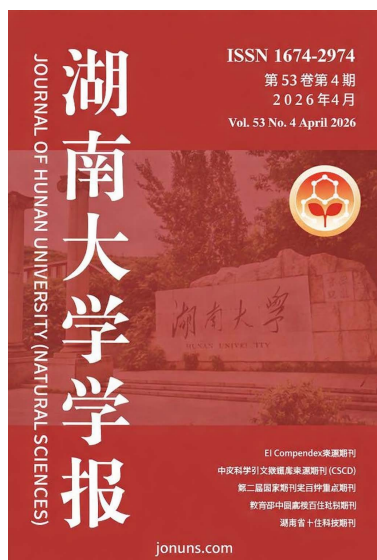




Journal of Hunan University (Natural Sciences)

Vol. 53 No. 4

April 2026

Available online at

<https://joununs.com>



Open Access Article

 <https://doi.org/10.55463/issn.1674-2974.53.4.11>

Driving Sustainable MSME Performance through Green Innovation and Environmental Practices In West Sumatera

Fitria^{*1}, Syamsul Amar¹, Parengki Susanto¹

¹ Environmental and Development Studies Program, Faculty of Economics and Business, Universitas Negeri Padang, Indonesia,

* Corresponding author: fitriaedwar85@gmail.com

Article History:

Received: March 4, 2026

Revised: April 12, 2026

Accepted: April 20, 2026

Published: April 30, 2026

Abstract: The increasing environmental pressure associated with the rapid growth of micro, small, and medium enterprises (MSMEs) has intensified the need for business models that integrate economic performance with environmental responsibility. Despite the growing interest in sustainable entrepreneurship, empirical studies examining how sustainable environmental practices and green innovation jointly influence MSME sustainability through financial mechanisms remain limited, particularly in tourism-driven regional economies. This study aims to examine the influence of sustainable environmental practices and green innovation on sustainable MSME performance, with financial performance acting as a mediating variable. The research was conducted among environmentally oriented MSMEs in West Sumatera, Indonesia, specifically in Agam Regency, Bukittinggi City, Pasaman Regency, and Padang Panjang City. Using a quantitative approach, data were collected from 301 MSMEs and analyzed using Structural Equation Modeling with Partial Least Squares (PLS-SEM). The findings reveal that sustainable environmental practices and green innovation significantly improve financial performance, which subsequently enhances sustainable MSME performance. Green innovation also demonstrates a direct positive influence on sustainable business performance, highlighting the importance of innovation in strengthening long-term competitiveness and environmental responsibility. However, the direct influence of environmental practices on sustainable business performance appears relatively weaker, indicating that financial capacity and innovation capability play critical roles in translating sustainability practices into tangible business outcomes. The novelty of this study lies in integrating sustainability practices, innovation capability, and financial performance within a unified



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analytical framework applied to MSMEs operating in tourism-oriented regional economies. The findings contribute to the literature on sustainable entrepreneurship and provide practical implications for policymakers, financial institutions, and MSME development agencies to promote green innovation, sustainability training, and green financing initiatives in supporting environmentally responsible MSME development.

Keywords: Sustainable environmental practices; Green innovation; Financial performance; Sustainable MSME performance; Green MSMEs; Emerging economies.

推动绿色创新与环境实践促进西苏门答腊省中小微企业可持续绩效提升

摘要：随着微型、小型和中型企业（MSMEs）的快速发展，与之相关的环境压力不断增加，因此亟需构建能够将经济绩效与环境责任相结合的商业模式。尽管可持续创业受到越来越多的关注，但关于可持续环境实践与绿色创新如何通过财务机制共同影响中小微企业可持续性的实证研究仍然有限，尤其是在以旅游业为驱动的区域经济背景下。本研究旨在考察可持续环境实践和绿色创新对中小微企业可持续绩效的影响，并将财务绩效作为中介变量。研究对象为印度尼西亚西苏门答腊省具有环境导向的中小微企业，具体包括阿甘县、武吉丁宜市、帕萨曼县和巴东班让市。研究采用定量方法，收集了301家中小微企业的数据，并运用偏最小二乘结构方程模型（PLS-SEM）进行分析。研究结果表明，可持续环境实践和绿色创新显著提升财务绩效，而财务绩效进一步增强中小微企业的可持续绩效。绿色创新还对可持续经营绩效产生直接的正向影响，突出了创新在增强长期竞争力和环境责任方面的重要作用。然而，环境实践对可持续经营绩效的直接影响相对较弱，这表明财务能力和创新能力在将可持续实践转化为实际经营成果方面发挥着关键作用。本研究的创新性在于，将可持续实践、创新能力和财务绩效整合到一个统一的分析框架中，并应用于以旅游业为导向的区域经济背景下运营的中小微企业。研究结果丰富了可持续创业领域的相关文献，并为政策制定者、金融机构和中小微企业发展机构提供了实践启示，以推动绿色创新、可持续发展培训和绿色融资计划，从而支持具有环境责任意识的中小微企业发展。

