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## Determinants of Environmental Performance: The Role of Green Supply Chain Management in Linking Internal and External Factors (Study on SMEs in Central Papua)

Agung Nugroho

agungn1414@gmail.com

Program Studi Teknik Industri

Universitas Satya Wiyata Mandala

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**Abstract** : This study examines the determinants of environmental performance of micro, small, and medium enterprises (SMEs) in Central Papua by analyzing the roles of strategic orientation, internal environment management, and government regulation, with Green Supply Chain Management (GSCM) as a mediating variable. Using a quantitative explanatory approach, data were collected from 400 SME owners and managers through structured questionnaires. The analysis was conducted using Partial Least Squares–Structural Equation Modeling (PLS-SEM). The results indicate that internal environment management and government regulation have significant positive effects on both GSCM and environmental performance. GSCM is also found to have a direct and significant influence on environmental performance. Furthermore, GSCM partially mediates the relationships between internal environment management and environmental performance, as well as between government regulation and environmental performance. In contrast, strategic orientation does not significantly affect GSCM, and GSCM does not mediate the relationship between strategic orientation and environmental performance, although strategic orientation has a direct effect on environmental performance. These findings suggest that strong internal environmental systems and effective regulatory pressure are critical drivers of GSCM adoption and environmental performance improvement among SMEs. The study highlights the importance of integrating internal capabilities and regulatory frameworks with green supply chain practices to enhance sustainable environmental performance.

**Keywords** : Environmental Performance, Green Supply Chain Management, Internal Factors, External Factors.

### INTRODUCTION

The rise of global environmental issues has pushed organizations, including MSMEs, to prioritize environmental alongside economic performance. As MSMEs dominate Indonesia's business structure and significantly contribute to resource use and waste generation (Du et al., 2024), their activities directly affect environmental quality. Increasing pressure from governments, consumers, and communities further compels MSMEs to adopt

sustainable practices to ensure long-term competitiveness. Green Supply Chain Management (GSCM) is considered an effective strategy to enhance environmental performance by integrating environmental considerations throughout the supply chain, from procurement to distribution (Jan et al., 2024). GSCM reduces waste, improves energy efficiency, and lowers emissions while strengthening corporate image. However, its adoption among Indonesian MSMEs remains limited due to constraints in resources, technology, and managerial capability.

Internal factors such as strategic orientation and internal environmental management significantly influence MSMEs' commitment to environmentally friendly practices (Han & Zhang, 2021). Sustainability-oriented MSMEs are more adaptive in integrating environmental aspects into operations, while effective internal systems support waste control and resource efficiency. Externally, government regulations, green standards, and incentive programs encourage GSCM adoption. As of October 31, 2025, Indonesia had 30.19 million MSMEs, concentrated in West Java (5.4 million), East Java (4.58 million), and Central Java (4.45 million). In contrast, Papua (64,761), Central Papua (17,258), and South Papua (13,281) show far lower numbers, reflecting limited competitiveness, particularly in meeting environmental sustainability demands. MSMEs in Central Papua face additional challenges, including limited infrastructure, technology access, and human resources. Uneven policy socialization and supervision further hinder environmental management adoption, with most MSMEs still prioritizing short-term economic goals over sustainability.

Based on the above background, a comprehensive understanding of the internal and external factors influencing MSMEs' environmental performance is essential, particularly the role of Green Supply Chain Management (GSCM) as a mediating mechanism. Therefore, this study aims to analyze the determinants of environmental performance of MSMEs in Central Papua by examining the effects of strategic orientation, internal environmental management, and government regulation through GSCM. This research is expected to contribute theoretically to the development of GSCM literature and provide practical recommendations for MSME actors and policymakers in formulating strategies to enhance sustainable environmental performance.

## **RESEARCH METHODS**

This study employs a quantitative approach with an explanatory design to examine factors influencing the environmental performance of MSMEs in Central Papua. The

respondents are 400 MSME owners and managers with decision-making authority, selected to represent regional MSME characteristics. Data were collected through a structured questionnaire based on the study's conceptual model, using a five-point Likert scale. Data analysis was conducted using Partial Least Squares–Structural Equation Modeling (PLS-SEM) with SmartPLS, including evaluation of the measurement model (outer model) for validity and reliability, and the structural model (inner model) to test relationships among variables (Hair, Hult, et al., 2021).

## RESULTS AND DISCUSSION

**Evaluating Outer Model.** The measurement model demonstrates strong validity based on convergent and discriminant validity tests. All outer loading values exceed the recommended threshold of 0.70 (Hair, Hult, et al., 2021), indicating that each indicator reliably represents its respective construct. In addition, all constructs achieve AVE values above 0.50, with Government Regulation and Strategic Orientation showing particularly high explanatory power, confirming adequate convergent validity and strong measurement quality. Discriminant validity is also supported by the cross-loading and Fornell–Larcker results. Each indicator loads highest on its corresponding construct compared to others, and the square root of AVE for every construct exceeds its inter-construct correlations. These findings confirm that all constructs are empirically distinct, and overall, the measurement model is valid and suitable for further structural analysis.

