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## GREEN INNOVATION-ORIENTED STRATEGY AND FINANCIAL PERFORMANCE OF MANUFACTURING MSMEs: TOWARD GREEN ECONOMIC SUSTAINABILITY

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### Abstract

The objective of this study is to examine how environmental regulations impact the financial performance of manufacturing MSMEs, taking into account the mediating role of green innovation-oriented (GIO) and the moderating role of green dynamic capability (GDC). A quantitative approach using SEM-PLS analysis was applied to data from 177 respondents in North Balikpapan. The findings indicate that environmental regulations do not directly affect financial performance. However, they significantly enhance GIO, which subsequently has a positive and significant impact on financial performance. Additionally, while GDC directly influences financial performance, it does not moderate the relationship between environmental regulation and financial performance. This study emphasizes the importance of green innovation as a strategic response to regulatory pressures for improving MSME performance in a sustainable manner.

**Keywords:** environmental regulation, green innovation, green dynamic capability, financial performance, MSMEs

### Abstrak

Tujuan dari penelitian ini adalah untuk menganalisis pengaruh regulasi lingkungan terhadap kinerja keuangan UMKM manufaktur dengan mempertimbangkan peran mediasi dari orientasi inovasi hijau (GIO) dan peran moderasi dari kemampuan dinamis hijau (GDC). Pendekatan kuantitatif dengan teknik analisis SEM-PLS diterapkan pada data dari 177 responden di Balikpapan Utara. Hasil penelitian menunjukkan bahwa regulasi lingkungan tidak berpengaruh langsung terhadap kinerja keuangan. Namun, regulasi lingkungan secara signifikan meningkatkan GIO, yang kemudian memberikan dampak positif dan signifikan terhadap kinerja keuangan. Selain itu, meskipun GDC memiliki pengaruh langsung terhadap kinerja keuangan, GDC tidak memoderasi hubungan antara regulasi lingkungan dan kinerja keuangan. Penelitian ini menekankan pentingnya inovasi hijau sebagai respons strategis terhadap tekanan regulasi untuk meningkatkan kinerja UMKM secara berkelanjutan.

**Kata Kunci:** regulasi lingkungan, inovasi hijau, kemampuan dinamis hijau, kinerja keuangan, UMKM

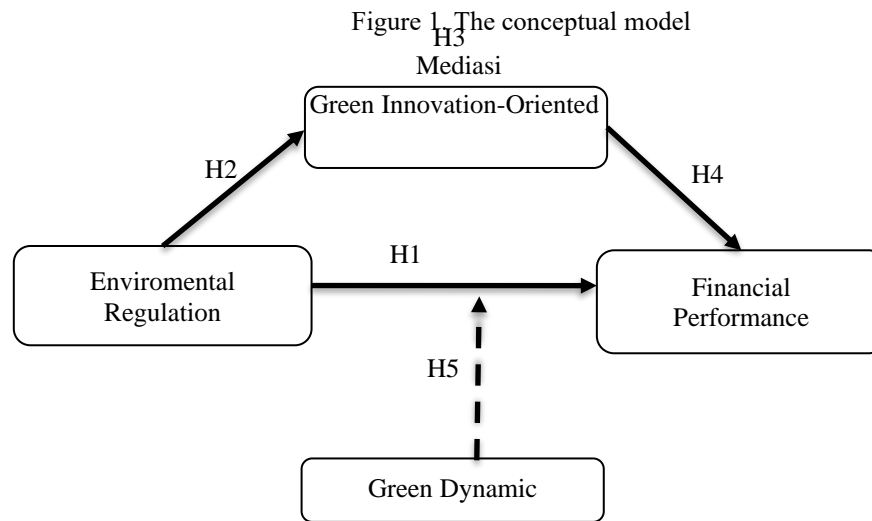
### INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) contribute over 61% to Indonesia's national GDP and absorb more than 97% of the domestic workforce (Kadin. (2024). In the manufacturing sector, MSMEs play a vital role in both local and national industrial supply chains. However, in the face of global dynamics, MSMEs are increasingly required to transition toward more sustainable and environmentally friendly business practices. Changes