关键词：可持续环境实践；绿色创新；财务绩效；中小微企业可持续绩效；绿色中小微企业；新兴经济体。

1. Introduction

The transition toward sustainability has fundamentally reshaped how business performance is conceptualized in modern economic systems. In the contemporary global economy, firms are increasingly expected to balance economic growth with social and environmental responsibilities rather than focusing solely on profit maximization[1]. This shift is particularly relevant for micro, small, and medium enterprises (MSMEs), which play a crucial role in employment generation, poverty reduction, and regional economic development. As key drivers of local economies, MSMEs are now required to integrate sustainability principles into their operational practices in order to maintain long-term competitiveness and resilience [2]. Within this framework, sustainable

business practices are increasingly recognized as strategic approaches that allow firms to create economic value while preserving environmental resources and supporting social well-being.

From a strategic perspective, sustainability practices are no longer viewed merely as regulatory obligations but also as drivers of operational efficiency and competitive advantage[3]. Firms that adopt environmentally responsible practices often achieve improvements in resource efficiency, reduced production costs, and stronger reputational capital. Empirical evidence supports this argument. The World Bank in 2022, reports that enterprises implementing sustainability initiatives can increase energy efficiency by up to 25 percent and reduce operational costs by approximately 15 percent [4]. Similarly, Malesios show that sustainability-oriented businesses have a higher

probability of surviving economic crises compared with those that do not adopt such practices [5]. In addition, sustainability initiatives strengthen consumer trust and corporate reputation, which ultimately contribute to improved financial performance and long-term competitiveness.

Despite these potential benefits, the rapid expansion of MSMEs has also generated significant environmental challenges, particularly in developing countries where environmental management systems remain limited. Many MSMEs continue to prioritize production expansion and profit generation without implementing adequate environmental protection measures, thereby contributing to environmental degradation[6]. In Indonesia, approximately 60 percent of MSMEs still lack proper waste management systems [7]. Poorly managed solid, liquid, and gaseous waste can contaminate surrounding ecosystems, posing risks to environmental quality and public health[8]. For example, Acosta identified hazardous chemical substances in wastewater generated by small-scale laundry businesses in Salatiga, highlighting the environmental risks associated with inadequate waste treatment systems[9].

These environmental challenges are particularly visible in tourism-driven regional economies where MSME activities are closely associated with increasing resource consumption and waste generation. In Indonesia, West Sumatera ranks eighth nationally in terms of the number of MSMEs, with approximately 296,052 business units, most of which operate in the food and beverage sector[10]. This sector plays an important role in supporting regional economic development by creating employment opportunities and generating local income. The growth of MSMEs in this region is strongly supported by the rich culinary heritage of Minangkabau culture and the increasing number of tourists visiting several major destinations in West Sumatera[10]. According to the Tourism Office, tourist visits to paid attractions in Bukittinggi reached 764,640 visitors and generated approximately IDR 17.5 billion in local government revenue[11].

Within the provincial context, several strategic areas have emerged as important centers of MSME activity, particularly Agam Regency, Bukittinggi City, Pasaman Regency, and Padang Panjang City. These regions form interconnected economic corridors that support tourism development, culinary industries, and local handicraft sectors. The rapid growth of MSMEs in these areas has contributed significantly to regional economic development and employment generation. However, the expansion of tourism-related MSME activities has also intensified environmental pressures due to increasing resource consumption and production waste[12]. Data from local MSME authorities indicate that thousands of MSMEs operate across these regions, with a substantial proportion engaged in tourism-related sectors such as culinary services and small-scale food production[13]. Meanwhile, environmental monitoring reports indicate that many MSMEs in these regions still

lack adequate waste management systems, particularly in high-tourism areas such as Jam Gadang and surrounding tourism corridors.

One potential pathway to address these environmental challenges is through the adoption of sustainable environmental practices and green innovation. Sustainable environmental practices involve implementing environmentally responsible business activities such as efficient resource use, pollution prevention, and environmentally friendly production processes. Green innovation focuses on developing environmentally friendly products and technologies that minimize ecological impacts while enhancing competitiveness. Product innovation enables firms to design environmentally friendly goods using sustainable materials[14], while process innovation improves production efficiency by reducing energy consumption and minimizing waste generation[15]. However, the adoption of such innovations among MSMEs remains limited. Data from the Bukittinggi, Agam, Pasaman, and Padang Panjang, Cooperative and MSME Office show that only around 31 percent of MSMEs have implemented technological innovations in their business processes (). National surveys also indicate that more than 60 percent of MSME actors have not received training related to innovation and product development[16].

In addition to environmental practices and innovation, financial performance plays an important mediating role in enabling MSMEs to sustain environmentally responsible business strategies[17]. The implementation of sustainable environmental practices and green innovation often requires investments in cleaner technologies, energy-efficient production systems, and environmentally friendly materials. Firms that successfully implement such strategies may experience improved operational efficiency and reduced production costs, which ultimately strengthen financial performance[18]. Previous studies suggest that sustainability initiatives can enhance financial outcomes by improving efficiency and strengthening market reputation. Improved financial performance can subsequently enable MSMEs to reinvest in environmentally responsible innovations and sustainable practices, thereby strengthening their long-term business sustainability[19].

