Studi Akuntansi, Keuangan, dan Manajemen (SAKMAN)
ISSN 2798-0251, Vol 5, No 4, 2026, 235-245 https://doi.org/10.35912/sakman.v5i4.6276

Environmental Sustainability Practices Leveraging Green Finance and Innovation for Enhance Eco-Friendly SMEs Performance

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Article History:
Received on 05 February 2026
1st Revision on 12 February 2026
2nd Revision on 21 February 2026
3rd Revision on 09 March 2026
Accepted on 30 March 2026

Abstract
Purpose: This study examines how green finance and green innovation affect the business performance of environmentally conscious SMEs in East Java, particularly emphasizing the mediating role of environmental sustainability in promoting improved business outcomes while fostering sustainability.
Research Methodology: The PLS-SEM method was used to analyze the business performance of 150 environmentally conscious SMEs in East Java.
Results: This study indicates that both green innovation and green funding have a positive and significant impact on business performance. Green finance improves operational efficiency and market competitiveness. Meanwhile, green innovation greatly enhances a company's reputation and customer satisfaction, and the relationship between green finance, green innovation, and business performance is mediated by environmental sustainability strategies
Conclusions: The results show that SME company performance is shaped by a synergistic relationship. Sustainability methods improve corporate success by strengthening green financing and innovations.
Limitations: This research is limited to 150 environmentally friendly batik SMEs in East Java; therefore, the results may not be generalizable to other industrial sectors or regions.
Contributions: These findings have significant ramifications for politicians and business practitioners advocating the use of green finance and innovation to achieve commercial and environmental sustainability.

Keywords: *Business Performance, Eco-Friendly, Green Finance, Environmental, Sustainability*

How to Cite: Hendra, J., Hudzafidah, K., Wilamsari, F., Suharsono, J. (2026). Environmental Sustainability Practices Leveraging Green Finance and Innovation for Enhance Eco-Friendly SMEs Performance. *Studi Akuntansi, Keuangan, dan Manajemen*, 5(4), 235-245.

1. Introduction

The increasing prioritization of sustainability in organizational activities has driven significant attention to eco-friendly SMEs. In East Java, Indonesia, eco-friendly batik SMEs represent a growing sector that combines traditional craftsmanship with modern sustainable practices. The global textile industry has significant environmental impacts, prompting a shift towards more sustainable production methods (OECD, 2024). The integration of green finance and green innovation is pivotal in supporting these enterprises to enhance their business performance while promoting environmental sustainability (George, Howard-Grenville, Joshi, & Tihanyi, 2016; Gereffi & Lee, 2016). Sustainable batik businesses in East Java face various challenges, including limited access to finance and technological innovation (OECD, 2024).

Despite these challenges, SMEs are likely to contribute considerably to the SDGs by adopting sustainable practices and innovations. The funding of initiatives that promote environmental sustainability is referred to as "green finance" (Cui, Wang, & Wang, 2020; Dong, Xu, & McIver, 2021). Green finance, which involves funding environmentally responsible programs and green development initiatives, and creating new procedures and technology intended to limit harmful impacts on the environment, are essential in overcoming these barriers and enhancing business performance (OECD, 2024). In Indonesia and Southeast Asia, SMEs face structural challenges in transitioning to sustainable business models. Limited access to green financing instruments, high collateral requirements, and low sustainability literacy constrain SMEs' abilities to invest in environmentally friendly technologies. In Indonesia, many batik SMEs struggle to finance wastewater treatment facilities and adopt natural dye innovations because of the high upfront costs. Similarly, SMEs in Malaysia, Vietnam, and Thailand encounter barriers in meeting ESG standards, accessing green credit, and obtaining the environmental certifications necessary for export competitiveness. These constraints highlight the urgency of strengthening green finance mechanisms and innovation ecosystems to support the transformation of SMEs into sustainable SME transformation.