in the environmental regulatory landscape driven by national policies and international commitments such as the Paris Agreement have led to stricter controls over production activities. For MSMEs, this situation creates external pressure that may hinder financial performance but also presents opportunities for developing green innovation as an adaptive strategy (Gartia et al., 2024). Previous research has shown that environmental regulations do not always have negative impacts. On the contrary, regulations may act as catalysts for environmental innovation (green innovation), which ultimately improves operational efficiency and financial outcomes (Shen et al., 2019; Luthan et al., 2025). Nevertheless, the majority of these studies focus on large corporations, while empirical research in the MSME sector particularly in developing areas such as North Balikpapan remains limited.

There is inconsistency in the findings of studies examining The impact of environmental regulation on financial performance, especially when green innovation acts as a mediating factor. In the MSME context, the role of green innovation-oriented strategy defined as a firm's strategic orientation toward environmentally friendly innovation has not been widely explored empirically. Khan et al. (2021) indicate that green innovation may fully mediate the relationship between financial resources and MSME performance. Other studies also emphasize that green innovation enhances firm profitability under strict regulatory environments (Aguilera-Caracuel & Ortiz-de-Mandojana, 2013 ; Yi et al., 2021). Rustiarini et al. (2022) affirm that green innovation is essential in improving both sustainability and financial performance in MSMEs, serving as a mediator between intellectual capital and business outcomes. In addition to green innovation orientation, the concept of green dynamic capability a firm's adaptive capacity to respond to environmental pressures through sustainable innovation is also gaining attention in the literature. Several studies confirm that GDC can strengthen the relationship between environmental regulation and financial performance by enhancing a firm's innovative capability (Safitri et al., 2024; Xing et al., 2020; Akhtar et al., 2024; Garad & Khalifa, 2024) Given the urgency of transitioning toward a green economy and the limited research focused on MSMEs in non-metropolitan areas of Indonesia especially in North Balikpapan this study seeks to address the research gap by examining the impact of environmental regulation on the financial performance of MSMEs, the mediating role of a green innovation-oriented strategy, and the moderating role of green dynamic capability.

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## LITERATURE REVIEW

### Dynamic Capabilities Theory

Dynamic Capabilities Theory (Teece et al., 1997) posits Firms that can quickly integrate, develop, and reconfigure both internal and external competencies are better equipped to respond to environmental changes. In this regard, MSMEs must cultivate Green Dynamic Capability (GDC), which reflects the firm's ability to adapt to environmental regulations through sustainable and adaptive green innovation initiatives. (Chen & Chang, 2013).

## RESEARCH METHOD

This study utilizes a quantitative survey design with Partial Least Squares Structural Equation Modeling (PLS-SEM) to test a structural model that includes mediation and moderation relationships. PLS-SEM was chosen because it is well-suited for data that is not normally distributed, moderate sample sizes, and its ability to handle complex model structures. (Sarstedt et al., 2024). The analysis was conducted using SmartPLS 3.0, which enables simultaneous testing of construct validity, reliability, and path relationships between latent variables (Hair et al., 2017). Study population comprises manufacturing MSMEs located in the North Balikpapan District. The sample was determined using purposive sampling. The minimum required sample size was calculated using (Hair et al., 2017). guideline, which recommends ten times the number of indicators. With 17 indicators in total, a minimum of 170 respondents was required. To anticipate potential invalid responses, the final target was set at 177 respondents.

Data was collected through an online survey using Google Forms. All questionnaire items were assessed using a five-point Likert scale. Before distribution, a pilot test was conducted with 30 respondents to verify the clarity and consistency of the measurement items. Construct validity and reliability were assessed using convergent validity (with AVE > 0.50), composite reliability, and discriminant validity based on the Fornell-Larcker criterion. All validity and reliability assessments were performed on the final dataset to ensure the robustness of the measurement model (Hair et al.,

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2017). Total of 177 respondents participated in this study, dan dianggap cukup untuk analisis PLS-SEM (Sarstedt et al., 2024), consisting of owners or managers of manufacturing MSMEs in North Balikpapan District.