The following are the results of the composite reliability and Cronbach alpha tests in this study:

Table 1. Composite Reliability and Cronbach Alpha

|                                 | <b>Cronbach's<br/>alpha</b> | <b>Composite<br/>reliability<br/>(rho_a)</b> | <b>Composite<br/>reliability<br/>(rho_c)</b> | <b>Average<br/>variance<br/>extracted (AVE)</b> |
|---------------------------------|-----------------------------|--|--|---|
| Environmental Performance       | 0.913                       | 0.924  | 0.935  | 0.741   |
| Government Regulation           | 0.983                       | 0.986  | 0.987  | 0.936   |
| Green Supply Chain Management   | 0.915                       | 0.920  | 0.933  | 0.698   |
| Internal Environment Management | 0.909                       | 0.864  | 0.922  | 0.704   |
| Strategic Orientation           | 0.982                       | 0.982  | 0.985  | 0.918   |

The Composite Reliability and Cronbach's Alpha results confirm that all constructs meet reliability standards. Cronbach's Alpha values range from 0.909 to 0.983, exceeding the 0.70 threshold and indicating very high internal consistency (Hair et al., 2021). Likewise, Composite Reliability values (rho\_a and rho\_c) are all above 0.90, surpassing the

recommended minimum of 0.60. Environmental Performance, Government Regulation, Green Supply Chain Management, Internal Environment Management, and Strategic Orientation demonstrate strong reliability, confirming that the measurement instruments are consistent and appropriate for further structural model analysis.

Evaluating Inner Model. R-square is a test used to determine the extent of the impact on the dependent variable as a result of the influence of independent variables .

Tabel 2. Value R Square

|                               | R-square | R-square adjusted |
|-------------------------------|----------|-------------------|
| Environmental Performance     | 0.675    | 0.672             |
| Green Supply Chain Management | 0.506    | 0.502             |

The R-square ( $R^2$ ) results demonstrate moderate to substantial explanatory power. Environmental Performance has an  $R^2$  of 0.675 (adjusted  $R^2 = 0.672$ ), indicating that 67.5% of its variance is explained by the independent variables, while 32.5% is influenced by other factors. Green Supply Chain Management shows an  $R^2$  of 0.506 (adjusted  $R^2 = 0.502$ ), meaning that 50.6% of its variance is explained by the model, with 49.4% attributable to external factors. Based on PLS-SEM criteria, these values indicate good structural model explanatory capability.

#### Hypothesis Testing and Discussion

Table 3. Hypothesis Testing

|   | Original sample (O) | T statistics ( O/STDEV ) | P values | Decision     |
|---|---------------------|--------------------------|----------|--------------|
| Strategic Orientation -> Green Supply Chain Management                              | -0.033              | 0.473                    | 0.637    | Not accepted |
| Strategic Orientation -> Environmental Performance                                  | -0.497              | 9.753                    | 0.000    | Accepted     |
| Internal Environment Management -> Green Supply Chain Management                    | 0.166               | 2.344                    | 0.019    | Accepted     |
| Internal Environment Management -> Environmental Performance                        | 0.285               | 4.855                    | 0.000    | Accepted     |
| Government Regulation -> Green Supply Chain Management                              | 0.677               | 20.118                   | 0.000    | Accepted     |
| Government Regulation -> Environmental Performance                                  | 0.187               | 4.064                    | 0.000    | Accepted     |
| Green Supply Chain Management -> Environmental Performance                          | 0.582               | 10.285                   | 0.000    | Accepted     |
| Strategic Orientation -> Green Supply Chain Management -> Environmental Performance | -0.019              | 0.478                    | 0.633    | Not accepted |
| Internal Environment Management -> Green Supply Chain Management ->                 | 0.097               | 2.405                    | 0.016    | Accepted     |

|  | <b>Original<br/>sample (O)</b> | <b>T statistics<br/>( O/STDEV )</b> | <b>P<br/>values</b> | <b>Decision</b> |
|--|--------------------------------|-------------------------------------|---------------------|-----------------|
| Environmental Performance<br>Government Regulation -> Green<br>Supply Chain Management -><br>Environmental Performance | 0.394                          | 9.812                               | 0.000               | Accepted        |