Although previous studies have examined sustainability practices and innovation in MSMEs, many studies have treated these factors independently rather than examining their integrated relationships. Some studies emphasize the role of environmental practices in improving operational efficiency, while others focus on the contribution of innovation to competitiveness and value creation [20]. However, several important gaps remain. First, many studies treat environmental practices and green innovation as separate predictors rather than as interconnected mechanisms. Second, financial performance is often examined as a terminal outcome, even though it may act as the channel through which sustainability-oriented strategies shape long term

business performance. Third, empirical evidence remains limited in tourism based regional economies, where environmental quality, destination competitiveness, and MSME performance are closely intertwined. This gap is theoretically important because it obscures how sustainability practices are translated into actual business outcomes under the resource constraints that characterize many MSMEs in emerging economies.

This study addresses that gap by examining the relationships among sustainable environmental practices, green innovation, financial performance, and sustainable MSME performance in West Sumatera, particularly in Agam Regency, Bukittinggi City, Pasaman Regency, and Padang Panjang City. The study offers three main contributions. First, it extends the literature on sustainable entrepreneurship by focusing on a tourism based regional economy in an emerging country context, where MSMEs face simultaneous pressures for growth, environmental responsibility, and market legitimacy. Second, it integrates sustainable environmental practices, green innovation, and financial performance into a single explanatory framework for sustainable MSME performance. Third, it clarifies that the effect of environmental practices on sustainable performance may not be fully direct, because their value depends on the firm's ability to transform environmental commitment into innovation capability and financial strength.

2. Research Methods

2.1. Research Design

This study employed a quantitative, explanatory, and cross-sectional design to examine the relationships among sustainable environmental practices, green innovation, financial performance, and sustainable MSME performance. A quantitative approach was appropriate because the study sought to test hypothesized relationships among latent constructs using standardized indicators and statistical analysis. The proposed model was analyzed using partial least squares structural equation modeling (PLS-SEM) with Smart PLS 4 version. This technique was selected because the study was prediction oriented, involved multiple latent constructs and mediation paths, and was appropriate for analyzing complex relationships among reflective variables.

2.2. Study Area and Research Context

The study was conducted in West Sumatera Province, Indonesia, with a focus on Agam Regency, Bukittinggi City, Padang Panjang City, and Pasaman Regency. These areas were selected because they represent important centers of MSME activity, particularly in tourism and culinary sectors that contribute substantially to the regional economy. They also provide a relevant setting for examining environmentally oriented MSMEs, as local development programs in these regions have increasingly promoted

environmentally responsible business practices.

In this study, Go Green MSMEs refer to enterprises that had adopted at least one environmentally oriented practice, such as efficient resource use, waste reduction, recycling, environmentally friendly production processes, or the use of environmentally friendly materials. This operational definition was used to identify the target population and to align the sample with the objectives of the study.

2.3. Population and Sampling

The population of this study comprised 1,219 environmentally oriented MSMEs operating in West Sumatera Province in 2024. The sampling frame was compiled from records maintained by the Ministry of Cooperatives and SMEs, regional MSME offices, and supporting institutional databases used to verify environmentally oriented MSMEs in the four selected study areas, namely Agam Regency, Bukittinggi City, Padang Panjang City, and Pasaman Regency. For the purpose of this study, Go Green MSMEs were defined as enterprises that had implemented at least one environmentally responsible practice, such as efficient resource use, waste reduction, recycling, environmentally friendly production processes, or the use of eco-friendly materials.

The minimum sample size was initially estimated using Slovin's approach because the study was based on a finite and known population. With a population of 1,219 MSMEs and a margin of error of 5 percent [19], the calculation yielded a minimum sample of 301 MSMEs. However, the adequacy of this sample was not considered solely on the basis of Slovin's approach. Because the study employed PLS SEM, the final sample size was also assessed in relation to the structural complexity of the proposed model. In this respect, 301 observations were considered sufficient to support stable parameter estimation and bootstrapping, as the sample exceeded the minimum requirement implied by the number of structural paths directed to the endogenous constructs.

A multistage probability sampling procedure was then employed. In the first stage, the total sample was allocated proportionally across business size categories in order to preserve the population structure, resulting in 227 micro enterprises, 36 small enterprises, and 38 medium enterprises. In the second stage, the sample was distributed proportionally across the four study areas, comprising 84 enterprises from Agam Regency, 96 from Bukittinggi City, 43 from Padang Panjang City, and 78 from Pasaman Regency. In the final stage, respondents were selected through stratified random sampling within each business stratum and geographic area. This procedure was intended to maintain proportional representation across enterprise scale and location while ensuring that the final sample reflected the distribution of environmentally oriented MSMEs in West Sumatera.