**RESULT AND DISCUSSION**

Demographic characteristics are summarized as follows. Gender, majority of respondents were male (54.24%), while the rest were female (45.76%). This distribution reflects the slightly higher male involvement in the manufacturing sector in the study area.

Table 1. Respondent Demographic Information

Description	Category	Frequency (n)	Percent (%)
Gender	Male	96	54.24%
	Female	81	45.76%
Education	Senior High School	23	12.99%
	Bachelor’s Degree	47	26.55%
	Master’s Degree	31	17.51%
	Others	36	20.34%
	<i>Missing/Not Reported</i>	40	22.60%
Length of Manufacturing Business	< 3 years	34	19.21%
	4–5 years	52	29.38%
	> 6 years	51	28.81%
	<i>Missing/Not Reported</i>	40	22.60%
Monthly Income	< Rp 10Million	37	20.90%
	Rp 11 – 15 Million	80	45.20%
	Rp 16 – 20 Million	20	11.30%
	<i>Missing/Not Reported</i>	40	22.60%
Types of Manufactured Products Purchased	Fashion Clothing	37	20.90%
	Craft Products	12	6.78%
	Electronics	14	7.91%
	Cosmetics	8	4.52%
	Other Manufacturing	106	59.89%

Source: Processed data, 2025

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**Measurement Model Analysis**

The measurement model was evaluated to assess the reliability and validity of the constructs. The results, presented in Table 2, include item reliability, internal consistency reliability, and convergent validity. These were assessed using factor loadings, composite reliability (CR), and average variance extracted (AVE). All indicator loadings exceeded the recommended threshold of 0.70, confirming that the measurement model demonstrates acceptable reliability and validity (Hair et al., 2017). Outer loading assessment was conducted in two iterations. In the first test, several indicators exhibited factor loadings below 0.70. These indicators were removed, and the measurement model was re-evaluated. The second test yielded improved outer loadings above the threshold, confirming the adequacy of the construct reliability and convergent validity (Hair et al., 2017).

Table 2. *Outer Loadings, Composite Reliability, Average Variance Extracted*

Construct	Item	Outer Loadings	Composite Reliability (CR)	Average Variance Extracted (AVE)
Environmental Regulation	ER.1	0,875	0,919	0,740
	ER.2	0,860		
	ER.3	0,860		
	ER.4	0,847		
Green Innovation-Oriented	GIO.1	0,815	0,888	0,613
	GIO.2	0,769		
	GIO.3	0,795		
	GIO.4	0,823		
	GIO.5	0,708		
Green Dynamic Capability	IG.1	0,762	0,879	0,592
	IG.2	0,808		
	IG.3	0,753		
	IG.4	0,745		
	IG.5	0,777		
Green Innovation-Oriented	GIO.1	0,815	0,888	0,613
	GIO.2	0,769		
	GIO.3	0,795		
	GIO.4	0,823		
	GIO.5	0,708		
Financial Performance	FP.1	0,734	0,840	0,637
	FP.2	0,824		
	FP.3	0,833		

Source: Processed data, 2025

Reliability and validity of the measurement model, the outer loadings, composite reliability (CR), and average variance extracted (AVE) were evaluated for each construct using SmartPLS 3.0. Table 2 presents the results. Outer Loadings. All indicators for each construct showed outer loading values above the recommended threshold of 0.70 (Hair et al., 2017), indicating strong indicator reliability. For the construct *Environmental Regulation*,

