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Green Process Innovation and its Impact on Sustainability Performance: The Mediating Role of Green Supply Chain Management

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Abstract

Purpose: The food and beverage sector, which contributes significantly to plastic waste in Indonesia, may reduce its usage of single-use plastics by using green process innovation. By incorporating economic and environmental goals into the strategic management of supply chain operations, Green Supply Chain Management can propel this. This study aims to evaluate the role of green process innovation and Green Supply Chain Management in achieving sustainable corporate performance (SP) in Indonesia, especially in the food and beverage industry.

Method: Purposive sampling was used to select samples from the food and beverage industry during the 2021-2023 period, which resulted in 12 companies being used as samples. Path analysis was used as a data analysis method in this study. After that, Warp- PLS 8.0 software was used to process the data obtained.

Result: The results showed that green process innovation has a positive and significant influence on sustainable corporate performance, and green process innovation has a positive and considerable influence on Green Supply Chain Management. Meanwhile, Green Supply Chain Management does not influence sustainable corporate performance, and Green Supply Chain Management cannot mediate the influence between green process innovation and sustainable corporate performance.

INTRODUCTION

Plastic has become an important material in everyday life and has been applied in various products, ranging from food and beverage packaging and medical devices to electronic devices. This happens because plastics have lightweight, water-resistant characteristics and relatively low production costs, making them ideal for various industrial purposes. However, plastic also causes various environmental challenges because plastic waste is not biodegradable and takes between 58 and 1,200 years to decompose (Chamas et al., 2020). Plastic waste has become one of the most significant environmental problems facing worldwide. Of the 9.2 billion tons of plastic produced since the 1950s, 7 billion tons have become waste, with 19-23 million tons filling landfills and polluting lakes, rivers, soil, and oceans yearly (UN Environment Programme). Based on the census of the Nusantara River Affairs Research Agency (BRUIN) in 2023, 25,733 plastic waste items were found in Indonesia during the census period, and they were dominated by waste from food and beverage products produced in economical packaging, such as sachets or disposable plastic packaging (Greenpeace Indonesia, 2019; Riski, 2024).

Increased awareness of the negative impacts caused by the use of plastics has prompted several industries to make efforts to reduce their dependence on single-use plastics (Tan et al., 2021). It will also replace it with other alternatives as an application of the circular economy by using the reuse and refill system as one of the leading solutions in overcoming the plastic problem crisis (Greenpeace Indonesia, 2019). Reducing the use of single-use plastics in the food and beverage industry can be achieved by implementing green process innovation (GPI), using bio-plastic-based materials that can be biodegraded, organic recycling, and industrial symbiosis (Tan et al., 2021). GPI is focused on production processes where innovations can be applied to reduce environmental risks, pollution emissions, and other negative impacts, such as cleaner production, pollution control, pollution prevention, environmental efficiency, and recirculation (Cainelli et al., 2015; Ma et al., 2017; Sharma & Henriques, 2005). Innovation in production processes by implementing green processing can significantly reduce emissions and improve waste management practices in companies and countries, leading to cleaner waterways and the natural environment (Chiou et al., 2011; Khan et al., 2021). In addition, the implementation of GPI not only reduces harmful environmental impacts but can also improve company performance through cost efficiency, speed, and flexibility of operations (Khan et al., 2021) and can assist businesses in gaining and maintaining several competitive advantages (Albort-Morant et al., 2016; Xie et al., 2019).

Green supply chain management (GSCM) is a key driver in implementing GPI, which involves integrating environmental and economic objectives into the strategic management of supply chain operations (Herrmann et al., 2021). This GSCM can benefit companies in improving product design manufacturing processes and increasing compliance in reducing environmental impacts (Chiou et al., 2011; Novitasari & Agustia, 2021; Yusuf et al., 2023) That aims to minimize waste, including hazardous chemicals, emissions, energy, and solid waste, along the supply chain, such as product design, sourcing and material selection, production processes, final product delivery, and end-of-life management (Chin et al., 2015). A key component of GSCM is cooperation between suppliers and focal companies to support ecologically and socially responsible operations from the supply side (Chin et al., 2015), so companies need to incorporate environmental standards into their entire supply chain to achieve sustainable performance (SP) (Hejazi et al., 2023). Such collaboration is a strategy companies can use to promote and enhance the environmental capabilities of their supply partners (Chin et al., 2015; Klassen & Vachon, 2003). These practices not only minimize the company's environmental and social impacts but can also improve the company's efficiency and reputation (Acar & Çemberci, 2024).