2.4. Respondents, Data Sources, and Data Collection

This study used both primary and secondary data. Primary data were collected from MSME owners or managers through a structured questionnaire. Owners or managers were selected as respondents because they were considered the most knowledgeable about the firm’s environmental practices, innovation activities, and business performance. Eligible respondents were MSMEs located in the four selected regions, categorized as micro, small, or medium enterprises, and identified as environmentally oriented businesses in the sampling frame.

The survey was conducted from September 2025 to January 2026. A total of 301 questionnaires were distributed, and usable responses were retained for analysis. Questionnaires that were incomplete or did not meet the study criteria were excluded from the final dataset. Secondary data were obtained from official reports and institutional records, including the Ministry of Cooperatives and SMEs, regional MSME offices in West Sumatera, and supporting documents used to identify the population and contextualize the study area.

2.5 Questionnaire Development and Measurement

The questionnaire was developed by adapting measurement items and contextualizing them to environmentally oriented MSMEs in West Sumatera. The final instrument contained 16 reflective indicators across four latent constructs: sustainable environmental practices, green innovation, financial performance, and sustainable MSME performance.

All constructs were measured using a five points Likert scale ranging from 1 = strongly disagree to 5 strongly agree. The questionnaire was prepared in Indonesia language. The wording of the items was adjusted to fit the MSME context of West Sumatera without altering the substantive meaning of the original measures. Before full data collection, the instrument was reviewed by subject experts and pilot tested with 30 MSME respondents to assess clarity, relevance, and readability. The operational definitions and measurement items are presented in Table 1.

Table 1. Operational Definition Variable

Variable	Measurement Item
Exogenous Variable	
Sustainable Environmental Practices (X1) are the measures and policies adopted by MSMEs to reduce environmental harm through efficient resource use, responsible waste	1. Efficient use of energy and natural resources
	2. Waste reduction and recycling practices

management, and environmentally friendly production processes.	3. Environmentally friendly production processes
	4. Use of eco-friendly materials in production
Green Innovation (X2) is strategic efforts by MSMEs to improve products and production processes in environmentally responsible ways that enhance competitiveness, efficiency, and business sustainability.	1. Development of environmentally friendly products
	2. Adoption of green production technologies
	3. Innovation in reducing energy consumption
	4. Innovation in waste management and pollution reduction
Mediating Variable	
Financial Performance (Z) is the ability of MSMEs to manage their financial resources effectively and efficiently to achieve their business objectives	1. Increase in business revenue
	2. Improvement in profitability
	3. Operational cost efficiency
	4. Growth of financial stability of the business
Endogenous Variable	
Sustainable MSME Performance (Y) is the MSMEs’ ability to operate efficiently and innovatively while maintaining environmental and social responsibility to achieve sustainable economic growth.	1. Long-term business growth
	2. Improvement of environmental performance
	3. Increased customer trust and market competitiveness
	4. Ability to maintain sustainable business operations

2.6. Data Analysis

Data were analyzed using Smart PLS 4 version. The analysis was conducted in two stages. The first stage

evaluated the measurement model, and the second stage evaluated the structural model.

For the measurement model, convergent validity was assessed using indicator loadings and the average variance extracted (AVE). Indicator loadings of 0.70 or higher were considered desirable, although loadings above 0.60 were retained when theoretically justified. AVE values above 0.50 indicated adequate convergent validity [20]. Internal consistency reliability was assessed using Cronbach's alpha and composite reliability, with values above 0.70 indicating satisfactory reliability. Discriminant validity was assessed primarily using the heterotrait-monotrait ratio (HTMT), with values below 0.85 indicating adequate distinction among constructs. Cross loadings were used as a supplementary check [20].

The structural model was evaluated using the coefficient of determination (R^2), predictive relevance (Q^2), and bootstrapped path coefficients [21]. Hypothesis testing was based on t statistics and p values. At the 5 percent significance level, a path was considered statistically significant when the t statistic exceeded 1.96 and the p value was below 0.05 [22]. Mediation was assessed by examining the indirect effects of sustainable environmental practices and green innovation on sustainable MSME performance through financial performance. Mediation was interpreted on the basis of the significance of the indirect effects and the pattern of the corresponding direct effects [23].

2.7 Ethical Considerations

Participation in the survey was voluntary. Before data collection, respondents were informed about the purpose of the study and assured that their responses would be treated confidentially and used only for academic purposes. No personally identifying information is reported in this article.

3. Result

3.1. Respondent Characteristics

Respondent characteristics in this study representing environmentally oriented MSMEs in West Sumatera Province. In terms of geographic distribution, the respondents were drawn from Bukittinggi City, with 96 respondents or 31.9 percent of the sample, followed by Agam Regency with 84 respondents or 27.9 percent, Pasaman Regency with 78 respondents or 25.9 percent, and Padang Panjang City with 43 respondents or 14.3 percent. This distribution indicates that the sample adequately reflects the four selected study areas. With regard to gender, female respondents accounted for 168 individuals or 55.8 percent of the sample, while male respondents accounted for 133 individuals or 44.2 percent. This pattern suggests a slightly stronger participation of women in environmentally oriented MSME activities in the study area.