Green finance has emerged as a crucial tool for SMEs to access the capital necessary for sustainable projects. It involves financial products and services that prioritize environmental sustainability, such as green bonds and sustainability-linked loans (OECD, 2024). The availability of green finance enables SMEs to invest in eco-friendly technologies and practices, leading to improved operational efficiency and markets. Moreover, the adoption of green finance enhances the reputation of SMEs and attracts environmentally conscious consumers and investors (OECD, 2023). Green innovation, on the other hand, focuses on developing and implementing new technologies and processes that minimize environmental impact. For eco-friendly batik SMEs, this could involve the use of natural dyes, water-saving techniques and waste reduction methods (OECD, 2023). Green innovation not only helps reduce the environmental footprint of SMEs but also contributes to cost savings and improved product quality (Agyapong, Agyapong, & Poku, 2017). Additionally, green innovation can create new market opportunities and drive long-term business growth (Gereffi & Lee, 2016). Environmental sustainability practices mediate the relationship between green financing, green innovation, and business performance. These practices include measures such as energy efficiency, waste management and resource conservation (OECD, 2024). By integrating sustainable environmental practices into their operations, SMEs can achieve a balance between economic growth and environmental protection (George et al., 2016). This not only enhances business performance but also ensures long-term sustainability (Griggs, Nilsson, Stevance, & McCollum, 2017).

The urgency of this research lies in the need to provide empirical evidence of the influence of sustainable finance and eco-innovation on the performance of batik SMEs. With increasing environmental regulations and consumer awareness, SMEs must adopt sustainable practices to remain competitive (OECD, 2024). This study aims to fill this gap by examining the mediating role of environmental sustainability practices (OECD, 2023). The benefits of this study are manifold. First, it provides valuable insights for policymakers on the importance of supporting green finance and innovation to enhance the sustainability of SMEs (Audina, Achyani, & Trisnawati, 2026). Second, it offers practical recommendations for SME owners on how to leverage green finance and innovation to improve their business performance. Finally, it contributes to the broader discourse on sustainable development and the role of SMEs in achieving the SDGs (Kamal-Chaoui, 2017).

The novelty of this study lies in its focus on eco-friendly batik SMEs in East Java, a region with rich cultural heritage and significant potential for sustainable development. By examining the specific challenges and opportunities faced by these SMEs, this study provides a unique perspective on the integration of green finance and green innovation in the context of traditional industries (OECD, 2023). Additionally, the use of the Partial Least Squares (PLS) method allows for a robust analysis of the complex relationships between the variables (OECD, 2024). This study aims to: (1) investigate the impact of green finance on the business performance of environmentally friendly batik SMEs in East Java; (2) examine the role of green innovation in enhancing business performance; and (3) assess the

mediating effect of environmental sustainability practices on the correlation between green financial practices, environmental innovation, and firm performance (OECD, 2023).

Through this comprehensive analysis, this study aims to provide actionable insights for promoting sustainable business practices among SMEs. In conclusion, this study underscores the critical role of green finance and innovation in driving the sustainable development of eco-friendly batik SMEs in East Java. By addressing the specific challenges and opportunities faced by these SMEs, this study provides valuable contributions to the field of sustainable business practices and supports the achievement of the SDGs (Kamal-Chaoui, 2017; OECD, 2024). The findings highlight the importance of integrating environmental sustainability practices to enhance business performance and ensure long-term viability (George et al., 2016; Gereffi & Lee, 2016).

2. Literature Review and Hypothesis/es Development

Green Finance is defined as financial investment aimed at supporting sustainable development projects, environmental protection, and climate change mitigation. The indicators of green finance include access to green funding, the cost of green financing, government incentives, and financial performance. Access to green funding measures the availability of financial resources for green projects, whereas the cost of green financing assesses the interest rates and fees associated with green financial products. Government incentives encompass subsidies, tax rebates, and grants that promote sustainable projects, and financial performance evaluates the return on investment (ROI) and profitability of green initiatives.

Recent studies have emphasized the significant role of green finance in supporting SMEs' sustainability efforts. According to theOECD ((OECD, 2024), green finance has been instrumental in enhancing SMEs' access to capital for sustainable projects. UNEP (2020) Structural capital includes processes, patents, and technologies that support green innovation. The G20 Green Finance Study Group discusses global initiatives and their effectiveness in promoting green finances. Debrah, Chan, and Darko (2022) provide evidence that green bonds positively influence corporate sustainability performance. Zhang and Marquardt (2020) investigate the role of government incentives in promoting green finance. Erforth (2020) further discusses the impacts and opportunities of green loans for SMEs. Iswari et al. (2023) discuss the impact Green entrepreneurial Intellectual Capital is positively significant to financial performance. This study contributes to the green finance and sustainability literature by empirically demonstrating the central role of environmental sustainability practices. While previous studies primarily focused on direct effects (Meyers et al., 2020), this study shows that sustainability practices act as a pathway through which financial and innovation capabilities translate into performance outcomes. This expands the resource-based view by highlighting sustainability practices as strategic environmental capabilities. Many organizations are actively looking for new innovative solutions to go green that can be implemented to achieve business sustainability (Yusoff et al., 2019).