Empirical research shows that the GPI influences company performance (Li et al., 2023; Novitasari & Agustia, 2021; Ozilhan-Ozbey et al., 2024; Wang & Ahmad, 2024; Xie et al., 2019, 2022). GSCM influences company performance (Acar & Çemberci, 2024; Hejazi et al., 2023; Holling

& Backhaus, 2023). GPI influences GSCM (Issa et al., 2024). Meanwhile, other studies show no influence between GSCM and company performance (Khan & Qianli, 2017; Novitasari & Agustia, 2021). While many studies address GPI or GSCM individually, studies that specifically integrate these concepts are still minimal. Research that evaluates how GSCM can mediate the relationship between GPI and corporate sustainability performance (SP) is scarce, especially in developing countries such as those in the Southeast Asian region, particularly Indonesia, which could provide different insights into the impact of GPI and GSCM. Most research focuses on developed countries, creating a research gap in developing countries. In addition, existing studies tend to evaluate environmental, economic, or operational performance separately, while comprehensive studies covering social performance are lacking. Considering this gap, this study evaluated the role of GPI and GSCM in achieving corporate SP in Indonesia, especially in the food and beverage industry.

Green Process Innovation and Sustainability Performance

GPI, or green innovation, is defined as new or developed processes, techniques, systems, and products that avoid or reduce environmental damage (Ma et al., 2017). This GPI involves transitioning from conventional energy sources to bioenergy to reduce total energy consumption and greenhouse gas emissions, making it a clean technology (Khan et al., 2021), which refers to any innovation or development in terms of technology, organization, society, or institution that can reduce environmental burdens so that it can be used as a tool to improve environmental management processes (Bhatia, 2021; Chan et al., 2016; Guoyou et al., 2013). Companies often implement GPIs to increase productivity, save costs, and create new opportunities in the market (Makhloufi et al., 2023; Wang & Ahmad, 2024). By relying on green innovation capabilities, companies can improve efficiency in the production process and operational quality so that the production process can meet consumer needs, meet environmental regulations, and contribute to sustainable development (Bhatia, 2021; Dai et al., 2017).

In green innovations, reduced air or water emissions, reduced water consumption, and improved resource and energy efficiency can provide cost efficiencies and increase profitability (Kivimaa & Kautto, 2010; Xie et al., 2019). In addition, investors and consumers tend to give higher prices to companies that show a positive image, especially for environmentally friendly green products, which can positively affect company performance (Xie et al., 2022). Empirical research states that the GPI has a positive influence on company performance (Li et al., 2023; Novitasari & Agustia, 2021; Ozilhan-Ozbey et al., 2024; Wang & Ahmad, 2024; Xie et al., 2019). Whereas GPI improves operational efficiency through waste reduction and more efficient energy use, which in turn lowers production costs, companies that implement GPI tend to have a better reputation in the eyes of consumers and stakeholders, which can increase competitiveness and market share. Thus, we propose the following hypothesis:

H1: GPI has a positive effect on SP.

Green Process Innovation and Green Supply Chain Management

GSCM integrates environmental aspects into all aspects of the production process, including product design, raw material procurement and selection, manufacturing procedures, final product distribution, and end-of-life management (Liu & You, 2021), where process innovation is central to enabling companies to improve the efficiency of production processes by reducing the amount of resources used and waste, as well as lowering energy and error rates (Liu & De Giovanni, 2019). Such green practices can be achieved by companies with a fully integrated collaborative program with suppliers along the supply chain (Liu & De Giovanni, 2019), in which multiple actors, both direct and indirect, in GSCM, integrate to reduce environmentally harmful waste in each supply chain pathway (Burki, 2018).

The integration of GPI into the supply chain combines green practices with technological advances to reduce environmental impact and improve operational effectiveness (Issa et al., 2024). Stakeholder-driven integration of suppliers and consumers supports environmental management initiatives. It allows companies to improve production procedures to reduce waste and replace it with recycled or less hazardous materials (Wu, 2013). So that it can contribute to the success of sustainability practices, renewable energy, eco-efficiency, innovation clusters, and synergized industry networks (Herrmann et al., 2021).

Empirical research shows GPI influences GSCM (Issa et al., 2024). In contrast, GPI involves the integration of green technologies and environmentally friendly practices that reduce emissions and waste, improve energy efficiency, and encourage the use of environmentally friendly raw materials that can positively contribute to GSCM by improving operational efficiency and sustainability. Thus, we propose the following hypothesis:
H2: GPI has a positive effect on GSCM.

Green Supply Chain Management and Sustainability Performance

GSCM is an environmental innovation that integrates environmental sustainability into all aspects of production and distribution (Hongquan & Abdullah, 2023), where a key component is the cooperation between supplier and company, from supplier selection to packaging, which is mutually focused on supporting ecologically and socially responsible operations from the supply side (Chin et al.., 2015), where GSCM companies can reduce raw material costs and use recycled resources (Novitasari & Agustia, 2021). Governments, businesses, and supply chain partners collaborate to improve supply chain management (SCM) by reducing environmental risks, minimizing waste, energy use, and pollution, and strengthening community relationships. This partnership also promotes environmental education (Darnall & Edwards, 2006).

