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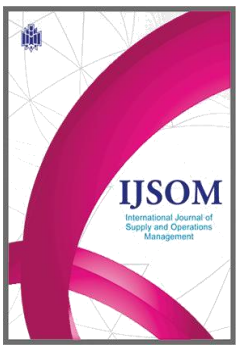

The Impact of Green Logistics Management Practices on Manufacturing Firms' Sustainability Performance in Ghana and Indonesia

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Abstract

This study investigates the impact of four dimensions of Green Logistics Management Practices (GLMP)–Inbound Logistics (IL), Outbound Logistics (OL), Green Operation and Production (GOP), and Reverse Logistics (RS)–on economic, environmental, and social performance, which represent the sustainability dimensions in both Ghana and Indonesia. This study compares the impacts of the Green Logistics Management Practices (GLMP) in Ghana and Indonesia, considering their respective economic and environmental contexts. It aims to understand how GLMP contribute to sustainability in rapidly industrializing regions, filling a gap in the literature on the comparative effects of GLMP in different socio-economic environments. The data collection process involved the use of a plant-level survey methodology, a cross-sectional survey conducted through email, and in-person to gather information from manufacturing firms in both countries. A total of 265 manufacturing companies were randomly selected from each country for the survey, ensuring that each participant had an equal opportunity to be included, thus maintaining the sample equality between the two countries. The application of structural equation modeling demonstrates the presence of significant relationships between the dimensions of GLMP and sustainability performance in both contexts. We proposed a conceptual framework and conducted an empirical investigation into the relationship between GLMP and sustainability performance (SP) in two countries with distinct continental characteristics. We used a set of hypotheses and employed structural equation modelling (SEM) to test our proposed framework. This study provides valuable insights into the practical implications of implementing GLMPs to improve the overall performance. This study addresses a significant void in the literature by offering a comparative analysis of Ghana and Indonesia. This analysis offers distinct perspectives on the correlation between GLMPs and sustainability performance. The lack of previous comparative studies highlights the originality of this research, providing a significant contribution and establishing a groundwork for future research opportunities in various geographical contexts.

Keywords: Green Logistics Management Practices; Sustainability Performance; Structural Equation Modeling; Comparative Analysis; Ghana and Indonesia.

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Introduction

Sustainability has emerged as a paramount objective for businesses worldwide, necessitating the integration of environmentally responsible practices into daily operations(Le, Tran, Lam, Tra, & Uyen, 2024). In the manufacturing sector, the importance of adopting green logistics management practices cannot be overstated. Green logistics encompasses various strategies and measures aimed at reducing the environmental impact of logistics activities, including transportation, packaging, and inventory management(Karaman, Kilic, & Uyar, 2020). By minimizing energy consumption, emissions, and waste generation, firms can contribute to the preservation of natural resources and reduce their carbon footprints, aligning with global sustainability goals(Adebayo et al., 2023). In the rapidly evolving landscape of global business and trade, the nexus between Green Logistics Management Practices (GLMPs) and sustainability performance remains underexplored, particularly in the context of Africa and Asia (Purwaningsih, Muslikh, Suhaeri, & Basrowi, 2024). This essay argues for the necessity of research that explicitly compares the impacts of GLMPs on sustainability performance in these regions.

The research gap identified in this study is the lack of understanding regarding the comparative impact of GLMP in different socio-economic and geographical contexts, particularly in emerging markets such as Ghana and Indonesia. Previous studies have mainly focused on developed regions, leaving a gap in the literature on how GLMP influence sustainability performance in developing countries. This study fills this gap by conducting a comparative analysis of GLMP's effects of GLMPs on sustainability performance in Ghana and Indonesia. The contribution of this study is to provide novel insights into the challenges and opportunities of implementing GLMP in these rapidly industrializing regions, thereby contributing valuable knowledge to the field of sustainable logistics management. By conducting a comparative analysis of Ghana and Indonesia, two representative countries in Africa and Asia, this study addresses the global urgency of integrating sustainable logistics practices in regions experiencing rapid industrial growth and environmental challenges. Previous studies have primarily focused on developed regions, making this study unique in its contribution to the field.

The burgeoning economic activities and expanding trade networks in Africa and Asia underscore the urgency to understand the intricate dynamics between green logistics and sustainability(Hidayati, Garnevska, & Childerhouse, 2021). The existing body of research, as evidenced by the analyzed abstracts, predominantly centers on other regions, leaving a conspicuous gap in our understanding of how GLMPs uniquely influence sustainability performance in Africa and Asia. This geographical neglect raises questions about the applicability of existing findings to regions with distinct socioeconomic, cultural, and environmental contexts. Africa and Asia have witnessed remarkable economic growth and expanded trade networks in recent years(Turok & McGranahan, 2013). The rise of emerging markets, increased industrialization, and globalization have amplified the importance of sustainable supply chain practices(Y. Agyabeng-Mensah, Afum, & Acquah, 2021). Dedicated exploration of GLMPs in this context is crucial for tailoring sustainable strategies that align with the unique challenges and opportunities in these regions.

Academically, addressing this research gap can provide scholars with a nuanced understanding of how GLMPs contribute to or hinder sustainability performance in Africa and Asia. It offers an opportunity to unearth region-specific insights, paving the way for the development of contextualized frameworks and theories that can enrich the broader field of supply chain sustainability. From a practical standpoint, businesses and policymakers have made immense gains. Insights into the relationship between GLMPs and sustainability performance can inform strategic decisions and guide companies toward more effective and regionally tailored sustainable practices. Governments can use this knowledge to shape policies that encourage environmentally responsible logistics practices and foster sustainable economic growth (Bojnec & Tomšič, 2020). By advocating for research that directly compares GLMPs and sustainability performance in Africa and Asia, we initiated a conversation that acknowledges the importance of these regions in the global economic landscape. This conversation is not only a response to the current gap in the literature but also a proactive step toward creating a more inclusive and comprehensive understanding of sustainable supply chain practices.

In conclusion, the unexplored territory of the relationship between GLMPs and sustainability performance in Africa and Asia presents a compelling case for future research. Bridging this gap will not only contribute significantly to academia, but also provide practical insights that can drive sustainable practices in these dynamic and rapidly growing regions. By starting this conversation, we lay the foundation for a more holistic and globally relevant understanding of green logistics in the 21st century. This study fills a significant research gap by conducting a comparative analysis

of the impact of GLMP on sustainability performance in Ghana and Indonesia. By examining these two distinct emerging economies, this study provides valuable insights into how GLMP can be customized to improve sustainability outcomes in various socioeconomic and environmental settings.