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four items (ER.1 to ER.4) showed loadings between 0.847 and 0.875. Similarly, the indicators for *Green Innovation-Oriented* (GIO.1 to GIO.5) had loadings ranging from 0.708 to 0.823. *Green Dynamic Capability* also showed acceptable loadings, with all items above 0.74. For *Financial Performance*, all three indicators (FP.1 to FP.3) demonstrated loadings above 0.73, indicating adequate measurement strength. Composite Reliability (CR). All constructs exceeded the minimum acceptable value of 0.70, suggesting good internal consistency reliability. *Environmental Regulation* scored a CR of 0.919, followed by *Green Innovation-Oriented* at 0.888, *Green Dynamic Capability* at 0.879, and *Financial Performance* at 0.840. These values confirm that the constructs are reliably measured by their respective indicators. Average Variance Extracted (AVE). The AVE values for all constructs were above the threshold of 0.50, indicating satisfactory convergent validity. Specifically, *Environmental Regulation* achieved an AVE of 0.740, while *Green Innovation-Oriented*, *Green Dynamic Capability*, and *Financial Performance* scored 0.613, 0.592, and 0.637 respectively. These results confirm that each construct accounts for a significant portion of the variance in its indicators. In general, the findings validate that the measurement model satisfies the criteria for indicator reliability, internal consistency, and convergent validity, thereby supporting the use of these constructs for subsequent structural model analysis.

### Discriminant Validity

Discriminant validity between the constructs, this study used the Fornell-Larcker criterion, as shown in Table 3. Discriminant validity refers to the extent to which a construct is truly distinct from other constructs in the model, both conceptually and statistically. According to the Fornell-Larcker criterion, the square root of the AVE for each construct (diagonal values) must be higher than the correlation values with other constructs (off-diagonal values). In Table 3, the diagonal values are bolded, This demonstrates that each construct explains more variance with its indicators than with any other construct in the model.

The square root of the AVE for Environmental Regulation is 0.861, which is greater than its correlations with Green Dynamic Capability (0.830), Green Innovation-Oriented (0.816), and Financial Performance (0.751). This indicates that the construct is empirically distinct. Similarly, the square root of the AVE for Green Innovation-Oriented is 0.783, which is higher than its correlations with other constructs, including Financial Performance (0.819) and Green Dynamic Capability (0.785). Interaction term Environmental Regulation moderates Green Dynamic Capability shows no collinearity with its base constructs, indicated by a perfect diagonal value (1.000) and strong negative correlations with other variables, as expected in interaction analysis in moderation models. Financial Performance shows adequate discriminant validity with a diagonal value of 0.798, greater than its correlations with *Green Dynamic Capability* (0.809) and *Green Innovation-Oriented* (0.819), which still remains within an acceptable threshold indicating conceptual closeness but statistical distinctiveness.

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Table 3. Discriminant Validity

Relationships Construct	Environmental Regulation	Environmental Regulation* Green Dynamic Capability_	Financial Performance	Green Dynamic Capability	Green Innovation-Oriented
Environmental Regulation	0,861				
Environmental Regulation* Green Dynamic Capability_	-0,783	1,000			
Financial Performance	0,751	-0,709	0,798		
Green Dynamic Capability	0,830	-0,771	0,809	0,769	
Green Innovation-Oriented	0,816	-0,732	0,819	0,785	0,783

Source: Processed data, 2025

**Moderation Analysis and Measurement Reliability**

The moderation construct in this study, which represents the interaction between Environmental Regulation and Green Dynamic Capability, was tested for reliability and validity before assessing its effect in the structural model. The values for both Cronbach's Alpha and rho\_A are reported as 1.000, indicating perfect internal consistency. While such values are rare in primary constructs, they are expected for interaction terms created by multiplying standardized indicators in SEM-PLS, where the construct is modeled as a single composite latent variable. Overall, the results presented in this table validate the use of the interaction term Environmental Regulation × Green Dynamic Capability in the model. These metrics confirm that the moderation construct is statistically reliable and valid, enabling an accurate evaluation of how Green Dynamic Capability moderates the relationship between Environmental Regulation and Financial Performance among MSMEs in the manufacturing sector.