Collaboration between the focal company and its suppliers is key to GSCM, which promotes environmentally and socially responsible practices (Klassen & Vachon, 2003). This collaboration can increase commercial opportunities, with global companies increasingly adopting green and environmentally friendly practices (Burki, 2018). Companies must incorporate environmental standards into their supply chain to achieve SP (Hejazi et al., 2023).

Empirical research shows that GSCM influences company performance (Acar & Çemberci, 2024; Hejazi et al., 2023; Holling & Backhaus, 2023), where GSCM has a role in improving operational efficiency, reducing environmental impacts, and ensuring the company's compliance with environmental regulations to strengthen good relations with stakeholders such as customers and suppliers and encourage product development innovations that contribute to improving the company's SP.
H3: GSCM has a positive effect on SP.

Green Process Innovation, Green Supply Chain Management, and Sustainability Performance

Combining green innovation strategies with green logistics management methods is essential in strategic management. This combination aligns with the resource-based view (RBV), highlighting the importance of specialized resources and skills, such as green innovation (Issa et al., 2024). The "triple-bottom-line" framework defines sustainability in the business world, which includes economic, environmental, and social responsibilities. This approach ensures businesses can survive, continue, and sustain their existence. Achieving sustainability and competitiveness requires close cooperation between companies, suppliers, and other supply chain participants, aiming to maximize profits while minimizing resource use (Mathu, 2021).

GPI promotes the development and manufacture of more environmentally friendly products by improving operational and administrative procedures, thereby increasing resource efficiency and laying the foundation for sustainable product innovation (Wang & Ahmad, 2024). At the same time,

SCM involves coordinating activities from procuring raw materials to delivering finished products to customers. With the growing emphasis on sustainability, companies increasingly adopt green practices in their supply chain operations to improve environmental performance and reduce overall environmental impact (Issa et al., 2024).

The company can effectively improve SP on GPI implementation with the support of GSCM integration capabilities that will assist the company in improving production technology, products, and services (Sun & Sun, 2021). Therefore, integrating the GSCM approach is one of the most effective ways to improve corporate SP (Hongquan & Abdullah, 2023). Thus, we propose the following hypothesis:

H4: GSCM can mediate the effect of GPI on SP.

RESEARCH METHODS

The population in this study includes all companies engaged in the food and beverage industry listed on the Indonesia Stock Exchange, which are then determined using purposive sampling techniques. The criteria used are: (1) food and beverage companies that publish annual reports and sustainability reports for 2021-2023; (2) food and beverage companies that have consistently achieved PROPER ratings in 2021-2023; and (3) food and beverage companies that present complete data related to research variables. So, the sample used in this study amounted to 12 companies with 3 years of observation, namely 2021-2023. This research uses the partial least squares structural equation model (PLS-SEM) as a statistical data analysis tool for path model analysis. Model evaluation was carried out with 10 measures of model fit for the inner model, and hypotheses were tested with an alpha value of 5%.

Green Process Innovation, Using the content analysis method, each item is scored between 0 and 2 according to whether the company's sustainability report contains relevant information or not: 0 indicates that no relevant information is found; 1 indicates that there is relevant information but lacks implementation details; and two indicates that there is relevant information with complete details (e.g., detailed instructions, implementation plans, or statistical terms indicating that the company engages in relevant forms of innovation, as well as numerical indicators to describe corresponding environmental practices). The green innovation process score is calculated by indexing the average of all disclosed indicators (Xie et al., 2019).

Sustainability Performance: Due to the short-term activity and uncertainty of the external environment in emerging markets, return on assets (ROA) is more stable than sales growth or return on sales in showing the results of specific past and current actions. ROA is often used in the literature on green innovation (Rafli, 2024; Xie et al., 2019). PROPER (Assessment of Company Performance in Environmental Management) is used to measure green investments, where there are five levels in the Ministry of Environment and Forestry's PROPER rating system: five for Gold (excellent), four for Green, three for Blue, two for Red, and one for Black (very poor) (Indriastuti & Chariri, 2021). Social performance is measured using CSR Investments, which are efforts made by businesses to gain support from stakeholders by being seen as a socially conscious organization. As such, it can enhance the business's reputation, increasing revenue. Natural logs account for CSR operating costs in the CSR investment measurement process (Indriastuti & Chariri, 2021).