Strategic Orientation on GSCM. The results indicate that strategic orientation does not significantly affect Green Supply Chain Management (GSCM) among SMEs in Central Papua. Although strategic orientation is generally viewed as a key element of organizational planning, it does not automatically translate into green operational practices. In SMEs facing limitations in resources, capital, and technical capabilities, strategic plans often remain broad and lack concrete environmental implementation. This finding aligns with (Yulita, 2019), who argues that strategic orientation does not directly influence GSCM adoption without a strong environmental commitment. Moreover, prior studies suggest that strategic orientation must be articulated into specific environmental dimensions to effectively drive GSCM. For instance, (Habib et al., 2021) found that green entrepreneurial orientation and market orientation positively influence GSCM, whereas general strategic orientations show weak associations with green practices. In SMEs, strategic decisions are heavily shaped by feasibility and internal capacity; survival and short-term pressures often take precedence over long-term environmental strategies. Additionally, regulatory pressure and environmentally conscious market demand are frequently more decisive drivers of GSCM implementation than formal strategic orientation alone (S. Liu et al., 2020).

Strategic Orientation on Environmental Performance. The results show that strategic orientation has a significant positive effect on environmental performance, indicating that firms integrating sustainability, efficiency, and competitiveness into their long-term vision and objectives achieve better environmental outcomes. This is reflected in waste reduction, emission control, and resource efficiency as part of operational strategy. Prior studies (Bendig et al., 2023) similarly confirm that strategic orientation enhances environmental performance, particularly when supported by strong managerial commitment. A well-defined strategic orientation enables firms to establish internal policies that promote environmental goals, such as environmentally friendly standard operating procedures, employee awareness programs, and the integration of environmental indicators into strategic management systems. Research by (Tseng et al., 2019) found that incorporating environmental considerations into business strategy significantly improves environmental management and regulatory compliance, while

(Dai et al., 2025). emphasize that explicit environmental integration strengthens organizational commitment to responsible practices. Moreover, amid increasing stakeholder pressure for sustainability, sustainability-oriented strategies enhance firms' responsiveness to cleaner production demands (Ning et al., 2025). Thus, strategic orientation serves as a crucial foundation for aligning business objectives with environmental responsibility, even when GSCM does not act as the primary mediating mechanism.

**Internal Environment Management on GSCM.** The study results reveal that internal environmental management significantly influences the adoption of Green Supply Chain Management (GSCM), highlighting that internal organizational readiness is a key foundation for environmentally friendly supply chain practices. Top management commitment establishes environmental vision and policy direction, environmental training enhances employee competence, and effective internal control systems support monitoring and continuous improvement. Thus, internal environmental management functions not merely administratively but strategically in integrating GSCM principles across business processes (Agyabeng-Mensah et al., 2020; Y. Wang & Ozturk, 2023). These findings suggest that strengthening internal systems is crucial for improving firms' sustainability readiness. SMEs with clear management structures, strong environmental commitment, and adequate control mechanisms are more capable of implementing GSCM despite resource limitations. Therefore, enhancing internal environmental management can serve as a strategic pathway to promote GSCM adoption, improve environmental performance, and strengthen long-term competitiveness, consistent with prior studies (Khan & Hamza, 2025).

**Internal Environment Management on Environmental Performance.** The results show that internal environmental management significantly improves environmental performance among SMEs in Central Papua. Strengthening practices such as top management commitment, environmentally friendly operating procedures, and employee environmental training directly supports emission reduction, energy efficiency, and improved waste management. This indicates that environmental performance depends not only on external pressures but also on strong internal readiness and systematic environmental management. These findings align with prior studies (Armilando et al., 2024), which demonstrate that firms with robust internal environmental systems achieve higher environmental performance. Managerial commitment, organizational structure, and effective environmental control systems are critical in minimizing environmental impacts. Moreover, proactive development of internal environmental capabilities leads to more consistent and sustainable performance

improvements compared to reactive compliance approaches (Lutfi et al., 2024). Thus, internal environmental management represents a strategic driver of sustainable environmental performance.

**Governance Regulation on GSCM.** The study results indicate that governance regulation significantly influences the adoption of Green Supply Chain Management (GSCM), highlighting the role of government regulations as effective external pressures for SMEs to implement environmentally friendly supply chain practices. Environmental standards, production regulations, and sustainability policies compel firms to adjust operational and supply chain activities toward greener practices. In this context, regulatory compliance functions not only as a legal obligation but also as a catalyst for organizational transformation toward sustainability. These findings are consistent with prior research showing that regulatory pressure is a key determinant of GSCM adoption, particularly for SMEs with limited resources and environmental awareness (J. Wang, 2024). Government regulations both compel and guide firms to integrate environmental considerations into raw material selection, production processes, and distribution activities (Lee & Choi, 2021). herefore, governance regulation serves as a crucial institutional mechanism that accelerates GSCM implementation by embedding sustainability within a consistent and binding policy framework.