Table 4. Moderation Analysis

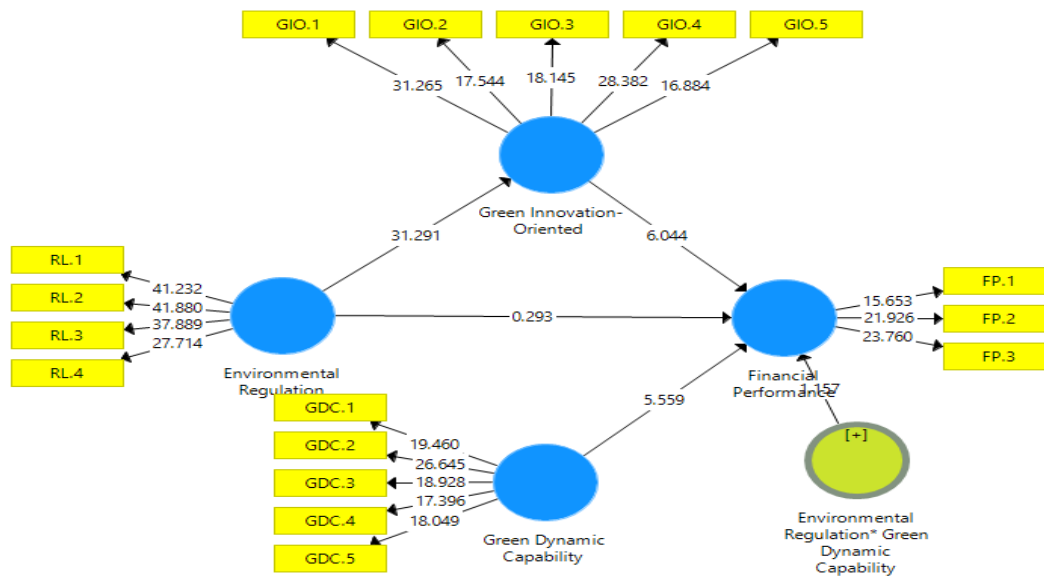
Moderation Relationships	Environmental Regulation* Green Dynamic Capability_	Cronbach's Alpha	rho_A	Reliabilitas Komposit	Rata-rata Varians Diekstrak (AVE)

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Environmental Regulation * Green Dynamic Capability	1,549	1000	1000	1000	1000
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Source: Processed data, 2025

Full structural model of Green Innovation-Oriented and financial performance



### Structural Model Results

The structural model was assessed using Partial Least Squares Structural Equation Modeling (PLS-SEM) through SmartPLS 3.0. Table 5 provides a summary of the direct, indirect, and moderation effects, along with the corresponding path coefficients (O), standard deviations (STDEV), t-statistics, and p-values.

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Table 5. Structural Model Results

Relationships Construct	Sampel Asli (O)	Rata-rata Sampel (M)	Standar Deviasi (STDEV)	T Statistik (  O/STDEV  )	P Values
Environmental Regulation → Financial Performance	-0,024	-0,024	0,083	0,293	0,770
Environmental Regulation → Green Innovation-Oriented	0,816	0,817	0,026	31,291	0,000
Environmental Regulation* Green Dynamic Capability_ → Financial Performance	-0,047	-0,046	0,040	1,157	0,248
Green Dynamic Capability → Financial Performance	0,408	0,414	0,073	5,559	0,000
Green Innovation-Oriented → Financial Performance	0,466	0,462	0,077	6,044	0,000
Environmental Regulation → Green Innovation-Oriented → Financial Performance	0,381	0,379	0,067	5,658	0,000

Source: Processed data, 2025

**Direct Effects**

**Environmental Regulation dengan Financial Performance**

The direct effect was negative and not significant ( $\beta = -0.024$ ,  $p = 0.770$ ,  $t = 0.293$ ), indicating that environmental regulations alone do not have a direct impact on the financial performance of MSMEs in the manufacturing sector. This supports the argument in the proposal that the effect of regulation may not be straightforward and requires strategic mediation.