Green Supply Chain Management, Using the content analysis method, each item is scored between 0 and 2 according to whether the company's sustainability report contains relevant information or not: 0 indicates that no relevant information is found; 1 indicates that there is relevant information but lacks details; and two indicates that there is relevant information with complete details, after which all disclosed indicators are created into an average index (Xie et al., 2019). Variables and their measurements can be seen in table 1

Table 1.
Variables and Measurement

Variables	Measurement	References
Green Process Innovation	Aims to reduce resource and energy consumption and improve resource and energy efficiency Using recycled materials, recycling techniques, and environmental technologies Implement an environmental campaign. Using pollution control equipment Adopt pollution control projects and technologies	Xie et al. (2019)
Green Supply Chain Management	Have ISO 9000 or ISO 14000 certificate Eco-friendly distribution and marketing Reverse logistics, packaging using recycling Close relationships with suppliers to determine purchasing criteria and quality of materials from suppliers Product quality meets customer needs	Novitasari & Agustia (2021)
Sustainability Performance	Economic Performance (RoA) Environmental Performance (Proper) Social Performance (CSR Investment)	Xie et al. (2019) Indriastuti & Chariri (2021)

RESULTS & DISCUSSION

This study involved 12 F&B industry companies with an observation period of 3 years, resulting in a total sample 36. The data in the study were collected through observation and documentation methods of the financial statements and sustainability reports of the companies that were the object of research. Descriptive statistics were obtained using the SPSS 26 program to analyze the characteristics of the company sample, which are presented in table 2.

Table 2.
Descriptive Statistics

Variables	N	Min	Max	Mean	Std. Deviation
PROPER	36	2.00	4.00	3.0556	0.41019
LN_CSR Inv	36	18.88	27.21	21.8313	2.72262
ROA	36	0.02	0.31	0.1064	0.07048
GPI	36	0.40	1.00	0.7556	0.18118
GSCM	36	0.20	0.80	0.5417	0.17948

Based on table 2, the PROPER variable has an average of 3.0556 with a standard deviation of 0.41019, indicating that the environmental performance of companies tends to be in the upper middle level with relatively slight variations. LN_CSR Inv, which reflects investment in CSR, has an average of 21.8313 with a standard deviation of 2.72262, indicating a considerable difference in CSR investment between companies. ROA has a mean of 0.1064 with a standard deviation of 0.07048, indicating varying profitability between companies. For sustainability-related variables, GPI has a mean of 0.7556 with a standard deviation of 0.18118. In contrast, GSCM has a mean of 0.5417 with a standard deviation of 0.17948, reflecting the level of green process innovation and supply chain management that also varies between firms.

This study evaluates the research model using inner model evaluation, namely the Goodness of Fit Model in Warp-PLS 8 using Model Fit and Quality Indices, where the criteria used do not apply rigidly and absolutely (see table 3). So that if one or two indicators are met, the model can still be used.

Table 3.
Structural Model Testing (Inner Model)

Model Fit and Quality Indices	Result	Description
Average path coefficient (APC)	0.438 P<0.001	Highly Significant
Average R-squared (ARS)	0.417 P=0.001	Highly Significant
Average adjusted R- squared (AARS)	0.395 P=0.002	Highly Significant
Average block VIF (AVIF)	1.088	Accepted
Average full collinearity VIF (AFVIF)	1.346	Accepted
Tenenhaus GoF (GoF)	0.599	Large
Sympson's paradox ratio (SPR)	1.000	Accepted
R-squared contribution ratio (RSCR)	1.000	Accepted
Statistical suppression ratio (SSR)	1.000	Accepted
Nonlinear bivariate causality direction ratio (NLBCDR)	0.833	Accepted

This study uses the PLS-SEM method with the Warp-PLS 8 program to test the hypothesis. Hypothesis testing parameters in Warp-PLS are carried out using the resampling method so that the assumption of normal distribution is not required. This study uses the "Stable 3" resampling method because this method can produce consistent and more precise P-values than those produced by other program resampling methods, so this method is quite reliable for path coefficients associated with direct effects (Kock, 2022).

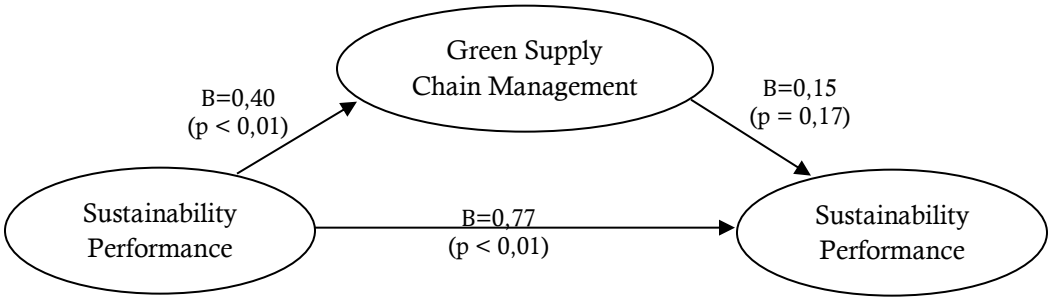

Figure 1.
Conceptual Framework

Table 4.
Hypothesis Result

Hypothesis	β	P-Value	Description
GPI →SP	0.767	<0.001	Sig. Positive effect
GPI → GSCM	0.395	0.004	Sig. Positive effect
GSCM → SP	0.151	0.169	Unaffected
GPI → GSCM → SP	0.060	0.303	Unable to mediate

The analysis shows in figure 1 and table 4, that GPI has a positive and significant influence on SP with a coefficient of 0.767 and a p-value of <0.001, which means H1 is accepted. In addition, GPI also has a positive and significant influence on GSCM with a coefficient of 0.395 and a p-value of 0.004, which means H2 is accepted. In addition, GSCM does not have a significant effect on SP with a coefficient of 0.151 and a p-value of 0.169, and GSCM cannot mediate the effect between GPI and

SP with a coefficient of 0.060 and a p-value of 0.303. So, based on these results, H3 and H4 are rejected.