**Governance Regulation on Environmental Performance.** The study results show that governance regulation significantly improves environmental performance, indicating that government policies not only shape operational changes but also directly enhance firms' environmental outcomes. Regulations related to emission limits, resource efficiency, environmental standards, and waste management encourage SMEs to adopt more systematic and disciplined environmental control practices. Clear rules and strict enforcement mechanisms motivate firms to implement greener production processes, resulting in measurable environmental performance improvements. These findings align with prior studies (Chen et al., 2024), which identify regulatory pressure as a key external driver of environmental performance, particularly among SMEs that depend on policy guidance. Effective regulations enhance compliance, stimulate cleaner technology adoption, and promote sustainable environmental management. Therefore, governance regulation acts as a strategic policy instrument in guiding SMEs toward improved and sustainable environmental performance.

GSCM on Environmental Performance. The study results indicate that Green Supply Chain Management (GSCM) significantly improves environmental performance, highlighting its role as a key mechanism for reducing firms' environmental impacts. Practices such as green purchasing, eco-design, and integrated waste management minimize hazardous material use, reduce waste generation, and enhance resource efficiency. By embedding environmental considerations throughout the supply chain from raw material selection to product distribution firms can substantially lower negative environmental impacts. These findings are consistent with prior research (Dzikriansyah et al., 2023), which reports a positive and significant relationship between GSCM and environmental performance. Firms that consistently apply GSCM practices tend to achieve lower emissions, more effective waste management, and higher compliance with environmental standards. Thus, GSCM serves not only as an operational initiative but also as a strategic approach to enhancing environmental performance and supporting long-term business sustainability.

Strategic Orientation through GSCM on Environmental Performance. The results show that strategic orientation through Green Supply Chain Management (GSCM) does not significantly affect environmental performance, indicating that GSCM does not mediate the relationship between strategic orientation and environmental performance. Although SMEs may adopt market, entrepreneurial, or sustainability orientations, these strategic directions have not been effectively translated into structured and consistent GSCM practices. As a result, conceptual strategies have not generated measurable improvements in environmental performance. This finding can be attributed to common SME constraints, including limited resources, managerial capacity, and technical knowledge for GSCM implementation. Prior research suggests that strategic orientation enhances environmental performance only when supported by strong managerial commitment, robust internal systems, and effective operational integration (Habib et al., 2021). Thus, strategic orientation alone is insufficient to improve environmental performance without consistent and well-implemented GSCM practices within SME supply chains (Nadeem & Siddiqui, 2017).

Internal Environment Management through GSCM on Environmental Performance. The results show that internal environmental management influences environmental performance through Green Supply Chain Management (GSCM), with GSCM acting as a partial mediator. Strong managerial commitment, clear environmental policies, and employee training enhance firms' readiness to implement GSCM practices consistently. These practices such as green purchasing, eco-design, and waste integration—directly improve environmental

performance by reducing waste, increasing resource efficiency, and minimizing environmental impacts. These findings highlight the importance of synergy between internal organizational readiness and operational green supply chain practices (Dzikriansyah et al., 2023). Internal environmental management provides the structural foundation, while GSCM translates this commitment into concrete supply chain actions. Therefore, improving environmental performance requires not only strengthening internal environmental systems but also integrating them effectively with sustainable GSCM practices (D. Liu et al., 2024).

Government Regulation through GSCM on Environmental Performance. The study results indicate that government regulations influence environmental performance through Green Supply Chain Management (GSCM), with GSCM acting as a significant mediating mechanism. Environmental standards, waste management policies, and sustainability requirements encourage SMEs to adopt greener supply chain processes. In this context, GSCM functions as an operational tool that translates regulatory pressure into concrete practices such as green purchasing, environmentally controlled production, and systematic waste management. These findings suggest that regulatory pressure alone does not automatically improve environmental performance without effective implementation mechanisms (Dzikriansyah et al., 2023). GSCM bridges government policies and firm-level operational actions, enabling regulatory impacts to materialize in measurable environmental improvements. Therefore, the effectiveness of environmental regulations largely depends on SMEs' capacity to consistently and sustainably integrate GSCM practices into their supply chain activities (Kalyar et al., 2020).

## **CONCLUSION**

This study concludes that internal environmental management and government regulation are key drivers of environmental performance among SMEs in Central Papua, both directly and indirectly through Green Supply Chain Management (GSCM). Internal environmental management enhances organizational readiness via managerial commitment, environmental policies, and employee training, while government regulation provides external pressure to comply with environmental standards. GSCM significantly improves environmental performance and acts as a partial mediator in the relationships between internal environmental management and environmental performance, as well as between government regulation and environmental performance. In contrast, strategic orientation does not significantly affect GSCM and is not mediated by GSCM in influencing environmental

performance, although it has a direct impact on environmental outcomes. This suggests that strategic intent alone is insufficient without effective operational implementation through GSCM. Overall, sustainable environmental performance in SMEs relies less on strategic formulation alone and more on strong internal environmental systems, consistent regulatory enforcement, and the effective integration of green supply chain practices.

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