Literature Review

Table 1 presents the selected sustainability practice performance and green logistics management practices garnered from the literature for the theoretical enhancement of this research.

Table 1. Selected sustainability practices and Green Logistics Management practices literature

Sustainability Performance	
Researcher(s)	Portrayal: Theme/objective/method/application
(Panpatil, Lahane, & Kant, 2023)	In order to prioritize the organizational sustainable performance indicators (SPIs) that arise from the adoption of Green Supply Chain Practices (GSCPs), a novel hybrid framework will be developed. This framework will integrate the Fuzzy Weighted Aggregated Sum Product Assessment (F-SWARA) and Fuzzy Weighted Aggregated Sum Product Assessment (F-WASPAS) methods.
(De Souza, Kerber, Bouzon, & Rodriguez, 2022)	Addressing environmental challenges in the linear production system by implementing Green Logistics (GL) in the plastic sector. The study utilizes the Analytic Hierarchy Process (AHP) method to evaluate and rank 27 green practices and indicators.
(Cheng, Masukujjaman, Sobhani, Hamayun, & Alam, 2023)	Examine empirical data from 211 Bangladeshi manufacturing SMEs, investigate the direct and indirect effects of green logistics management on company sustainability performance via circular economy practices using the PLS-SEM technique.
(Karaman et al., 2020)	Exploring the relationship between green logistics performance and sustainability reporting, examining the moderating role of corporate governance utilizing data from 117 countries over the period 2007-2016,
(Yaw Agyabeng-Mensah, Afum, & Ahenkorah, 2020)	The study aims to assess the effectiveness of a conceptual model linking green logistics management practices to social, environmental, market, and financial performances for achieving sustainability. Using structured questionnaires from 240 firms in the entertainment, manufacturing, and logistics industries
(Yingfei & Romanova, 2022)	Investigate the relationship between infrastructure and green logistics performance in the services sector, discussing the mediating roles of business performance and service quality. Utilizing a deductive and cross-sectional approach
(Khan et al., 2019)	This study aims to explore the intersection of sustainability and logistics, specifically examining the environmental, economic, and social dimensions of sustainable logistics.
(Yildiz Çankaya & Sezen, 2019)	The objective of this study is to examine the effects of eight dimensions of green supply chain management (GSCM) on economic, environmental, and social performance within the framework of corporate sustainability. The methodology entails conducting a plant-level survey to examine the relationships. This survey utilizes cross-sectional face-to-face and email data obtained from manufacturing firms in Turkey. Structural equation modelling is employed to evaluate the proposed research model and hypotheses.
(Yaw Agyabeng-Mensah & Tang, 2021; Paulraj, Chen, & Blome, 2017)	Conducted an insightful investigation This study examines the effects of green logistics management practices, supply chain traceability, and logistics eccentricity on sustainability performance. Their findings reveal a positive correlation between green logistics management practices and both social and environmental sustainability. Intriguingly, the study also identifies a negative influence of these practices on business performance. This nuanced perspective prompts a deeper exploration of the complex interplay between environmental responsibility, social considerations, and the bottom line within the context of sustainable business practices.

The reviews in Table 1 highlight the shared commitment to understanding and enhancing sustainability in supply chain practices. These studies collectively contribute to the evolving discourse on green logistics, offering valuable insights for industry practitioners, policymakers, and researchers. As the importance of sustainability continues to grow, these findings pave the way for more targeted and effective strategies to achieve environmentally friendly and socially responsible supply chain management.

Conceptual Model

Green Logistics Management Practices

Green Logistics Management Practices (GLMPs) are measured through a range of indicators reflecting environmentally conscious strategies in the literature. Common metrics include green purchasing, assessing sustainable sourcing; green manufacturing, evaluating eco-friendly production processes; green distribution, gauging efficient and low-impact transportation; green packaging, measuring eco-packaging initiatives; green marketing, examining sustainable promotional efforts; environmental education, assessing employee training on eco-practices; internal environmental management, evaluating internal processes for environmental impact reduction; and investment recovery, measuring efforts to reclaim and reuse resources. These indicators collectively provide a comprehensive assessment of the adoption and effectiveness of environmentally sustainable practices within logistics management (Couckuyt, Van Looy, & De Backer, 2017; De Souza et al., 2022; Denu, Bentley, & Duan, 2023; Dzah, O. Agyapong, W. Apprey, T. Agbevanu, & K. Kagbetor, 2022; Karaman et al., 2020; Panpatil et al., 2023; Rissman et al., 2020).

Structural Equation Modelling

Structural Equation Modeling (SEM) assesses the relationship between Green Logistics Management Practices (GLMPs) and Sustainability Performance. It involves defining latent constructs, identifying observed variables, creating a measurement model to estimate factor loadings, formulating a structural model to depict the hypothesized relationships, and evaluating model fit using indices. Path coefficients reveal the strength and direction of relationships, while mediation or moderation analyses explore additional complexities. Iterative model modification enhances empirical alignment, making SEM a comprehensive tool for understanding the intricate dynamics between GLMPs and Sustainability Performance in sustainable supply chain research.

Sustainability Performance

Sustainability performance is often measured using a multidimensional approach, incorporating environmental, social, and economic indicators. Environmental metrics include carbon footprint, energy efficiency, and waste reduction. Social aspects encompass community engagement, labor practices, and diversity. Economic indicators involve profitability, cost savings from sustainable practices, and overall financial stability. Various frameworks, such as the Global Reporting Initiative (GRI) and the Triple Bottom Line, are commonly employed to assess sustainability. The integration of these diverse indicators enables a comprehensive evaluation of an organization's commitment to balancing environmental responsibility, social well-being, and economic viability in the pursuit of sustainable practices (Couckuyt et al. 2017; Can, 2020; Dzah et al. 2021; Denu, et al. 2023; Panpatil et al. 2023; de Souza et al. 2022; Zhou, 2023; Karaman et al. 2020).

The study has pinpointed that various standards and their corresponding sub-standards exert a significant influence on the performance of Green Logistics Management Practices (GLMP) and Sustainability Performance (SP). Table 2 provides an overview of the latent and observed variables associated with GLMP and SP, as discovered in the Sustainability Performance Management literature.

