, agro-processing, hospitality, repair activities, and relatively small-scale manufacturing. The results should therefore not be extrapolated directly to capital-intensive heavy industry or large corporations with different environmental technologies, regulatory exposures, capital structures, and production processes.

Future studies could combine longitudinal designs with regional comparisons and objective administrative indicators. A comparative analysis between secondary cities and major metropolitan-industrial centres would be especially useful for determining whether the associations identified in this study vary systematically with infrastructure, financial access, technology availability, and local institutional capacity.

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