Green finance is hypothesized to influence business performance (H_1) because access to environmentally oriented financial capital enables SMEs to invest in efficiency-enhancing technologies, improve their operational processes, and strengthen their market positioning. Financial support reduces the resource constraints typically faced by SMEs, thereby enhancing their competitiveness and profitability. Policymakers should strengthen targeted green financing schemes for SMEs, particularly in traditional industries, such as batik. Establishing structured green loan guidelines, interest subsidies, and eco-certification grants can accelerate the adoption of sustainable technologies. Local governments can also collaborate with banks to create region-specific green financial products that ensure inclusivity for micro and small batik enterprises.

H_1: Green finance positively impacts the business performance of eco-friendly batik SMEs in East Java.

Green innovation is proposed to affect business performance (H_2) because innovation improves product differentiation, operational efficiency, and customer perception. Environmentally friendly innovations create added value, allowing SMEs to respond to changing market demands and sustainability-related regulations. The adoption of eco-friendly technologies involves the use of renewable energy, waste

reduction techniques, and water-saving technologies. Investment in R&D measures expenditure on research and development for sustainable products, whereas sustainable production practices evaluate the implementation of eco-friendly production processes. Environmental certifications, such as ISO 14001, assess the adoption of recognized environmental-management systems. The literature on green innovation indicates its crucial role in enhancing firm performance. (Ronaldo & Suryanto, 2022) conceptual framework links green innovation to competitive advantage. It highlights that green innovation leads to improved firm performance by boosting efficiency and market appeal. Klewitz and Hansen (2014) focused on green innovation in SMEs and found that these innovations are integral to sustainability strategies. Horbach (2019) analyzed the adoption of green innovations in European SMEs. Demirel and Kesidou (2019) Kiefer, Del Río González, and Carrillo-Hermosilla (2019) Ullah, Wang, Mohsin, Jiang, and Abbas (2022) review the policy impacts and factors influencing green innovation adoption, respectively

H_2: Green innovation positively impacts the business performance of eco-friendly batik SMEs in East Java.

Business Performance measures the efficiency and effectiveness of an organization in achieving its goals. For SMEs, this includes financial performance, market competitiveness and operational efficiency. Financial performance encompasses metrics such as revenue growth, profitability and ROI. Market competitiveness measures market share, customer base expansion, and brand reputation, whereas operational efficiency examines cost savings, productivity improvements, and resource utilization. The literature on business performance measurements is extensive. Richard, Kirby, and Chadwick (2013) conduct a comparative analysis of financial and non-financial performance measures, highlighting the need for a balanced approach. Raymond, Bergeron, Croteau, and St-Pierre (2016) explore performance measurement practices in SMEs, underscoring the importance of tailored measurement systems for small businesses. Environmental Sustainability Practices refer to the actions and strategies that businesses implement to minimize their environmental impact and promote sustainable resource use. These practices include energy conservation, waste management, sustainable sourcing and pollution reduction. Indicators of environmental sustainability practices include energy conservation measures, waste management strategies, sustainable sourcing policies, and pollution reduction efforts.

Studies on environmental sustainability practices have shown their critical role in improving both environmental and business performance. Implementing sustainability practices can lead to cost savings and improved operational efficiencies. Melnyk, Dehtyarova, Kubatko, Karintseva, and Derykolenko (2019) emphasized that firms with robust sustainability practices often experience enhanced brand reputation and customer loyalty. Hart and Dowell (2011) discuss the competitive advantages gained through sustainability, such as differentiation and innovation. Wijethilake and Upadhaya (2020) highlighted the positive impact of sustainability practices on risk management. Furthermore, Othman and Ameer (2024) reinforce the importance of integrating sustainable principles into strategic planning for long-term growth. Green finance also facilitates green innovation by making the financial resources needed for research and development available. Government incentives and financial support for green projects encourage SMEs to adopt innovative technology and practices. Studies by Huang, Marquardt, and Zhang (2023) Erforth (2020) highlight the role of green finance in promoting innovation within SMEs. The use of green finance can encourage better environmental sustainability. Research indicates that access to sustainable financing resources enhances the implementation of environmentally friendly practices. For example, Delmas and Pekovic (2018) found that access to environmentally friendly financial resources enables firms to adopt sustainable technologies and processes.