Table 2 shows the variables connected to the GLMP and SP models, both latent and observed.

Table 2. Variables connected to the GLMP and SP models, both latent and observed

Latent Variables	**Observed Variables**	**Reference**	**Description**
Sustainability Performance	Environmental performance (Y1)	Couckuyt et al. (2017); Can, (2020); Dzah et al (2021); Denu, et al. (2023)	Strategic and efficient management of transportation, supply chain, and distribution processes with minimal negative impacts on the environment, aiming to reduce emissions, waste, and resource consumption while maintaining long-term operational viability.
	Social performance (Y2)	Couckuyt et al. (2017); Can, (2020); Dzah et al (2021); Denu, et al. (2023)	Fostering equitable and ethical practices within the supply chain, ensuring fair treatment of workers, respecting communities, and contributing positively to society, while maintaining efficient and effective operations.
	Economics performance (Y3)	Couckuyt et al. (2017); Dzah et al (2021); Denu, et al. (2023)	Maintaining profitable and viable operations while minimizing waste and cost, ensuring long-term financial health and stability**.**
Latent Variables	**Observed Variables**	**Reference**	**Description**
Green Logistics Management Practices	Inbound Logistics (X1)	(Rubio & Jiménez-Parra, 2014) (Chambon, Karia, Sandwell, & Hallett, 2020) (Yaw Agyabeng-Mensah & Tang, 2021)	Involves implementing eco-friendly practices and strategies for the transportation, handling, and management of raw materials and goods coming into a company's supply chain.
	Outbound Logistics (X2)	Rubio & Jiménez-Parra (2014); karia (2020); Agyabeng-Mensah et al (2021);	Focuses on implementing environmentally sustainable practices in the distribution, transportation, and delivery of products to customers or other destinations.
	Green operation and Production (X3)	Rubio & Jiménez-Parra (2014); Karia (2020); Agyabeng-Mensah et al (2021);	Involve adopting environmentally friendly processes and practices within the manufacturing and operational aspects of the supply chain to reduce waste, energy consumption, and environmental impacts while maintaining productivity and efficiency.
	Reverse Logistics (X4)	Rubio & Jiménez-Parra (2014); Karia (2020); Agyabeng-Mensah et al (2021);	Reverse logistics, as a green logistics measure, focuses on the efficient and sustainable management of product returns, recycling, and the disposal of waste materials, aiming to minimize environmental impact and maximize resource recovery within the supply chain.

The following hypotheses concerning the relationship between green logistics management practices (GLMP) and sustainability performance (SP) measurements are developed:

H_1: Green Logistics Management Practices Positively Impact the Environmental Performance of Manufacturing Firms.

H_2 Green logistics management practices improve manufacturing firms' economic performance.

H_3: Green logistics management practices improve manufacturing firms'social performance.

H_4 The Impact of Green Logistics Management Practices on Sustainability Performance Varies Between Ghana and Indonesia Due to Contextual Differences

Environmental Performance through Green Logistics Management Practices

Green logistics management practices (GLMP) include a variety of measures to lower the environmental effects of logistics operations(Kim & Han, 2011). These practices include optimizing transportation routes to reduce fuel usage, deploying energy-efficient technologies, using environmentally friendly packaging materials, and establishing trash-reduction programs. The idea is that the implementation of GLMP will result in considerable improvements in environmental performance measures, such as reduced greenhouse gas emissions, lower energy usage, and waste generation(Yaw Agyabeng-Mensah et al., 2020). Transportation Optimization: By optimizing routes and consolidating shipments, firms can reduce fuel consumption and emissions. Implementing energy-efficient technologies in warehouses and distribution centers can lower energy use and the associated carbon footprints(Afum et al., 2020). Eco-friendly materials that use biodegradable or recyclable packaging materials can reduce environmental pollution and waste. Waste Management, Effective waste reduction and recycling programs can minimize the environmental impact of manufacturing operations(Kabirifar, Mojtahedi, Wang, & Tam, 2020). Reduction in carbon emissions and air pollutants, decreased energy consumption in logistics operations, lower volumes of waste sent to landfills, and enhanced compliance with environmental regulations.

H_1: Green Logistics Management Practices Positively Impact the Environmental Performance of Manufacturing Firms.

Economic Benefits of Green Logistics for Manufacturing Firms

This hypothesis suggests that GLMP not only contribute to environmental sustainability but also offer economic benefits to manufacturing firms. Economic performance can be measured through various indicators such as cost savings, increased profitability, and enhanced market competitiveness(Shvindina, 2022; Smokers, Tavasszy, Chen, & Guis, 2014). The adoption of GLMP can lead to cost reductions through improved operational efficiencies, lower energy and material costs, and enhanced asset utilization. Cost Savings, Efficient logistics operations reduce fuel and energy costs, thereby leading to overall cost savings(Smokers et al., 2014). Operational efficiency-streamlined processes and optimized supply chains improve productivity and reduce operational delays. The market competitiveness of a firm adopting GLMP can enhance its brand reputation and attract environmentally conscious consumers(Yaw Agyabeng-Mensah et al., 2020). Regulatory Compliance, Proactive adoption of green practices can mitigate the risk of penalties and fines associated with non-compliance with environmental regulations. A reduction in operational and logistics costs leads to an increase in profit margins due to efficiency gains(Yaw Agyabeng-Mensah et al., 2020). Enhanced brand image and customer loyalty and improved market position and competitive advantage.

H_2 Green logistics management practices improve manufacturing firms' economic performance.

Social Impact of Green Logistics Management Practices

GLMP positively affects manufacturing firms' social performance. Social performance can be evaluated through factors such as employee well-being, community relations, and social responsibility initiatives(Afeltra, Alerasoul, & Strozzi, 2023). GLMP can enhance the social standing of firms by promoting safer and healthier work environments, thereby fostering positive relationships with local communities, and contributing to societal well-being. Sustainable practices for employee well-being can improve workplace conditions, reduce exposure to harmful substances, and promote employee health and safety(Massey, 2020). Community Relations Engaging in environment-friendly practices can strengthen community ties and enhance a firm's social license to operate. Corporate Social Responsibility

(CSR) Firms that prioritize sustainability are more likely to engage in CSR activities that benefit society as a whole(Deigh, Farquhar, Palazzo, & Siano, 2016).