Based on the results of hypothesis testing, it is found that GPI has a positive and significant effect on SP in the F&B industry. From these results, implementing GPI in the F & B industry can help improve efficiency in the production process, reduce waste, and meet environmental regulations. The implementation of GPI allows companies to optimize the use of resources, such as water and energy, thereby reducing operational costs and increasing competitiveness (Albort-Morant et al., 2016; Makhloufi et al., 2023; Wang & Ahmad, 2024). In addition, the use of sustainable raw materials, such as bio-plastic-based materials that can be biodegraded (Tan et al., 2021), can further enhance the positive image of the company to increase the attractiveness of products for consumers so that they can have a positive influence on company performance (Xie et al., 2022). One example of GPI implementation in the F&B industry is the use of recycled packaging (Tan et al., 2021), which not only helps reduce plastic waste but can also improve the company's image in the eyes of stakeholders, especially consumers. In addition, reducing the use of conventional plastics can also reduce long-term production costs, thus supporting the company's sustainability performance. The results of this study are in line with empirical research, which states that GPI has a positive and significant effect on SP (Li et al., 2023; Novitasari & Agustia, 2021; Ozilhan Ozbey et al., 2024; Wang & Ahmad, 2024; Xie et al., 2019).

Based on the results of hypothesis testing, it is found that GPI has a positive and significant effect on GSCM in the F&B industry. This result is due to the role of GPI in integrating green technology and environmentally friendly practices that reduce emissions and waste, increase energy efficiency, and encourage the use of sustainable raw materials. Companies can improve production efficiency through GPI by reducing resource use (B. Liu & De Giovanni, 2019). The involvement of stakeholders, namely suppliers and consumers, allows companies to optimize their production procedures by using recycled materials or more environmentally friendly materials (Wu, 2013). Integrating GPI into the supply chain improves operational efficiency. It supports various sustainability initiatives, such as utilizing renewable energy, increasing eco-efficiency, strengthening innovation, and creating a more synergistic industrial network (Herrmann et al., 2021). Therefore, GPI is a significant factor that strengthens the implementation of GSCM in the F&B industry, encouraging the creation of a more sustainable and environmentally friendly supply chain. This study's results align with empirical research stating that GPI has a positive and significant effect on GSCM (Issa et al., 2024).

Based on the results of hypothesis testing, it is found that GSCM has no significant effect on SP in the F&B industry. This result is because implementing GSCM requires considerable investment and motivation to improve reputation, efficiency, effectiveness, differentiation, and revenue growth (Novitasari & Agustia, 2021). In addition, there are still many challenges in implementing GSCM in Indonesia, such as limited resources and a lack of awareness of environmental issues (Ismail, 2023). The practice of reverse logistics in GSCM is rarely applied due to the high costs required for its implementation, limited infrastructure, and low company awareness and commitment. Most companies focus more on regulatory compliance rather than actively implementing sustainability strategies. Thus, the low adoption rate leads to GSCM's inability to influence SP (Laosirihongthong et al., 2013). The results of this study contradict empirical research, which states that GSCM has a positive and significant effect on SP (Acar & Çemberci, 2024; Hejazi et al., 2023; Holling & Backhaus, 2023). However, this study aligns with empirical research, which states that there is no influence between GSCM and SP (Novitasari & Agustia, 2021).

The results of the hypothesis testing show that GSCM cannot mediate the influence of GPI and SP in the F&B industry. This result is because the GPI implemented in the company has improved energy efficiency, reduced waste, and optimized the use of resources quite significantly. The lack of synergy between stakeholders and low awareness of environmental issues are the main obstacles to implementing GSCM in this industry (Ismail, 2023). Without a solid collaboration between the

government and the private sector and a deep understanding of the urgency of green business practices, GSCM cannot help maximize the positive impact of GPI on SP. This result is in line with the findings in empirical research where the implementation of the GPI directly contributes to improving corporate sustainability performance without needing to be mediated by GSCM (Novitasari & Agustia, 2021). So, although GSCM has a role in supporting supply chain sustainability in the F&B industry, its influence is still not strong enough to mediate between GPI and SP.