H_3: Green finance positively impacts green innovation in eco-friendly batik SMEs in East Java.

Green innovation is expected to influence environmental sustainability practices (H_4) because it enables firms to implement cleaner production methods, waste reduction systems, and energy-efficient technologies. Green innovation facilitates the development of more environmentally friendly technologies and processes. Research suggests that firms adopting green innovation tend to have better environmental sustainability. For example, Hermosilla, Del Río, and Konnola (2010) Pacheco, Alves,

and Liboni (2018) Udeagha and Muchapondwa (2023) Yao, Zeng, Sheng, and Gong (2021) found that green innovation significantly contributes to reducing companies' carbon footprint.

H_4: Green innovation positively impacts Environmental sustainability practices of eco-friendly batik SMEs in East Java.

Finally, environmental sustainability practices are hypothesized to enhance business performance (H_5) because sustainable operations reduce costs, improve reputation, and strengthen long-term competitiveness. Thus, the hypotheses collectively reflect an integrated mechanism linking financial resources, innovation capacity, sustainability, and performance outcomes. Environmental sustainability practices can positively affect business performance. Research suggests that integrating sustainability practices into business strategies can enhance operational efficiency and reduce the production costs. For example, Bassetti, Blasi, and Sedita (2021); (Hart & Ahuja, 1996) Wang, Wang, and Chang (2022) found that integrating green supply chain practices can improve operational efficiency and reduce costs

H_5: Environmental sustainability practices impact the business performance of eco-friendly batik SMEs in East Java.

Research on SMEs (Figure 1) shows that green environmental practices significantly and positively influence business and sustainability performance. For example, Sudarmiatin and Fitri (2023) found that green environmental practices positively and significantly influence business performance.

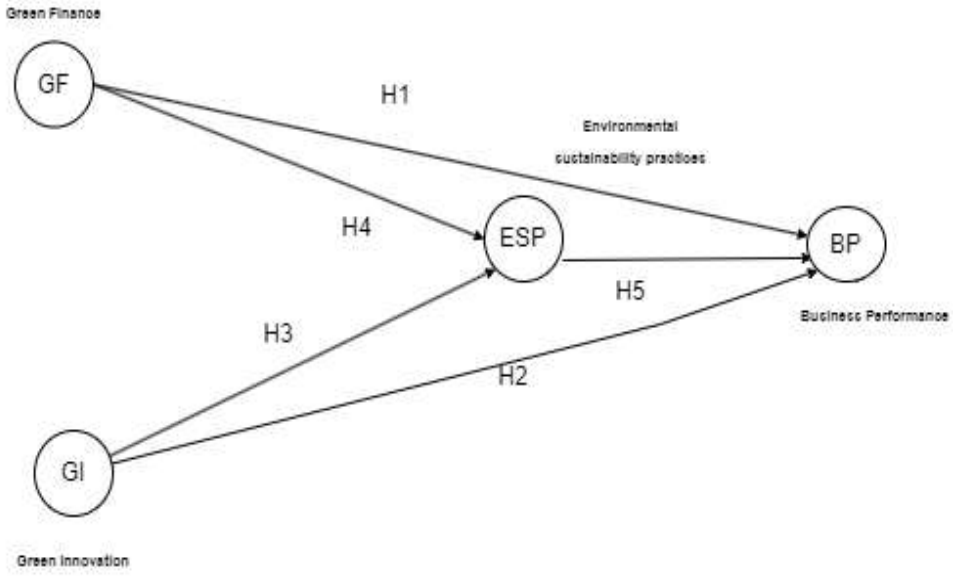

Figure 1. Research hypothesis

3. Methodology

This research methodology focuses on examining how green finance and innovation influence the business performance of eco-friendly batik MSMEs in East Java using the PLS-SEM approach. Green finance encompasses indicators such as access to green funding, government incentives, and financial performance metrics, such as Return on Investment (ROI) from green initiatives. Green innovation refers to the development and adoption of new products, processes, and practices that reduce environmental impact. Key indicators include the adoption of green technologies, investment in research and development (R&D) for sustainability, and obtaining environmental certifications such as ISO 14001. The study population consisted of 176 eco-friendly batik SMEs in East Java. These SMEs were identified through local government databases, SME associations, and industry records that classify businesses based on their adoption of sustainable practices. A purposive sampling technique was employed to ensure that the respondents met specific research criteria. The inclusion criteria were as follows: (1) SMEs actively operating in the batik sector in East Java; (2) SMEs that have implemented at least one form of green finance mechanism, such as green credit facilities, environmentally linked government incentives, or sustainability-oriented investment schemes; (3) SMEs that have adopted green innovation practices, including eco-friendly production processes, use of natural dyes, waste