H_3: Green logistics management practices improve manufacturing firms' social performance.

Contextual Impact on Green Logistics' Effectiveness.

This study explores the idea that the effectiveness and outcomes of GLMP are influenced by specific contextual factors in Ghana and Indonesia. These factors include economic conditions, regulatory frameworks, technological capabilities, cultural attitudes towards sustainability, and the level of infrastructure development(Bamgbade, Kamaruddeen, & Nawi, 2017). The hypothesis posits that, while GLMP can positively impact sustainability performance in both countries, the magnitude and nature of these impacts will differ due to these contextual variations. Differences in economic stability, industrial growth, and resource availability can affect the adoption and effectiveness (Hrušovský, Reiner, & Taudes, 2022; Link, Kowal, & Qureshi, 2020). Variations in environmental regulations and enforcement mechanisms can also influence the implementation of green practices. The level of technological advancement and access to sustainable technologies can impact the efficiency of GLMP, and cultural perceptions of sustainability and environmental responsibility can shape the acceptance and success of GLMP(Afeltra et al., 2023). Infrastructure Development, the state of logistics, and transportation infrastructure can affect the feasibility and impact of green logistics initiatives(Lohmer, Silva, & Lasch, 2022). In Ghana, the impact of GLMP may be moderated by economic constraints and infrastructural challenges, leading to varying degrees of success. In Indonesia, regulatory support and technological advancements may facilitate the more effective implementation of GLMP, resulting in stronger sustainability performance. Context-specific strategies and interventions are required to optimize the adoption and impact of GLMP in each country.

H_4 : The Impact of Green Logistics Management Practices on Sustainability Performance Varies Between Ghana and Indonesia Due to Contextual Differences

Table 3. Comparative Analysis of the Current Study and Relevant Literature

Study	**Key Focus**	**Methodology**	**Findings/Results**	**Contributions**	**Comparison with Current Study**
Analysis of a dual-channel green supply chain game-theoretical model under carbon policy (2023)	Impact of carbon policies on green supply chain dynamics	Game-theoretical model	Demonstrates how carbon policies influence pricing and supply chain strategies	Provides insights into the strategic behavior under carbon policies	Unlike the game-theoretical approach, the current study uses SEM to empirically assess GLMP impacts on sustainability in real-world contexts (Ghana & Indonesia).
Multi-objective sustainable opened-and closed-loop supply chain under mixed uncertainty during COVID-19 pandemic (2021)	Sustainable supply chain management under uncertainty	Multi-objective optimization under mixed uncertainty	Highlights challenges in managing supply chains during the pandemic with sustainability considerations	Offers a robust approach to managing uncertainty in supply chains	The current study complements by focusing on GLMP's role in sustainability across regions, with less focus on pandemic-related disruptions.
Effect of price-sensitive demand and default risk on optimal credit period and cycle time for a deteriorating inventory model (2021)	Inventory management considering demand sensitivity and credit risks	Analytical modeling	Identifies optimal strategies for inventory management under risk conditions	Addresses the need for balancing financial risks with inventory decisions	While this study is focused on inventory management, the current study emphasizes the broader impacts of GLMP on sustainability metrics, including inventory practices.

Table 3. Comparative Analysis of the Current Study and Relevant Literature (*Continued*)

Multi-Product Multi Echelon Measurements of Perishable Supply Chain: Fuzzy Non-Linear Programming Approach (2021)	Optimization of perishable goods supply chains	Fuzzy non-linear programming	Optimizes supply chain operations for perishable products	Enhances supply chain efficiency in handling perishable goods	The current study broadens the scope by focusing on overall sustainability in GLMP rather than just perishable goods.
Impacts of green and preservation technology investments on a sustainable EPQ model during COVID-19 pandemic (2022)	Impact of green technology investments on production and sustainability	EPQ model with sustainability focus	Demonstrates the benefits of investing in green technologies during crises	Highlights the importance of technology in sustaining operations during disruptions	The current study also highlights the importance of green practices, but from a broader logistics management perspective and regional comparison.
Inventory model involving reworking of faulty products with three carbon policies under neutrosophic environment (2023)	Carbon policies and inventory management	Neutrosophic environment modeling	Examines the effects of different carbon policies on inventory management	Provides a framework for managing inventory under environmental regulations	The current study examines environmental impacts of GLMP broadly, rather than specific carbon policy implications.
Sustainable-resilient-responsive supply chain with demand prediction: An interval type-2 robust programming approach (2024)	Demand prediction and supply chain resilience	Interval type-2 robust programming	Offers a model for managing supply chains with predictive analytics and resilience	Combines sustainability with predictive modeling for enhanced supply chain management	The current study contributes by focusing on empirical analysis of GLMP's effects on sustainability, rather than predictive modeling.
Evaluating carbon cap and trade policy effects on a multi-period bi-objective closed-loop supply chain in retail management under mixed uncertainty: Towards greener horizons (2024)	Effects of carbon cap and trade policies on closed-loop supply chains	Bi-objective optimization under uncertainty	Provides insights into the long-term impacts of carbon policies on retail supply chains	Highlights the strategic implications of carbon policies in supply chain management	The current study's empirical approach contrasts with the optimization focus, offering practical insights into GLMP across different regions.

The following model depicts Figure 1 connections between observable variables and underlying factors.

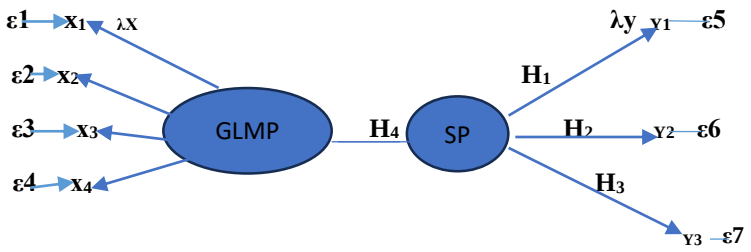

Figure 1. Conceptual Model

Research Gaps and Contribution

The existing literature on GLMP has focused on sustainability performance but lacks comparative studies between different geographical regions. This study fills this gap by comparing GLMP in various regions. This study contributes to the understanding of Green Logistics Management Practices (GLMP) and their impact on sustainability performance in emerging markets, such as Ghana and Indonesia. It fills a gap in the literature by providing a comparative analysis of GLMP in these regions, which have distinct economic structures, regulatory frameworks, and cultural attitudes towards sustainability. The findings highlight the region-specific challenges and opportunities associated with implementing GLMP in developing countries, such as overcoming infrastructural challenges and aligning practices with economic development goals. The study also emphasizes the importance of capacity building and local adaptation of GLMP practices in regions with limited access to advanced technology.