CONCLUSION

Based on the analysis, this study shows that GPI positively and significantly influences SP in the F&B industry, indicating that implementing GPI can improve production efficiency, reduce waste, and strengthen company competitiveness. Thus, hypothesis 1 is accepted. In addition, GPI also has a positive and significant influence on GSCM, which indicates that GPI supports the integration of green technology and sustainable supply chain practices. Thus, hypothesis 2 is accepted. However, this study shows that GSCM does not significantly influence SP. This shows that implementing GSCM in the F&B industry still faces challenges, such as high investment costs, limited resources, and low awareness of sustainability issues. Thus, it can be concluded that hypothesis 3 is rejected. As for this study, GSCM cannot mediate the effect between GPI and SP. This result is because the direct influence of GPI on SP is already quite significant. At the same time, the role of GSCM as a mediator is still weak due to the lack of collaboration between stakeholders and low regulatory support. Thus, it can be concluded that hypothesis 4 is rejected. The findings in this study confirm that GPI has an important role in improving SP in the F&B industry. However, stronger collaboration and better policy support are still needed to maximize the role of GSCM in driving corporate sustainability.

Theoretically, this study contributes to the developing literature on the relationship between green process innovation, green supply chain management, and sustainability performance, particularly in the F&B sector in developing countries. The findings highlight that the effectiveness of GSCM is not always consistent and depends on structural contexts such as regulatory support and organizational readiness, thus expanding the theoretical understanding of the role of GSCM as a mediating variable. From a practical perspective, companies need to be more proactive in implementing Green Process Innovation (GPI) to improve efficiency, reduce waste, and meet environmental regulations, as well as integrating Green Supply Chain Management (GSCM) by selecting sustainable suppliers, optimizing green logistics, and increasing transparency in sustainability reporting to improve credibility and competitiveness. Another practical implication is the need for synergy between companies, governments, and communities to form a sustainability ecosystem that supports the implementation of GSCM more effectively and efficiently, especially in the face of cost and resource barriers. In addition, collaboration with governments, communities, and suppliers also needs to be strengthened to support business sustainability.

This study has several limitations that need to be considered, including the limited number of samples because only a few companies in the F&B industry have a PROPER rating to indicate compliance with environmental standards. These limitations make the research results not fully generalizable to the entire industry. In addition, many companies do not publicly disclose the costs they invest in CSR initiatives, making it difficult for researchers to measure the extent of the company's commitment to sustainability practices. Based on the conclusions of this study, several recommendations can be given. The findings in this study can be a reference for future research, especially in the scope of GPI, GSCM, and SP. Future researchers are recommended to expand the sample. Coverage by involving more companies, including those with different levels of environmental compliance, and future research can integrate other variables to obtain a more comprehensive understanding of the factors that influence or mediate the relationship between GPI and SP.

REFERENCES

Acar, S. G., & Çemberci, M. (2024). The Relation Between Green Supply Chain Management and Sustainable Performance. *Journal of International Trade, Logistics and Law*, 10(1), 304–308. https://www.jital.org/index.php/jital/article/view/496

Albort-Morant, G., Leal-Millán, A., & Cepeda-Carrión, G. (2016). The antecedents of green innovation performance: A model of learning and capabilities. *Journal of Business Research*, 69 (11), 4912–4917. https://doi.org/10.1016/j.jbusres.2016.04.052

Bhatia, M. S. (2021). Green process innovation and operational performance: The role of proactive environment strategy, technological capabilities, and organizational learning. *Business Strategy and the Environment*, *30*(7), 2845–2857. https://doi.org/10.1002/bse.2775

Burki, U. (2018). Green Supply Chain Management, Green Innovations, and Green Practices. In *Understanding Complex Systems* (pp. 81–109). https://doi.org/10.1007/978-3-319- 94322-0_4

Cainelli, G., De Marchi, V., & Grandinetti, R. (2015). Does the development of environmental innovation require different resources? Evidence from Spanish manufacturing firms. *Journal of Cleaner Production*, *94*, 211–220. https://doi.org/10.1016/j.jclepro.2015.02.008

Chamas, A., Moon, H., Zheng, J., Qiu, Y., Tabassum, T., Jang, J. H., Abu-Omar, M., Scott, S. L., & Suh, S. (2020). Degradation Rates of Plastics in the Environment. *ACS Sustainable Chemistry & Engineering*, *8*(9), 3494–3511. https://doi.org/10.1021/acssuschemeng.9b06635

Chan, H. K., Yee, R. W. Y., Dai, J., & Lim, M. K. (2016). The moderating effect of environmental dynamism on green product innovation and performance. *International Journal of Production Economics*, *181*, 384–391. https://doi.org/10.1016/j.ijpe.2015.12.006

Chin, T. A., Tat, H. H., & Sulaiman, Z. (2015). Green Supply Chain Management, Environmental Collaboration and Sustainability Performance. *Procedia CIRP*, *26*, 695– 699. https://doi.org/10.1016/j.procir.2014.07.035