management systems, or environmental certifications; and (4) SMEs that have been operating for a minimum of one year to ensure sufficient experience in implementing sustainability practices. The analysis will proceed with a thorough examination of data quality, descriptive statistical analysis of sample characteristics and variables, and subsequent PLS-SEM modeling.

PLS-SEM analysis will assess both the structural relationships between variables by examining direct and mediated effects and the measurement validity and reliability of constructs through factor analysis and Cronbach's alpha. The interpretation of the findings will involve testing hypotheses regarding the influence of the financial environment and green innovation on performance, mediated by environmental sustainability practices. This study aims to contribute theoretically by enhancing the understanding of how these factors interact within eco-friendly SME contexts. Practically, it seeks to provide practical observations and suggestions for stakeholders' policies to foster the adoption of green finance and innovation, thereby improving the overall business performance of eco-friendly batik SMEs in East Java. This methodology ensures a robust investigation of the complex dynamics of sustainability and business performance in SMEs, contributing valuable insights to both academia and industry stakeholders. This study investigated the impact of green finance and green innovation on the business performance of eco-friendly batik SMEs in East Java using Partial Least Squares Structural Equation Modeling (PLS-SEM). The research population comprised 176 eco-friendly batik SMEs, with a sample size of 150 SMEs participating in the surveys and interviews.

4. Results and Discussions

The empirical results confirm that all the proposed hypotheses are supported. Green finance and green innovation positively influence business performance, and environmental sustainability practices serve as a significant mediating mechanism. These findings highlight an integrated pathway linking financial resources, innovation activities, sustainability practices, and improved SME performance. This section presents the empirical findings of the study and discusses them in relation to the existing theories and prior research. The analysis integrates the statistical results generated through PLS-SEM with conceptual interpretations to provide a comprehensive understanding of the relationships among green finance, green innovation, environmental sustainability practices, and business performance.

4.1 Descriptive Statistics

The key findings are as follows:

Table 1. Descriptive statistics of variables

Variable	Mean	Std. Deviation	Min	Max
Green Finance (*X1*)	3.85	0.72	2.10	5.00
Green Innovation (*X2*)	4.02	0.68	2.50	5.00
Environmental Sustainability Practices (Mediation)	3.94	0.65	2.80	4.90
Business Performance (Y)	4.15	0.76	2.90	5.00

Table 1 provides the descriptive statistics for the four main constructs of this study. All variables showed mean values between 3.85 and 4.15, indicating that eco-friendly batik SMEs generally reported positive perceptions of their access to green finance, adoption of green innovation, implementation of sustainability practices, and overall business performance. The relatively low standard deviations suggest consistent responses across the SMEs. These descriptive patterns imply strong baseline engagement in sustainability-oriented activities within the sample, supporting the argument that environmental awareness has begun to shape business practices in traditional sectors such as batik production.