Table 4. Summary of Research Gaps and Contributions of the Study

Research Gap	Source(s)	Contribution of This Study
Lack of comparative studies on GLMP between developing regions	(Panpatil et al., 2023; Yaw Agyabeng-Mensah & Tang, 2021)	This study provides the first comparative analysis between Ghana and Indonesia, filling the gap in understanding regional differences in GLMP impact.
Limited understanding of GLMP's impact on different sustainability dimensions in emerging markets	(Karaman et al., 2020; Yingfei & Romanova, 2022)	This research examines the distinct impacts of GLMP on environmental, social, and economic performance in two emerging economies.
Inadequate focus on practical implications for businesses in developing regions	(Afum et al., 2020; De Souza et al., 2022)	The study offers actionable insights for manufacturing firms and policymakers in Ghana and Indonesia to enhance sustainability practices.

This study focused on comparing GLMP in Ghana and Indonesia. By addressing research gaps, this study enhances our understanding of how GLMP affect sustainability performance in different socio-economic and environmental contexts. The findings provide practical recommendations for businesses and policymakers in developing regions to improve sustainability outcomes. This research contributes significantly to existing knowledge in the field of green logistics management.

Data and Methodology

Design, measures, sampling, and sample size

To investigate the significant relationship between the research variables, an explanatory research design was employed (Ohemeng, Amoako-Asiedu, & Obuobisa Darko, 2018). The study focused on manufacturers and suppliers located in Accra, Kumasi, Ghana, Jakarta, and Bandung, Indonesia's economic, cultural, and political center. A total of 265 manufacturing companies were randomly selected from each country for the survey, ensuring that each

participant had an equal opportunity to be included, thus maintaining the sample equality between the two countries. The use of simple random selection guaranteed that all respondents from different firms in both countries had an equal chance of being included (Sudman, 1976). The demographic characteristics of the respondents from each country are presented in the Appendix.

Research Instruments

The data collection method in this study involved the use of a questionnaire survey, which is a common approach in business research. The questionnaire was carefully designed to gather data for analysis using AMOS (v22) software(Byrne, 2001). The main purpose was to establish connections between various research variables. The limitations of the study using structural equation modelling (SEM) include its cross-sectional design, which restricts the ability to establish causal relationships. The design only captures data at one point in time, preventing the assessment of temporal changes and the directionality of relationships over time. We used a 5-point Likert scale in the questionnaire to gauge respondents' sentiments regarding the relationship between green logistics management practices and sustainability performance. The Likert scale ranged from 1 (“strongly agree” to 5 for “strongly disagree”) and was employed to measure the constructs under examination.

To ensure the clarity and suitability of the questionnaire, we performed a multistep validation process. Initially, three experienced researchers assessed the survey questions for appropriateness and clarity. Subsequently, we refined the questionnaire based on their feedback, focusing on making the questions more practical and aligned with research objectives. This iterative refinement process aims to eliminate potential sources of confusion and to enhance the overall quality of the research instrument. Next, four experts in procurement and logistics completed survey questionnaires. They conducted a thorough review, meticulously assessing the alignment of the questionnaire's items with the research objectives and governing study hypotheses. This resulted in the identification of survey items characterized by robust content validity. To evaluate the GLMP, four specific aspects were selected: Inbound Logistics, Outbound Logistics, eco-friendly Operations and Production, and Reverse Logistics. The accuracy of the data collected through an online survey was verified. The challenges of data collection in Ghana and Indonesia are primarily due to the variability in infrastructure and accessibility between the two regions. This variability affected the ease and consistency of the data collection.

Numerical Problems

In this study, one challenge was achieving convergence in the SEM analysis, owing to the complexity of the model and multiple latent variables. To address this, an iterative refinement of the model was performed by adjusting the number of iterations and using alternative starting values. Another challenge is handling the missing data in the dataset. Multiple imputation methods were used to address this issue and ensure that missing data did not bias the results. By addressing these numerical problems, this study ensured the accuracy and reliability of the findings, providing a robust foundation for subsequent analyses.

Managerial Insights

The findings from this study provide important insights for manufacturing firms in Ghana and Indonesia regarding the implementation of GLMP. First, adopting GLMP can significantly enhance sustainability performance across the environmental, social, and economic dimensions. This can be achieved by reducing waste, lowering emissions, and improving the resource efficiency. Second, it is crucial to tailor the GLMP to the specific socioeconomic conditions of each region. In Ghana, the focus should be on improving economic performance, whereas in Indonesia, emphasis should be placed on enhancing social performance through community engagement and corporate social responsibility initiatives. Finally, adopting green practices can enhance a firm's brand reputation and attract environmentally conscious consumers, thereby leading to increased market competitiveness. Therefore, managers should consider investing in green technologies and practices to align their logistics operations with sustainability goals and improve their performance in the global market.

Sensitivity Analysis

Sensitivity analysis was conducted to assess the robustness of the findings. The analysis focused on variations in the key parameters within the SEM framework. Sensitivity tests were performed by adjusting the input data, such as by

varying the levels of green logistics practices and their associated costs. The results showed that, while the overall conclusions remained consistent, the magnitude of the impact on sustainability performance varied, particularly in scenarios with higher operational costs. Assumptions regarding the relationships between GLMP and sustainability performance were also tested by altering the path coefficients in the SEM. It was found that the strength of the relationships diminished slightly when more conservative assumptions were applied, but the overall positive impact of GLMP on sustainability remained robust. In addition, the sensitivity of the model to external environmental factors, such as changes in regulatory frameworks or economic conditions, was evaluated. The findings suggest that, while GLMP effectiveness can be influenced by these external factors, the practices generally maintained their positive impact across different scenarios. Overall, this sensitivity analysis confirms the reliability of the study results and provides confidence in the validity of the conclusions across a range of potential conditions and scenarios.