Chiou, T.-Y., Chan, H. K., Lettice, F., & Chung, S. H. (2011). The influence of greening the suppliers and green innovation on environmental performance and competitive advantage in Taiwan. *Transportation Research Part E: Logistics and Transportation Review*, *47*(6), 822–836. https://doi.org/10.1016/j.tre.2011.05.016

Dai, J., Cantor, D. E., & Montabon, F. L. (2017). Examining corporate environmental proactivity and operational performance: A strategy-structure-capabilities-performance perspective within a green context. *International Journal of Production Economics*, *193*, 272–280. https://doi.org/10.1016/j.ijpe.2017.07.023

Darnall, N., & Edwards, D. (2006). Predicting the cost of environmental management system adoption: the role of capabilities, resources and ownership structure. *Strategic Management Journal*, *27*(4), 301–320. https://doi.org/10.1002/smj.518

Greenpeace Indonesia. (2019). *Sampah Kemasan Makanan dan Minuman Mendominasi*. Greenpeace. https://www.greenpeace.org/indonesia/cerita/4238/sampah-kemasan-makanan-dan-minuman-mendominasi/

Guoyou, Q., Saixing, Z., Chiming, T., Haitao, Y., & Hailiang, Z. (2013). Stakeholders' Influences on Corporate Green Innovation Strategy: A Case Study of Manufacturing Firms in China. *Corporate Social Responsibility and Environmental Management*, *20*(1), 1–14. https://doi.org/10.1002/csr.283

Hejazi, M. T., Al Batati, B., & Bahurmuz, A. (2023). The Influence of Green Supply Chain Management Practices on Corporate Sustainability Performance. *Sustainability*, *15*(6), 5459. https://doi.org/10.3390/su15065459

Herrmann, F. F., Barbosa-Povoa, A. P., Butturi, M. A., Marinelli, S., & Sellitto, M. A. (2021). Green

Supply Chain Management: Conceptual Framework and Models for Analysis. *Sustainability*, *13*(15), 8127. https://doi.org/10.3390/su13158127

Holling, H., & Backhaus, L. (2023). A Meta-Analysis of Green Supply Chain Management Practices and Firm Performance. *Sustainability*, *15*(6), 4730. https://doi.org/10.3390/su15064730

Hongquan, Z., & Abdullah, A. R. (2023). Enhancing Sustainable Business Performance in China's Food Industry through Green Supply Chain Management. *International Journal of Business and Technology Management*, *5*(4), 448–457. https://doi.org/10.55057/ijbtm.2023.5.4.40

Indriastuti, M., & Chariri, A. (2021). The role of green investment and corporate social responsibility investment on sustainable performance. *Cogent Business & Management*, *8*(1), 1960120. https://doi.org/10.1080/23311975.2021.1960120

Ismail, H. (2023). Green Supply Chain Management: A Literature Review about the Phenomenon in Indonesia. *Business Journal: Jurnal Bisnis Dan Sosial*, *09*(01), 13–20. https://doi.org/10.25124/businessjournal.v9i1.5956

Issa, A., Khadem, A., Alzubi, A., & Berberoğlu, A. (2024). The Path from Green Innovation to Supply Chain Resilience: Do Structural and Dynamic Supply Chain Complexity Matter? *Sustainability*, *16*(9), 3762. https://doi.org/10.3390/su16093762

Khan, S. A. R., & Qianli, D. (2017). Impact of green supply chain management practices on firms' performance: an empirical study from the perspective of Pakistan. *Environmental Science and Pollution Research*, *24*(20), 16829–16844. https://doi.org/10.1007/s11356-017- 9172-5

Khan, S. J., Kaur, P., Jabeen, F., & Dhir, A. (2021). Green process innovation: Where we are and where we are going. *Business Strategy and the Environment*, *30*(7), 3273–3296. https://doi.org/10.1002/bse.2802

Kivimaa, P., & Kautto, P. (2010). Making or breaking environmental innovation? *Management Research Review*, *33*(4), 289–305. https://doi.org/10.1108/01409171011030426

Klassen, R. D., & Vachon, S. (2003). Collaboration and Evaluation in The Supply Chain: The Impact on Plant-Level Environmental Investment. *Production and Operations Management*, *12*(3), 336–352. https://doi.org/10.1111/j.1937- 5956.2003.tb00207.x

Kock, N. (2022). *WarpPLS User Manual: Version 7.0*. ScriptWarp Systems.