**Environmental Regulation dengan Green Innovation-Oriented**

The relationship was strong and highly significant ( $\beta = 0.816$ ,  $p < 0.001$ ,  $t = 31.291$ ), suggesting that environmental regulations significantly encourage MSMEs to engage in green innovation strategies. This supports the theoretical framework that regulation can act as a driver of innovation in the green economy.

### Green Innovation-Oriented dengan Financial Performance

This relationship was also found to be statistically significant ( $\beta = 0.466$ ,  $p < 0.001$ ,  $t = 6.044$ ), indicating that green innovation positively impacts the financial performance of manufacturing MSMEs. This underscores the role of innovation as a means for firms to achieve both environmental compliance and profitability.

### Green Dynamic Capability dengan Financial Performance

The effect was significant ( $\beta = 0.408$ ,  $p < 0.001$ ,  $t = 5.559$ ), indicating that dynamic capabilities, such as adaptability, learning, and resource reconfiguration, have a strong influence on financial outcomes. This validates the inclusion of green dynamic capability in the model as a key internal factor.

### Moderation Effect

#### Green Dynamic capability memoderasi Environmental Regulation dengan Financial Performance

The moderation effect was not statistically significant ( $\beta = -0.047$ ,  $p = 0.248$ ,  $t = 1.157$ ), suggesting that green dynamic capability does not significantly moderate the relationship between environmental regulation and financial performance. Although theoretically proposed, this finding implies that the interaction effect may be more complex or context-dependent in MSME settings.

### Mediation Effect

The indirect (mediation) path was statistically significant ( $\beta = 0.381$ ,  $p < 0.001$ ,  $t = 5.658$ ), confirming that green innovation-oriented strategies mediate the impact of environmental regulation on financial performance. This finding supports the central hypothesis of this study and highlights green innovation as a strategic mechanism for transforming regulatory pressure into financial benefits. While Green Innovation-Oriented plays a significant mediating role, the moderating effect of Green Dynamic Capability was not supported. Although dynamic capabilities independently enhance financial performance, their interaction with environmental regulation did not significantly strengthen the regulatory effects. These results align with the research objectives outlined in the proposal and offer insights into how MSMEs can utilize innovation under regulatory pressure to achieve sustainable growth.

The findings indicate that environmental regulation does not have a direct, significant impact on the financial performance of manufacturing MSMEs in North Balikpapan. This supports previous studies, which suggest that the effect of regulation on firm performance is often indirect and complex, depending on the firm's adaptive strategy (Shen et al., 2019; Xing et al., 2020). In the MSME context, environmental regulation tends to be perceived as a burden unless accompanied by relevant innovation strategies (Gartia & Das, 2024). Nevertheless, environmental regulation is found to have a strong influence on green innovation-oriented strategies. This result reinforces the Porter Hypothesis, which posits that stringent regulations can drive innovation, particularly when firms face external pressure and seek to remain competitive (Luthan et al., 2025; Eiadat et al., 2008). Regulation acts as a catalyst for firms to explore more environmentally friendly processes, products, and technologies.

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Green Innovation-Oriented, This, in turn, has a significant positive effect on financial performance, suggesting that sustainability-driven innovation can be a highly effective strategy for improving profitability and operational efficiency in MSMEs. This finding aligns with previous research, which indicates that green innovation not only enhances a company's reputation but also helps reduce operational costs and improve market access (Aguilera-Caracuel & Ortiz-de-Mandojana, 2013; Yi et al., 2021; Rustiarini et al., 2022). The analysis confirms a full mediation effect of green innovation-oriented strategies in the relationship between environmental regulation and financial performance. Accordingly, MSMEs that respond to regulation through innovation are more likely to gain financial benefits than those that merely comply without strategic transformation. These findings strengthen the view that green innovation serves as a bridge between external pressure and internal performance outcomes (Khan et al., 2021; Weng et al., 2015).