In terms of age, the respondents were predominantly

in their productive working years. The largest group was aged 31 to 40 years, comprising 99 respondents or 32.9 percent, followed by those aged 41 to 50 years with 91 respondents or 30.2 percent. Respondents aged over 50 years accounted for 67 individuals or 22.3 percent, while those aged below 30 years represented 44 individuals or 14.6 percent. Regarding educational attainment, senior high school was the most common level, reported by 127 respondents or 42.2 percent. This was followed by junior secondary school or equivalent with 59 respondents or 19.6 percent, bachelor's degree with 48 respondents or 15.9 percent, elementary school or equivalent with 36 respondents or 12.0 percent, and diploma with 31 respondents or 10.3 percent. This profile indicates that most respondents had at least a moderate level of formal education, which may support their ability to understand and implement environmentally responsible business practices.

Household size and business age also provide useful insight into the respondents' background. Most respondents reported having 3 to 4 family members, accounting for 156 individuals or 51.8 percent, followed by those with 5 or more family members at 107 individuals or 35.5 percent, and those with 1 to 2 family members at 38 individuals or 12.6 percent. In terms of business age, 118 enterprises or 39.2 percent had been operating for more than 10 years, 112 enterprises or 37.2 percent had been operating for 5 to 10 years, and 71 enterprises or 23.6 percent had been operating for less than 5 years. These findings indicate that the sample was dominated by relatively established businesses rather than newly created enterprises, suggesting that most respondents had sufficient business experience to provide informed assessments of environmental practices, innovation, financial performance, and sustainable MSME performance.

3.2. Measurement Model Evaluation (Outer Model)

Before testing the structural relationships, the reflective measurement model was assessed to examine indicator reliability, convergent validity, discriminant validity, and internal consistency reliability. The evaluation focused on outer loadings, average variance extracted, the heterotrait monotrait ratio, Cronbach's alpha, and composite reliability.

Table 2. Outer Loadings of Reflective Indicators

Item	X1	X2	Y1	Y2
X1.1	0.852			
X1.2	0.870			
X1.3	0.936			
X1.4	0.936			
X2.1		0.902		
X2.2		0.873		
X2.3		0.926		
X2.4		0.918		

Y1.1	0.925
Y1.2	0.968
Y1.3	0.946
Y1.4	0.937
Y2.1	0.886
Y2.2	0.929
Y2.3	0.938
Y2.4	0.923

As shown in Table 2, all outer loadings exceeded 0.70, ranging from 0.852 to 0.968. These results indicate that each indicator adequately represented its intended construct and that no item needed to be removed from the measurement model. The high loading values also suggest strong indicator reliability across all four constructs.

Convergent validity was then assessed using the average variance extracted. A construct is considered to demonstrate adequate convergent validity when its AVE exceeds 0.50 [25].

Table 3. Convergent Validity Results.

Variable	Average extracted variance (AVE)
Financial Performance (Y1)	0.892
Green Inovation (X2)	0.819
Suistanable Envirionmental Practice (X1)	0.808
Suistanable MSME Performance (Y2)	0.845

As reported in Table 3, all AVE values were above the recommended threshold of 0.50, ranging from 0.808 to 0.892. These findings confirm that the indicators explained a substantial proportion of the variance in their respective constructs and therefore support convergent validity.

Discriminant validity was assessed using the heterotrait monotrait ratio. HTMT values below 0.85 indicate that the constructs are empirically distinct from one another [26].

Table 4. Discriminant Validity Test Results

Variable	Y1	X2	X1	Y2
Financial Performance (Y1)				
Green Inovation (X2)	0.813			
Suistanable Envirionmental Practice (X1)	0.757	0.837		
Suistanable MSME Performance (Y2)	0.503	0.700	0.802	

The HTMT results in Table 4 show that all values were below 0.85, with the highest value observed between green innovation and sustainable environmental practices. This result indicates adequate discriminant validity and confirms that the four constructs capture related yet empirically distinct concepts.

Internal consistency reliability was evaluated using Cronbach's alpha and composite reliability. Values above 0.70 indicate satisfactory reliability.

Table 5. Internal Consistency Reliability

Variable	Cronbac h's alpha	Composite reliability (rho c)
Financial Performance (Y1)	0.959	0.970
Green Inovation (X2)	0.926	0.948
Suistanable Envirionmental Practice (X1)	0.921	0.944
Suistanable MSME Performance (Y2)	0.939	0.956

As shown in Table 5, all constructs demonstrated strong internal consistency. Cronbach's alpha values ranged from 0.921 to 0.959, while composite reliability values ranged from 0.944 to 0.970. These results confirm that the measurement instruments used in this study were reliable and suitable for structural model analysis.

3.3 Structural Model Evaluation (Inner Model)

After the adequacy of the measurement model had been established, the structural model was assessed using the coefficient of determination, predictive relevance, and bootstrapped path coefficients[27].

In the context of this study, the R² value for the financial performance and sustainable MSME performance variable can be seen in Table 6, which shows the extent to which these variables are influenced by other factors in the model.