Results and Discussion

Demographic Characteristics: This study surveyed manufacturing companies in both Ghana and Indonesia to capture a comprehensive set of demographic characteristics. The survey results indicate that, in both countries, a significant proportion of respondents were male. Furthermore, the majority of respondents had attained higher education, with a focus on undergraduate and postgraduate degrees. The majority of respondents had substantial work experience, ranging from less than five years to over 20 years. The representative industries encompassed textile manufacturing, food manufacturing, pharmaceuticals, and cement manufacturing, among others. Confirmatory Factor Analysis (CFA) is a statistical technique used to assess the fit of a hypothesized measurement model to observed data. It is commonly used in the fields of psychometrics and structural equation modelling. CFA allows researchers to test whether the results of the confirmatory factor analysis indicate strong factor loadings across multiple dimensions for Green Logistics Management Practices (GLMP) and Sustainability Performance (SP). The observed variables, including inbound logistics, outbound logistics, green operations, production, and reverse logistics, showed significant factor loadings in both Ghana and Indonesia. This confirms their reliability as a measure of GLMP.

Reliability Analysis

The reliability of the questionnaire was assessed using Cronbach's α in IBM SPSS (v27). The outcomes indicated that Cronbach's α for the SP survey was 0.892 and 0.762 for Indonesia, and for the GLM&P questionnaire, it was 0.881 and 0.899 for Ghana and Indonesia, respectively. A Cronbach's α value exceeding 0.7 for both the GLMP and SP survey questions affirmed the reliability of relationships between the observed and latent variables is being examined. factor analysis, KMO significance, and Bartlett's test were successfully executed, and IBM SPSS (v27). For Bartlett's test, a significance of less than 0.5 was sought, while for KMO, a significance exceeding 0.5 was required. The results in Tables 5 and 6 indicate that the data met the necessary adequacy criteria, allowing for factor analysis.

Table 5&6. Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test of sphericity result for Ghana and Indonesia

Table 5. Ghana

	Green Logistics Management Practices	Sustainability Performance
KMO	.881	.892
Barlett		
Approx. Chi-Square	1285.365	739.885
df	153	48
Sig.	.000	.000

Table 6. Indonesia

	Green Logistics Management Practices	Sustainability Performance
KMO	.899	.762
Barlett		
Approx. Chi-Square	1587.587	959.664
df	175	52
Sig.	.000	.000

Tables 5&6 provides the results of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity for both Ghana and Indonesia. These tests were used to assess the suitability of the data for factor analysis. The KMO measure assesses sampling adequacy by measuring the proportion of variance among the observed variables, which can be explained by underlying factors. A KMO value greater than 0.5 is generally considered

acceptable. In this case, the KMO values for both Ghana and Indonesia exceed 0.5, indicating that the data is suitable for factor analysis. Bartlett's test of sphericity examines whether the correlation matrix of the observed variables is significantly different from an identity matrix, indicating that the variables are not independent. A significance level less than 0.5 is sought for Bartlett's test. In this case, the significance values for both Ghana and Indonesia are less than 0.5, indicating that the correlation matrix is significantly different from the identity matrix, and the variables are not independent. Overall, the results of Table 5&6 suggest that the data collected for both Ghana and Indonesia are suitable for factor analysis, allowing for the exploration relationships between observed and latent variables of the study.

Factor Analysis

Confirmatory factor analysis was carried out on the GLMP to assess the extent to which the questionnaire items (referred to as observed variables) could account for the associated attributes (referred to as latent variables). The analysis was conducted using LISREL 8.50 software in the conventional approach, the factor loadings, in conjunction with their corresponding t-values, are presented in Table 7.

Table 7. Analysis of confirmatory factors for Ghana's GLMP performance

Latent variables	**Observed variables**	**Primary model**		**Revised model**	
		Factor Loadings	**t-value**	**Factor loadings**	**t-value**
Inbound Logistics (IL)	Percentage of raw material sourcing from local and environmentally sustainable sources. (IL1)	0.92	12.93	0.92	12.93
	Reduce inbound logistics-related carbon emissions by 15% within the next fiscal year (IL2)	0.75	10.78	0.75	10.79
	Implement travel plans aimed at achieving a 10% reduction in fuel consumption over the next year. (IL3)	0.05	0.07	-	-
Outbound Logistics	Prioritize bicycles, electric vehicles, and walking for 30% of deliveries in the next quarter. (OL1)	0.76	10.86	0.77	10.84
	Introduce shared car deliveries for 20% of product shipments in the next three months. (OL2)	0.04	0.22	-	-
	Optimize freight routes to reduce costs. (OL3)	0.73	10.52	0.73	10.4228
	Implement an electric vehicle subsidy program for product deliveries. (OL4)	0.81	11.82	0.82	11.82
Green Operation and Production	Achieve a waste reduction of 15% within the next year. (GOP1)	0.80	11.70	0.80	11.70
	Reduce paper printing usage by 20% within the next six months. (GOP2)	0.64	8.55	0.64	8.55
	Ensure that 80% of materials used are non-polluting within the next fiscal year. (GOP3)	0.59	7.82	0.59	7.82
	Implement shared warehouse facilities for at least 40% of storage needs within the next quarter. (GOP4)	0.74	10.20	0.74	10.20

Table 7. Analysis of confirmatory factors for Ghana's GLMP performance (*Continued*)

Reverse Logistics	Repurpose 60% of discarded materials or products by the end of the current fiscal year. (GOP5)	0.73	10.12	0.73	10.12
	Introduce reusable packaging for 50% of products within the next six months. (GOP6)	0.81	11.52	0.81	11.76
	Launch a program to recover and recycle 70% of end-of-life products within a year. (GOP7)	0.82	11.74	0.82	11.78
	Introduce a program to share 30% of refurbished products in six months. (GOP8)	0.76	10.48	0.76	10.48

The Table reveals that items IL3 and OL2 had factor loadings below 0.5, rendering them inadequate representatives of their respective attributes. Consequently, these variables were eliminated from the model and confirmatory factor analysis (CFA) was conducted. The outcomes of the revised model are presented in Table 7. Subsequently, confirmatory factor analysis was performed to ascertain which attributes exerted the most significant influence on GLMP performance in Ghana. The results, including the conventional solution, factor loadings, t-values, and fitness indicators, are presented in Table 7. It is apparent that the attribute related to the retrieved value should be excluded from the model because of its notably low factor loading.