Laosirihongthong, T., Adebanjo, D., & Choon Tan, K. (2013). Green supply chain management practices and performance. *Industrial Management & Data Systems*, *113*(8), 1088–1109. https://doi.org/10.1108/IMDS-04-2013-0164

Li, H., Li, Y., Sarfarz, M., & Ozturk, I. (2023). Enhancing firms' green innovation and sustainable performance through the mediating role of green product innovation and moderating role of employees' green behavior. *Economic Research-Ekonomska Istraživanja*, *36*(2). https://doi.org/10.1080/1331677X.2022.2142263

Liu, B., & De Giovanni, P. (2019). Green process innovation through Industry 4.0 technologies and supply chain coordination. *Annals of Operations Research*. https://doi.org/10.1007/s10479-019-03498-3

Liu, H.-C., & You, X.-Y. (2021). Green Supplier Evaluation and Selection: Models, Methods and Applications. In *Green Supplier Evaluation and Selection: Models, Methods and Applications*. Springer Singapore. https://doi.org/10.1007/978-981-16-0382-2

Ma, Y., Hou, G., & Xin, B. (2017). Green Process Innovation and Innovation Benefit: The Mediating Effect of Firm Image. *Sustainability*, *9*(10), 1778. https://doi.org/10.3390/su9101778

Makhloufi, L., Vasa, L., Rosak-Szyrocka, J., & Djermani, F. (2023). Understanding the Impact of Big Data Analytics and Knowledge Management on Green Innovation Practices and Organizational Performance: The Moderating Effect of Government Support. *Sustainability*,

15(11), 8456. https://doi.org/10.3390/su15118456

Mathu, K. (2021). Green Initiatives in Supply Chain Management Drives Enterprises' Competitiveness and Sustainability. In *Green Supply Chain - Competitiveness and Sustainability*. IntechOpen. https://doi.org/10.5772/intechopen.94770

Novitasari, M., & Agustia, D. (2021). Green supply chain management and firm performance: The mediating effect of green innovation. *Journal of Industrial Engineering and Management*, *14*(2), 391. https://doi.org/10.3926/jiem.3384

Ozilhan-Ozbey, D., Coskun-Degirmen, G., Berk, O. N., Sardagi, E., Celep, E., Koc, D., & Gozen, E. (2024). Green Core Competencies, Green Process Innovation, and Firm Performance: The Moderating Role of Sustainability Consciousness, a Mixed Method Study on Golf Hotels. *Sustainability*, *16*(10), 4181. https://doi.org/10.3390/su16104181

Rafli, M. R. (2024). An Impact Analysis of Acquisitions on Financial Performance at PT Sumber Alfaria Trijaya Tbk (AMRT) For The 2016-2022 Period. *Journal of Management and Islamic Finance*, *4*(1), 60–72. https://doi.org/10.22515/jmif.v4i1.8885

Riski, P. (2024). *Sensus BRUIN 2023, Sampah Plastik Persoalan Utama di Indonesia*. https://mongabay.co.id/2024/01/18/sensus-bruin-2023-sampah-plastik-persoalan-utama-di-indonesia/

Sharma, S., & Henriques, I. (2005). Stakeholder influences on sustainability practices in the Canadian forest products industry. *Strategic Management Journal*, *26*(2), 159–180. https://doi.org/10.1002/smj.439

Sun, Y., & Sun, H. (2021). Green Innovation Strategy and Ambidextrous Green Innovation: The Mediating Effects of Green Supply Chain Integration. *Sustainability*, *13*(9), 4876. https://doi.org/10.3390/su13094876

Tan, J., Tiwari, S. K., & Ramakrishna, S. (2021). Single-Use Plastics in the Food Services Industry: Can It Be Sustainable? *Materials Circular Economy*, *3*(1), 7. https://doi.org/10.1007/s42824-021-00019-1

UN Environment Programme. (n.d.). *Plastic Pollution*. UN Environment Programme. Retrieved July 25, 2024, from https://www.unep.org/plastic-pollution

Wang, Y. Z., & Ahmad, S. (2024). Green process innovation, green product innovation, leverage, and corporate financial performance; evidence from system GMM. *Heliyon*, *10*(4), e25819. https://doi.org/10.1016/j.heliyon.2024.e25819

Wu, G. (2013). The influence of green supply chain integration and environmental uncertainty on green innovation in Taiwan's IT industry. *Supply Chain Management: An International Journal*, *18*(5), 539–552. https://doi.org/10.1108/SCM-06-2012-0201

Xie, X., Hoang, T. T., & Zhu, Q. (2022). Green process innovation and financial performance: The role of green social capital and customers' tacit green needs. *Journal of Innovation & Knowledge*, *7*(1), 100165. https://doi.org/10.1016/j.jik.2022.100165

Xie, X., Huo, J., & Zou, H. (2019). Green process innovation, green product innovation, and corporate financial performance: A content analysis method. *Journal of Business Research*, *101*(June 2018), 697–706. https://doi.org/10.1016/j.jbusres.2019.01.010

Yusuf, M., Azhari, F., Amruzi, F. Al, Wahidi, M. M. I., & Anafarhanah, S. (2023). Green Economy Financing According to Fiqh Al-Biah as Part of Maqashid Sharia. *Pena Justisia: Media Komunikasi Dan Kajian Hukum*, *21*(1). https://doi.org/10.31941/pj.v21i1.2725