Tabel 6. Coefficient of Determination (R-Square)

Endogenous Variable	R-square
Financial Performance (Y1)	0.628
Sustainable MSME Performance (Y2)	0.822

The R² value for financial performance was 0.628, indicating that sustainable environmental practices and green innovation jointly explained 62.8 percent of the variance in financial performance. The R² value for sustainable MSME performance was 0.822, meaning that sustainable environmental practices, green innovation, and financial performance explained 82.2 percent of the variance in sustainable MSME

performance. These values indicate that the model had substantial explanatory power, particularly for sustainable MSME performance.

Furthermore, path analysis using the bootstrapping method was applied to examine the strength and significance of the relationships among variables. The complete analysis results are shown in Table 7.

Table 7. Direct and Indirect Effect

Consruct	Coef	T-Value	P-Value
Financial Performance (Y1)			
-> Suistanable MSME Performance (Y2)	0.491	8.055	0.000
Green Inovation (X2) -> Financial Performance (Y1)	0.543	8.776	0.000
Green Inovation (X2) -> Suistanable MSME Performance (Y2)	0.389	6.364	0.000
Suistanable Envirionmental Practice (X1) -> Financial Performance (Y1)	0.293	4.836	0.000
Suistanable Envirionmental Practice (X1) -> Suistanable MSME Performance (Y2)	0.096	2.293	0.022

Based on the path analysis results presented in Table 7, all relationships among variables in the research model demonstrate statistically significant effects at the 5% significance level ($p < 0.05$). The results show that Financial Performance (Y1) has a significant positive effect on Sustainable MSME Performance (Y2) with a path coefficient of 0.491, a t-value of 8.055, and a p-value of 0.000, indicating that improved financial performance contributes to higher sustainable business performance among MSMEs. Furthermore, Green Innovation (X2) has a significant positive effect on Financial Performance (Y1) with a coefficient of 0.543, a t-value of 8.776, and a p-value of 0.000, suggesting that the adoption of green innovation practices enhances the financial performance of MSMEs. Green Innovation (X2) also shows a direct positive effect on Sustainable MSME Performance (Y2) with a coefficient of 0.389, a t-value of 6.364, and a p-value of 0.000.

In addition, Sustainable Environmental Practices (X1) significantly influence Financial Performance (Y1) with a coefficient of 0.293, a t-value of 4.836, and a p-value of 0.000, indicating that environmentally responsible practices contribute to improved financial outcomes. Sustainable Environmental Practices (X1) also demonstrate a direct positive effect on Sustainable MSME Performance (Y2) with a coefficient of 0.096, a t-value of 2.293, and a p-value of 0.022, although the magnitude of this effect is relatively smaller compared to other relationships in the model. Overall, these findings indicate that green innovation and sustainable environmental practices play important roles in

improving financial performance and sustainable MSME performance, with financial performance acting as an important mechanism linking sustainability practices to long-term business performance.

4. Discussion

This study examined how sustainable environmental practices and green innovation shape sustainable MSME performance, with financial performance occupying a central position in the model, among environmentally oriented MSMEs in West Sumatera. Several important insights emerge from the findings. First, sustainability-oriented strategies matter for MSMEs, but their effects are not uniform. Green innovation shows a stronger and more immediate relationship with business outcomes, whereas sustainable environmental practices have a weaker direct association with sustainable MSME performance. Second, financial performance appears to be a crucial enabling condition that allows environmentally responsible initiatives to generate more durable business benefits. These findings suggest that sustainability does not translate into performance automatically. Its value depends on the firm's ability to convert environmental commitment into innovation capability and financial strength. In the context of tourism-oriented regional economies, MSMEs play an essential role in supporting local economic development while simultaneously facing increasing environmental challenges[28]. Therefore, the adoption of sustainable practices becomes increasingly important in ensuring that business growth does not generate excessive environmental pressure [29]. The results of this study confirm that integrating environmental responsibility, innovation capability, and financial performance provides a comprehensive pathway toward achieving sustainable MSME development in emerging regional economies.

The positive relationship between sustainable environmental practices and financial performance indicates that environmentally responsible routines can generate real economic benefits for MSMEs. Practices such as more efficient use of materials, better waste management, and cleaner production processes can reduce operating costs, limit inefficiencies, and improve overall process discipline. For small firms, where margins are often narrow, even modest gains in efficiency may have meaningful financial consequences. This finding therefore suggests that environmental responsibility should not be viewed only as a compliance burden. It can also function as a practical strategy for improving cost efficiency and operational resilience. The findings are consistent with previous research demonstrating that sustainability initiatives can increase energy efficiency and reduce operational costs for businesses[30]. Furthermore, sustainability-oriented practices may strengthen corporate reputation and increase consumer trust, which

can further contribute to improved financial outcomes[31]. From the perspective of the natural resource-based view, these practices become strategically valuable when they help firms preserve resources, improve efficiency, and strengthen capabilities that support long term competitiveness.