Table 8. GLMP performance confirmatory factor analysis in Indonesia

Latent variables	**Observed variables**	**Primary model**		**Revised model**	
		Factor Loadings	**t-value**	**Factor loadings**	**t-value**
Inbound Logistics (IL)	Percentage of raw material sourcing from local and environmentally sustainable sources. (IL1)	0.68	7.73	0.68	7.73
	Reduce inbound logistics-related carbon emissions by 15% within the next fiscal year (IL2)	0.65	7.48	0.65	7.48
	Implement travel plans aimed at achieving a 10% reduction in fuel consumption over the next year. (IL3)	0.72	12.73	0.72	12.73
Outbound Logistics (OL)	Prioritize bicycles, electric vehicles, and walking for 30% of deliveries in the next quarter. (OL1)	0.55	10.58	0.55	10.58
	Introduce shared car deliveries for 20% of product shipments in the next three months. (OL2)	0.03	0.05	-	-
	Optimize freight routes to reduce costs. (OL3)	0.56	10.66	0.57	10.64
	Implement an electric vehicle subsidy program for product deliveries. (OL4)	0.02	0.20	-	-
	Achieve a waste reduction of 15% within the next year. (GOP1)	0.53	10.32	0.53	10.32
	Reduce paper printing usage by 20% within the next six months. (GOP2)	0.61	11.62	0.62	11.62

Green operation and Production (GOP)	Ensure that 80% of materials used are non-polluting within the next fiscal year. (GOP3)	0.60	11.50	0.60	11.50
	Implement shared warehouse facilities for at least 40% of storage needs within the next quarter. (GOP4)	0.84	8.75	0.84	8.75
Reverse Logistics (RS)	Repurpose 60% of discarded materials or products by the end of the current fiscal year. (RL1)	0.79	7.92	0.79	7.92
	Introduce reusable packaging for 50% of products within the next six months. (RL2)	0.94	10.40	0.94	10.40
	Launch a program to recover and recycle 70% of end-of-life products within a year. (RL3)	0.93	10.32	0.93	10.32
	Introduce a program to share 30% of refurbished products in six months. (RL4)	0.91	11.72	0.91	11.72

The Table illustrates that items OL2 and OL4 exhibited factor loadings below 0.5, suggesting their inability to effectively represent the associated attributes. Consequently, these factors were excluded from the model, leading to repeated confirmatory factor analysis. The outcomes of the adjusted model are listed in Table 8 Following this, confirmatory factor analysis was conducted to identify the qualities exerting the most significant impact on GLMP performance in Indonesia. The conventional solution included factor loadings, t-values, and fitness indicators. are listed in Table 8. The results indicate the necessity of including all attributes owing to their notably high factor loadings.

Table 9. Confirmatory factor analysis for green logistics management practice performance

		Factor Loadings (Ghana)		Factor Loadings (Indonesia)	
Latent variable	Observed variable	Factor Loadings	t-value	Factor Loadings	t-value
Green logistics management practice	Inbound Logistics (IL)	0.78	10.73	0.75	10.88
	Outbound Logistics (OL)	0.99	11.53	0.98	11.64
	Green operation and Production (GOP)	1.05	9.67	0.87	10.55
	Reverse Logistics (RL)	0.89	9.93	1.01	10.07

Table 9 provides the results of the confirmatory factor analysis for green logistics management practice (GLMP) performance in both Ghana and Indonesia. It presents the factor loadings and t-values for four latent variables: Inbound Logistics (IL), Outbound Logistics (OL), Green Operation and Production (GOP), and Reverse Logistics (RL). Confirmatory Factor Analysis for GLMP Performance Factor Loadings (Ghana) and (Indonesia), Inbound Logistics (IL), Ghana: Factor Loading = 0.78, t-value = 10.73Indonesia: Factor Loading = 0.75, t-value = 10.88 Outbound Logistics (OL):Ghana: Factor Loading = 0.99, t-value = 11.53Indonesia: Factor Loading = 0.98, t-value = 11.64 Green Operation and Production (GOP):Ghana: Factor Loading = 1.05, t-value = 9.67 Indonesia: Factor Loading = 0.87, t-value = 10.55 Reverse Logistics (RL):Ghana: Factor Loading = 0.89, t-value = 9.93 Indonesia: Factor Loading = 1.01, t-value = 10.07. Inbound Logistics (IL): The factor loadings and t-values indicate that inbound Logistics practices significantly contribute to GLMP performance in both Ghana and Indonesia, with Ghana showing a slightly higher influence. Outbound Logistics (OL): Outbound logistics has the highest factor loadings among the four latent variables in both countries, indicating a very strong impact on GLMP performance. Green Operation and Production (GOP): In

Ghana, green operations and production have a slightly higher factor loading than Indonesia, suggesting a greater influence on GLMP performance. Reverse Logistics (RL): Reverse logistics shows a substantial impact in both countries, with Indonesia having a slightly higher factor loading.

These results show that all four latent variables are critical to GLMP performance in both Ghana and Indonesia; however, their influence varies slightly between the two countries. Outbound Logistics (OL) appear to be the most influential factor in both contexts.

Sustainability Performance

A confirmatory factor analysis was carried out on Sustainability Performance (SP) to assess the extent to which the questionnaire items, designated as observed variables, could elucidate the corresponding attributes identified as latent variables. The analysis was conducted using LISREL 8.50 software. Typical solution factor loadings, in addition to their respective t-values, are presented in Table 10.

Table 10. Confirmatory factor analysis of sustainability performance in Ghana

Latent variables	Observed variables	Factor loadings	t-value
Environmental Metrics (ENM)	Resource Consumption (ENM1)	0.78	8.79
	waste generation, energy usage, water consumption, and greenhouse gas emissions (ENM2)	0.92	8.55
Social Metrics (SM)	Delivery by bicycle, electric vehicle, and walking (SM1)	0.64	6.38
	Shared cars for delivery of products (SM2)	0.87	12.50
	Freight options that offer routes with much cheaper costs (SM3)	0.82	12.61
	Subsidy for electric vehicle program for delivery of products (SM4)	0.80	11.30
Economics Metrics (EM)	Reduction of waste (EM1)	0.79	12.11
	Recycling (EM2)	0.82	10.58
	Reducing the use of paper for printing (EM3)	0.63	12.34
	Use of non-polluting materials (EM4)	0.93	9.56
	Use of shared warehouse facility (EM5)	0.65	10.96

As illustrated in the table, all factor loadings fall within an acceptable range, confirming the validity of the model. Subsequently, a confirmatory factor analysis was performed to identify the qualities exerting the most significant influence on Supply Chain (SC) performance. Table 10 displays the loadings of the factors in the standard solution, the corresponding t-values, and the fitness indices. Notably, all values within the results align with acceptable criteria, confirming the validity of the model.