Meanwhile, Green Dynamic Capability has a direct positive influence on financial performance, indicating that a firm's adaptive capabilities such as organizational learning, resource reconfiguration, and green technology integration are essential for strengthening MSMEs' financial competitiveness. This supports the Dynamic Capabilities Theory Teece et al.(1997) and findings by Chen & Chang (2013), which highlight the importance of GDC in green product development and firm value creation. However, Green Dynamic Capability did not demonstrate a significant moderating effect between environmental regulation and financial performance. This implies that although GDC contributes directly, it is not sufficient to intensify the impact of regulation unless mediated by green innovation. This limitation may be attributed to the relatively low maturity level of GDC among MSMEs, many of which lack sufficient resources and strategic knowledge (Safitri et al., 2024; Akhtar et al., 2024). Overall, the findings suggest that environmental regulation should be viewed as an opportunity rather than a constraint, provided that firms are capable of responding through strategic and sustainable green innovation. For MSMEs in developing regions such as North Balikpapan, policy interventions and institutional support are crucial for enhancing their innovation capabilities and enabling long-term sustainable growth.

### **CONCLUSION**

The study aimed to examine the impact of environmental regulation on the financial performance of manufacturing MSMEs, taking into account the mediating role of green innovation-oriented strategies and the moderating role of green dynamic capability. The analysis revealed several key findings. First, environmental regulation does not directly affect the financial performance of MSMEs, suggesting that regulation alone is not enough to drive financial outcomes. This finding aligns with previous research (Shen et al. 2019 ; Xing et al. (2020), who argue that the effect of regulation on firm performance is often indirect and contingent upon how firms respond strategically. Second, environmental regulation strongly influences the development of green innovation-oriented strategies. This finding aligns with the Porter Hypothesis, which posits that regulatory pressure can stimulate environmental innovation that leads to efficiency and competitive advantage (Luthan et al., 2025; Eiadat et al., 2008). Third, green innovation-oriented strategies were confirmed as a significant mediator between environmental regulation and financial performance. This implies that firms responding to regulation through green innovation can enhance their financial outcomes. These

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results are consistent with previous findings (Aguilera-Caracuel and Ortiz-de-Mandojana 2013; Rustiarini et al. 2022), which suggest that green innovation promotes cost efficiency and competitive strength. Fourth, green dynamic capability has a direct and significant effect on financial performance, reinforcing the argument that adaptive capabilities are essential in dynamic environments (Chen & Chang, 2013; Safitri et al., 2024). However, GDC did not significantly moderate the relationship between environmental regulation and financial performance. This suggests that the moderating role of GDC may be context-dependent or requires further maturity in MSME practices (Akhtar et al., 2024). Overall, the study confirms that environmental regulation can serve as a strategic instrument to enhance MSME performance, but only when firms respond through innovative approaches and strengthened internal capabilities. Green innovation acts as a critical mechanism that converts external regulatory pressure into sustainable business advantage.

### Limitations and Recommendations

The study has several limitations. Future research is encouraged to broaden the geographical scope, adopt longitudinal approaches, and incorporate both quantitative and qualitative data to provide a more comprehensive understanding of how regulation and green innovation influence sustainability performance in the manufacturing MSME sector.

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### REFERENCE

- Aguilera-Caracuel, J., & Ortiz-de-Mandojana, N. (2013). Green innovation and financial performance: An institutional approach. *Organization & Environment*, 26(4), 365–385. <https://doi.org/10.1177/1086026613507931>
- Akhtar, S., Tian, H., Iqbal, S., & Hussain, R. Y. (2024). Environmental regulations and government support drive green innovation performance. *Clean Technologies and Environmental Policy*. <https://doi.org/10.1007/s10098-024-02721-3>
- Chen, Y. S., & Chang, C. H. (2013). The determinants of green product development performance: Green dynamic capabilities, green transformational leadership, and green creativity. *Journal of Business Ethics*, 116(1), 107–119. <https://doi.org/10.1007/s10551-012-1452-x>
- Eiadat, Y., Kelly, A., Roche, F., & Eyadat, H. (2008). Green and competitive? An empirical test of the mediating role of environmental innovation strategy. *Journal of World Business*, 43(2), 131–145. <https://doi.org/10.1016/j.jwb.2007.11.012>
- Garad, A., & Khalifa, M. (2024). Green innovation and firm performance: The role of environmental management practices. *International Journal of Green Management and Business Studies*.
- Gartia, R., & Das, S. (2024). Digital transformation, green innovation, and sustainability: Evidence from emerging markets.