The effect of green innovation on financial performance is even stronger, which suggests that innovation is the point at which environmental commitment becomes commercially meaningful. For MSMEs, developing environmentally friendly products, adopting cleaner production techniques, and reducing energy use can create differentiation while also improving internal efficiency. In other words, green innovation does not merely reduce environmental harm. It also helps firms generate value. This finding is particularly relevant for MSMEs, since they often operate under resource constraints and must respond quickly to changing market preferences [12]. In addition, process innovation allows businesses to optimize production processes and reduce operational costs through improved efficiency[32]. In this sense, green innovation reflects a firm's capacity to adapt its routines and resources in ways that improve both environmental and economic outcomes.

Financial performance also has a strong positive effect on sustainable MSME performance. This result indicates that financial strength is more than a short-term outcome. It is an enabling condition for sustainability. MSMEs that perform better financially are in a better position to invest in cleaner technologies, improve packaging and product quality, adopt more effective waste systems, and maintain environmentally responsible practices over time. For resource constrained firms, sustainability is difficult to sustain without adequate financial capacity. This helps explain why financial performance occupies such an important position in the model. Financial resources enable businesses to adopt environmentally friendly production equipment, improve waste management systems, and develop innovative products that meet market demands[33]. These findings are consistent with previous research emphasizing that financial performance plays a crucial role in enabling firms to implement sustainability strategies and maintain long-term competitiveness [34]. The findings suggest that sustainability becomes more durable when environmental practices and innovation are translated into revenue growth, cost efficiency, and greater financial stability.

The direct positive effect of green innovation on sustainable MSME performance further indicates that innovation has strategic value beyond its contribution to short term financial outcomes. MSMEs that innovate in environmentally responsible ways are better positioned to strengthen product appeal, improve operational consistency, and build customer trust. Green innovation

enables businesses to reduce environmental impacts while simultaneously improving product quality and market competitiveness [35]. In tourism-based markets, this advantage can be especially visible. Consumers are often sensitive to product quality, hygiene, packaging, and the broader image of the destination. These results support previous studies emphasizing that innovation plays a central role in achieving sustainable business performance and long-term competitiveness [36]. Hence, green innovation can contribute not only to internal efficiency but also to market legitimacy and competitive positioning. This helps explain why green innovation shows a more substantial direct relationship with sustainable MSME performance than sustainable environmental practices alone.

By contrast, the direct effect of sustainable environmental practices on sustainable MSME performance is statistically significant but relatively weak. This is one of the most important findings of the study. This finding suggests that environmental practices alone may not be sufficient to generate substantial improvements in business performance unless they are supported by innovation and adequate financial resources [37]. Several explanations are plausible. First, many environmental practices involve adjustment costs, including changes in materials, production routines, and waste handling systems. Second, their benefits are often indirect and cumulative rather than immediate. Third, small firms may not yet possess the managerial capability, technology, or capital needed to convert environmentally responsible routines into clear market advantages. For this reason, environmental practices are likely to improve sustainable performance more effectively when they are accompanied by innovation capability and adequate financial support. This finding adds an important nuance to the literature by showing that the value of sustainability practices depends on the firm's ability to operationalize them in economically meaningful ways.

The regional context of West Sumatra helps explain why these relationships are especially relevant. In a tourism-based economy, business performance is closely tied to destination image, cleanliness, product authenticity, and visitor trust. MSMEs operating in culinary and tourism related sectors compete not only on price but also on experience, reputation, and perceived responsibility. In such a setting, environmentally responsible business practices can strengthen local legitimacy, but their effect on long term business performance becomes stronger when they are supported by visible innovation and sufficient financial capacity. This regional perspective is one of the study's important contributions, because it shows that sustainability in MSMEs is shaped not only by internal firm behavior but also by the demands of place-based markets.

Overall, the findings contribute to the literature in two important ways. Empirically, they show that

sustainable environmental practices, green innovation, and financial performance are better understood as interconnected rather than separate drivers of sustainable MSME performance. Theoretically, the results support the view that environmental practices become strategically valuable only when firms are able to transform them into adaptive capability and economic value. Previous research has often examined sustainability practices and innovation separately when analyzing business performance [38]. Encouraging MSMEs to adopt environmental practices is important, but it is unlikely to be sufficient on its own. Support for green innovation, managerial capability, and access to finance is equally necessary if sustainability is expected to produce durable performance gains.

5. Conclusion

This study revealed that both sustainable environmental practices and green innovation contribute positively to financial performance, while green innovation also exerts a stronger direct influence on sustainable MSME performance. Financial performance occupies an important position in this relationship, indicating that sustainability-oriented strategies are more likely to generate durable business outcomes when they are accompanied by stronger financial capacity.

These findings offer two main contributions. First, the study extends the literature on sustainable MSME development by focusing on a tourism-oriented regional economy, where business performance is closely linked to environmental quality, local reputation, and visitor trust. Second, the study integrates sustainable environmental practices, green innovation, and financial performance within a single analytical framework, thereby providing a more coherent explanation of how sustainability-oriented strategies are associated with long-term MSME performance. The results suggest that environmental commitment alone is not sufficient. MSMEs are more likely to achieve sustainable performance when environmental practices are translated into innovation capability, operational efficiency, and stronger financial outcomes. From a broader policy and managerial perspective, the study highlights that sustainable MSME development should not be approached only as an environmental concern. It should also be treated as an economic strategy that can strengthen competitiveness, resilience, and long-term business viability in tourism-based regional economies such as West Sumatra.