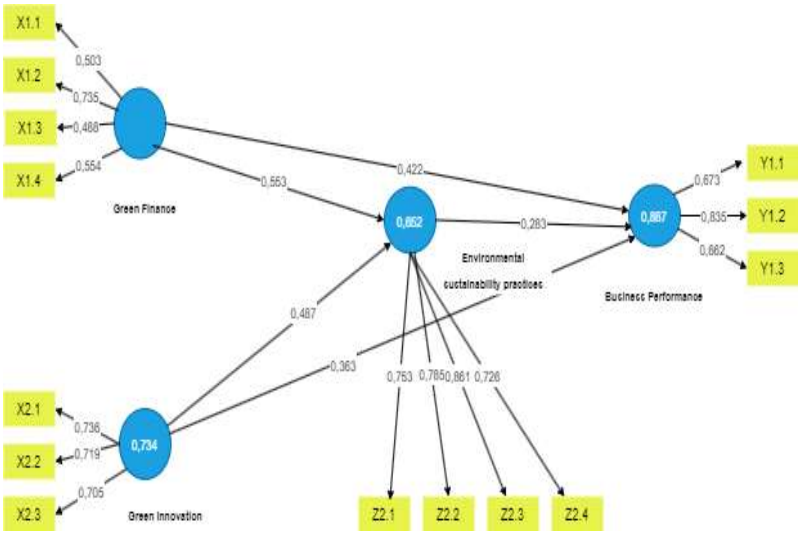

Figure 2. PLS result

Table 2. Path coefficients

Path	Original Sample	t-value	p-value	Result
Green Finance (X_1) -> Business Performance (Y)	0.422	6.21	< 0.001	Supported
Green Innovation (X_2) -> Business Performance (Y)	0.363	5.01	< 0.001	Supported
Green Finance (X_1) -> Environmental Sustainability Practices (Mediation)	0.553	7.81	< 0.001	Supported
Green Innovation (X_2) -> Environmental Sustainability Practices (Mediation)	0.487	6.92	< 0.001	Supported
Environmental Sustainability Practices (Mediation) -> Business Performance (Y)	0.283	4.21	< 0.001	Supported

The structural model results (Figure 2 and Table 2) show that all hypothesized relationships are statistically significant. Green finance and green innovation each exhibit direct positive effects on business performance, and both variables significantly influence environmental sustainability practices. Moreover, sustainability practices positively affect business performance, indicating a mediating mechanism in the model. The significance of each relationship underscores the interconnected nature of financial support, innovation capability, environmental management, and performance outcomes of SMEs.

Table 3. Measurement model results

Construct	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Green Finance (X_1)	0.85	0.87	0.65
Green Innovation (X_2)	0.82	0.85	0.61
Environmental Sustainability Practices (Mediation)	0.78	0.80	0.58
Business Performance (Y)	0.87	0.89	0.72

The validity and reliability results presented in Table 4.3 confirm that all constructs meet the threshold criteria for internal consistency and convergent validity. The composite reliability values exceeded 0.80, indicating strong internal reliability, while the AVE values ranged from 0.58 to 0.72, surpassing the minimum requirement of 0.50. These results support the robustness of the measurement model and demonstrate that the items effectively capture the underlying concepts of green finance, green innovation, environmental sustainability practices, and business performance. The adequacy of the measurement model strengthens the validity of subsequent structural path interpretations.

Table 4. T test ratios

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Green Finance (X_1) -> Business Performance (Y)	0.422	0.522	0.068	1.830	0.017
Green Innovation (X_2) -> Business Performance (Y)	0.363	0.423	0.064	0.677	0.004
Green Finance (X_1) -> Environmental Sustainability Practices (Mediation)	0.553	0.523	0.064	0.824	0.010
Green Innovation (X_2) -> Environmental Sustainability Practices (Mediation)	0.487	0.433	0.065	0.794	0.000
Environmental Sustainability Practices (Mediation) -> Business Performance (Y)	0.283	0.333	0.068	1.319	0.000

4.2 Effect of Green Finance on Business Performance

The findings reveal that green finance has a strong, significant, and positive effect on business performance ($\beta = 0.422$, $p < 0.001$). This suggests that SMEs with better access to environmentally oriented financing instruments, such as green credit, subsidized loans, and grants, tend to achieve higher operational efficiency, stronger market competitiveness, and improved financial outcomes. These results align with the theoretical view that financial resources serve as strategic assets that enable firms to adopt sustainable technologies and production processes. Previous studies, including OECD (2024), have similarly reported that green financing reduces cost burdens, facilitates eco-certification, and supports SMEs in transitioning toward greener business models. For batik SMEs, the availability of green finance appears to directly strengthen their strategic capabilities through technology upgrading and quality enhancement.

4.3 Effect of Green Innovation on Business Performance

Green innovation also had a significant positive impact on business performance ($\beta = 0.363$, $p < 0.001$). Practices such as the use of natural dyes, energy-efficient production processes, and eco-friendly material sourcing contribute to improved product quality, higher customer satisfaction, and a stronger brand reputation. Environmentally driven innovation can enhance competitiveness by reducing waste, improving efficiency, and creating differentiation in the market. This evidence aligns with studies such as Agyapong et al. (2017), which highlights the value of sustainability-oriented innovation in attracting environmentally conscious consumers. For traditional industries such as batik, green product innovation not only adds cultural value but also meets the growing demand for sustainable fashion products.