## Green Innovation-Oriented Strategy and Financial Performance of Manufacturing MSMEs: Toward Green Economic Sustainability

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- Guinot, J., Barghouti, Z., & Chiva, R. (2022). Understanding green innovation: A conceptual framework. *Sustainability*, *14*(10), 5787. <https://doi.org/10.3390/su14105787>
- Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM)* (2nd ed.). SAGE Publications.
- Kadin. (2024). *Kontribusi UMKM terhadap PDB Nasional*. Kamar Dagang dan Industri Indonesia. <https://kadin.id>
- Khan, R., Arif, H., Sahar, N. E., Ali, A., & Abbasi, M. (2021). The role of financial resources in SMEs' financial and environmental performance: Green innovation as a mediator. *Green Finance*, *3*(4), 352–366. <https://doi.org/10.3934/GF.2021016>
- Lin, Y. H., & Chen, Y. S. (2017). Determinants of green competitive advantage: The roles of green knowledge sharing, green dynamic capabilities, and green service innovation. *Quality & Quantity*, *51*(4), 1663–1685. <https://doi.org/10.1007/s11135-016-0345-1>
- Luthan, F., Uddin, M., Rahman, M. M., & Ameen, A. (2025). Exploring the pathways to green innovation.
- Nicoletti, B., & Appolloni, A. (2024). Green logistics 5.0: A review of sustainability-oriented innovation with foundation models in logistics. *European Journal of Innovation Management*. <https://doi.org/10.1108/ejim-07-2024-0787>
- Rustiarini, N. W., Bhegawati, D. A. S., & Mendra, N. P. Y. (2022). Does green innovation improve SME performance? The mediating role of intellectual capital. *Economies*, *10*(11), 282. <https://doi.org/10.3390/economies10110282>
- Safitri, W., Soeharso, Y., & Yusuf, M. (2024). SMEs' sustainability through green dynamic capabilities: Mediation analysis of green innovation.
- Sarstedt, M., Richter, N. F., Hauff, S., & Ringle, C. M. (2024). Combined importance–performance map analysis (cIPMA) in partial least squares structural equation modeling (PLS–SEM): A SmartPLS 4 tutorial. *Journal of Marketing Analytics*, 1–15. <https://doi.org/10.1057/s41270-024-00186-z>.
- Shen, L., Fu, J., & Wu, Y. (2019). Regulatory pressure and green innovation performance: Evidence from Chinese manufacturing firms. *Journal of Cleaner Production*, *231*, 574–583. <https://doi.org/10.1016/j.jclepro.2019.05.321>
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, *18*(7), 509–533. [https://doi.org/10.1002/\(SICI\)1097-0266](https://doi.org/10.1002/(SICI)1097-0266)
- Weng, H. H., Chen, J. S., & Chen, P. C. (2015). Effects of green innovation on environmental and corporate performance: A stakeholder perspective. *Sustainability*, *7*(5), 4997–5026. <https://doi.org/10.3390/su7054997>
- Xing, X., Liu, T., Shen, L., & Wang, J. (2020). Linking environmental regulation and financial performance: The mediating role of green innovation. *Sustainability*, *12*(15), 6186. <https://doi.org/10.3390/su12156186>
- Yi, Y., Zeng, S., Chen, H., & Shi, J. (2021). When does it pay to be good? A meta-analysis of the relationship between corporate social and financial performance. *IEEE Transactions on Engineering Management*, *68*(2), 468–484. <https://doi.org/10.1109/TEM.2019.2907737>