5.1 Limitations

This study has several limitations that should be acknowledged. First, the empirical setting is confined to selected areas of West Sumatra, namely Agam Regency, Bukittinggi City, Pasaman Regency, and Padang Panjang City. As a result, the findings may not be fully generalizable to MSMEs operating in other regions,

sectors, or institutional contexts. Second, the study employed a cross-sectional design, which captures relationships at a single point in time and therefore does not allow stronger conclusions about long-term dynamics or causal direction. Third, the analysis relied primarily on self-reported responses from MSME owners or managers, which may introduce subjective bias in the assessment of sustainability practices, innovation, and performance. Fourth, the model focused on sustainable environmental practices, green innovation, and financial performance, while other potentially relevant factors, such as institutional support, digital capability, market orientation, access to green finance, and regulatory pressure, were not included. Finally, the sample was limited to environmentally oriented MSMEs, which means the findings should be interpreted within that context and may not fully represent MSMEs with low or no environmental engagement.

5.2 Future Research Directions

Future research may extend this study in several important ways. First, subsequent studies could broaden the geographical scope by including MSMEs from other provinces in Indonesia or from other emerging economies in order to test the robustness of the model across different business and institutional environments. Comparative research between tourism-oriented and non-tourism-oriented regions would be particularly valuable for understanding whether the relationships identified in this study are context specific or more broadly applicable. Second, future studies should consider incorporating additional explanatory variables that may shape sustainable MSME performance more comprehensively. These may include institutional support, environmental regulation, access to green finance, digital transformation, entrepreneurial orientation, organizational capability, and market orientation. Third, longitudinal designs would provide stronger insight into how sustainability practices and innovation influence financial and business performance over time. Such an approach would be especially useful for examining whether the benefits of environmental practices emerge gradually rather than immediately. Finally, future research may also explore moderating and mediating mechanisms more deeply in order to identify the conditions under which green innovation and sustainability practices generate stronger performance outcomes.

5.3 Practical Implications

The findings of this study carry several practical implications for MSME owners, policymakers, financial institutions, and MSME development agencies. For MSME owners and managers, the results suggest that environmental practices should not be treated as isolated compliance activities. They need to be integrated into

core business operations in ways that improve efficiency, reduce waste, and support product and process innovation. In practical terms, this means that efforts such as cleaner production, better resource management, environmentally responsible packaging, and waste reduction should be linked directly to product quality, cost efficiency, and customer value. For local governments and regional Cooperative and MSME Offices, the findings indicate the need for more targeted support programs. General awareness campaigns are unlikely to be sufficient unless they are followed by technical assistance, sector-specific training, and sustained mentoring. In the context of West Sumatra, where many MSMEs are connected to tourism and culinary activities, support programs should help businesses improve hygiene standards, environmentally responsible production processes, packaging quality, and innovation capability in ways that strengthen both sustainability and destination competitiveness.

Financial institutions also have an important role to play. Since financial performance is closely associated with sustainable MSME performance, access to appropriate financing becomes essential for enabling MSMEs to adopt cleaner technologies, improve waste management systems, and invest in environmentally oriented innovation. Green financing schemes should therefore be expanded and designed in a way that is accessible to small firms, particularly those that lack collateral strength or formal financial capacity. These financing programs would be more effective if combined with business mentoring, monitoring, and technical guidance so that borrowed funds can be translated into measurable improvements in both business performance and environmental responsibility. More broadly, the findings suggest the importance of building a stronger support ecosystem for sustainable MSME development. Collaboration among local governments, MSME support agencies, financial institutions, universities, and business associations would help MSMEs move beyond symbolic environmental commitment toward more tangible and economically meaningful sustainability practices. In tourism-driven regional economies, such coordination is especially important because the sustainability of local MSMEs is closely linked to destination image, consumer trust, and the long-term attractiveness of the regional economy.

Declarations

Author Contributions

Conceptualization, F, SA, and PS; methodology, F; formal analysis, F and PS; data curation, F; writing, original draft preparation, F and SA; writing, review and editing, SA and PS; supervision, SA and PS; project administration, F. All authors have read and agreed to the published version of the manuscript.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request. Any shared data will be provided in anonymized form in order to protect respondent confidentiality.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Acknowledgments

The authors gratefully acknowledge all MSME owners and managers who participated in this study and generously shared their time and insights during the survey process.

Informed Consent Statement

Informed consent was obtained from all participants involved in the study.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript.

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Manuscript Information
Word count: 10,716 words (excluding references).
Peer-Review Record

Fast-track status: Not fast-tracked.
First-round reviews received: 3 reports.
Revision cycles completed: 3 rounds.
Final version submitted: April 20, 2026

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