4.4 Effect of Green Finance on Green Innovation

The results show that green finance significantly promotes green innovation in SMEs ($\beta = 0.553$, $p < 0.001$). Access to sustainable financing enables SMEs to invest in research and development, explore eco-friendly technologies, and redesign production processes to reduce their environmental impact. This finding is consistent with prior research, indicating that financial support is a critical enabler of SME innovation capacity. When SMEs receive targeted financial incentives for environmental projects, they are more likely to adopt new technologies, reconfigure their production methods, and pursue eco-certification. In the context of East Java batik, green finance reduces the initial capital barrier to adopting sustainable dyeing systems and efficient waste management technologies, thereby accelerating innovation. According to Agyapong et al. (2017), green finance substantially contributes to green innovation in China, and this effect is consistent across different estimators..

4.5 Effect of Green Innovation on Environmental Sustainability Practices

Green innovation positively affects environmental sustainability ($\beta = 0.487$, $p < 0.001$). Firms that invest in eco-friendly product and process innovations tend to implement broader sustainability initiatives, including better waste management, energy conservation, and responsible material sourcing. This supports the view that innovation is a catalyst for environmental management practices. Studies such as Pacheco et al. (2018) and Yao et al. (2021) similarly found that environmentally oriented innovation encourages firms to adopt systems that reduce ecological footprints. For batik SMEs, innovations such as water-saving dyeing techniques and natural coloring agents reinforce sustainable operational routines and strengthen their environmental stewardship.

4.6 Mediation Effect of Environmental Sustainability Practices

Environmental sustainability practices significantly enhance business performance ($\beta = 0.283$, $p < 0.001$), indicating a mediating role of environmental sustainability practices between green finance, green innovation, and business performance. This mediation suggests that financial resources and innovation efforts translate into improved performance, largely through their ability to strengthen sustainability practices. This finding aligns with the resource-based view, which posits that sustainability-oriented capabilities can enhance firm competitiveness by improving efficiency, reducing waste, and strengthening customer trust. Prior studies (Hart and Dowell (2011) similarly emphasize the role of sustainability practices in achieving operational and strategic advantages. For batik SMEs, sustainability serves as a strategic bridge linking investment and innovation to performance improvement.

5. Conclusions

5.1. Conclusion

Overall, the findings demonstrate a synergistic relationship between green finance, green innovation, and environmental sustainability practices in shaping SME business performance. Green finance supports innovation, innovation strengthens sustainability practices, and sustainability practices enhance firm performance. This interconnected system highlights the importance of adopting an integrated sustainability strategy rather than isolated intervention. The results contribute to a more comprehensive understanding of how traditional industries, such as batik, can transition toward sustainable and competitive business models through coordinated financial, technological, and environmental initiatives. SMEs should direct green finance toward practical eco-innovations, such as natural dyes, water efficiency, and waste management, supported by clear sustainability targets. Financial institutions and policymakers must provide accessible green financing, incentives, and technical support, and industry associations must encourage collaboration to strengthen competitiveness and long-term sustainability.

5.2. Research Limitations

This research focuses on 150 environmentally friendly batik SMEs in East Java. As a result, the findings may not be applicable to other industrial sectors. Additionally, the results may not be generalizable to regions outside of East Java.

5.3 Suggestions and Directions for Future Research

Further research is suggested to expand the scope of the sample beyond the batik SME sector and the East Java region so that the results can be generalized to other industrial contexts or regions with different characteristics. Considering the important role of environmental sustainability practices as a mediator, future research can explore additional variables, such as green intellectual capital or institutional support, to deepen the understanding of green business performance.

Acknowledgement

The authors thank all batik SME owners in East Java and the East Java Cooperatives and SMEs Office for their time and valuable information in collecting data for this study. Without the cooperation and active participation of these stakeholders, this study would not have been possible.

Author Contributions

MA conceptualized the study, conducted the data collection, and drafted the manuscript. FA supervised the research design, validated the methodology, and contributed to the theoretical development. RT performed the data analysis using PLS-SEM, interpreted the results, and critically revised the manuscript. All authors have reviewed and approved the final version of the manuscript.

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