Table 11. Confirmatory factor analysis for sustainability performance in Indonesia

Latent variables	Observed variables	Factor loadings	t-value
Environmental Metrics (ENM)	Resource Consumption (ENM1)	0.68	9.69
	waste generation, energy usage, water consumption, and greenhouse gas emissions (ENM2)	0.79	8.85

Table 11. Confirmatory factor analysis for sustainability performance in Indonesia (*Continued*)

Social Metrics (SM)	Delivery by bicycle, electric vehicle, and walking (SM1)	0.86	9.32
	Shared cars for delivery of products (SM2)	0.89	11.35
	Freight options that offer routes with much cheaper costs (SM3)	0.62	10.61
	Subsidy for electric vehicle program for delivery of products (SM4)	0.90	12.30
Economics Metrics (EM)	Reduction of waste (EM1)	0.79	10.71
	Recycling (EM2)	0.87	9.58
	Reducing the use of paper for printing (EM3)	0.68	8.44
	Use of non-polluting materials (EM4)	0.99	12.65
	Use of shared warehouse facility (EM5)	0.56	11.32

The factor loadings in the table were all within an acceptable range, which supports the validation of the model. Confirmatory factor analysis was subsequently conducted to identify the attributes that have the greatest impact on Supply Chain (SC) performance. The factor loadings in the standard solution along with their respective t-values and fitness indicators are presented in Table 11. The results indicate that all values satisfy the acceptable criteria, thereby confirming the validity of the model.

Table 12. Confirmatory factor analysis for sustainability performance

		Factor Loadings (Ghana)		Factor Loadings (Indonesia)	
Latent variables	Observed variables	Factor Loadings	t-value	Factor Loadings	t-value
Sustainability Performance	Environmental Performance (ENM)	0.89	7.88	0.78	9.65
	Social Performance (SM)	0.96	11.72	0.93	10.45
	Economics Performance (EM)	0.86	10.56	0.84	11.25

Table 12 shows the Ghanaian structural equation model for the GLMP and SP. The structural equation model in this picture shows the relationship between Ghana's Sustainability Performance (SP) and Green Logistics Management Practices (GLMP). The following factor loadings and pathways were included: GLMP to total SP Environmental Performance (ENM) to GLMP. SM to GLMP. GLMP to Factor Loadings for EM: To SP: 0.72; ENM: 0.63; SM: 0.63; EM: 0.51; GLMP to SP: 0.72 Figure 2: Indonesian Structural Equation Models (SEM) for GLMP and SP: The correlation between Sustainability Performance (SP) and Green Logistics Management Practices (GLMP) in Indonesia is shown in, the following factor loadings and pathways are included in it: GLMP to total SP. ENM for GLMP, SM, and GLMP. GLMP to factor loadings for EM: GLMP: 0.61 GLMP: 0.72 GLMP: 0.56 GLMP: SM to ENM, GLMP: 0.55. The correlations found using structural equation modelling show how GLMP improve sustainability performance in Ghana and Indonesia in terms of environmental, social, and economic aspects.

Test of Hypotheses Results

Table 13. Results of Hypothesis Testing from Ghana

Path	Hypothesis	Factor Loading	Result
GLMP – SP	H1	0.72	Accepted
GLMP – ENM	H2	0.63	Accepted
GLMP - SM	H3	0.63	Accepted
GLMP - EM	H4	0.51	Accepted

GLMP has a significant impact on the overall SP. The factor loading was 0.72. This has been found to have a significant impact on environmental performance. This was supported by a factor loading of 0.63, indicating a strong relationship between GLMP and environmental outcomes. GLMP has a significant impact on social performance. This was supported by a factor loading of 0.63, as indicated by H3. GLMP has an impact on economic performance, as indicated by a factor loading of 0.51 Hypothesis 4. The hypothesis regarding the significant influence of Green Logistics Management Practices (GLMP) on overall Sustainability Performance (SP) has been accepted, with a factor loading of 0.72. This statement signifies robust and affirmative correlation. The hypothesis regarding the impact of GLMP on Environmental Performance (ENM) was accepted, with a factor loading of 0.63. The data indicate a notable and favorable impact of GLMP on environmental metrics. Based on the data analysis, we accepted the hypothesis that GLMP influence SM. A factor loading of 0.63 suggests a strong positive relationship between GLMP and SM. The analysis concludes that the hypothesis regarding the impact of GLMP on EM is accepted. A factor loading of 0.51 indicates a moderate positive impact.

Table 14. Results of Hypothesis Testing from Indonesia

Path	Hypothesis	Factor Loading	Result
GLMP – SP	H1	0.61	Accepted
GLMP – ENM	H2	0.72	Accepted
GLMP - SM	H3	0.56	Accepted
GLMP - EM	H4	0.55	Accepted

Table 13 shows the results of hypothesis testing in Indonesia. This presents the path, hypothesis, factor loading, and result The GLMP - SP has an H_1 value of 0.61. The GLMP – ENM analysis accepted an H_2 value of 0.72. The value of 0.56 has been accepted for the GLMP – SM H_3. GLMP - EM, with an H_4 value of 0.55 has been accepted. The results of a study conducted in Ghana were accepted. The hypothesis that the (GLMP) has a significant influence on the overall SP is accepted. The factor loading for this influence was determined as 0.61. This statement denotes a robust positive correlation. The hypothesis that GLMP impacts ENM was accepted, with a factor loading of 0.72, indicating a statistically significant positive effect. The hypothesis that GLMP influences SM was accepted, with a factor loading of 0.56, indicating a positive relationship. This analysis confirms the hypothesis that GLMP affect EM. A factor loading of 0.55 indicates a moderate positive impact.

The results confirm that the adoption of Green Logistics Management Practices has a significant and positive impact on overall sustainability performance in Ghana and Indonesia. Sustainability has an impact on the environmental, social, and economic aspects. The factor loadings demonstrated consistent strength, indicating strong relationships between the tested hypotheses. The implementation of green logistics practices in manufacturing firms plays a crucial role in enhancing sustainability.

The findings of this study have important implications for academics and practitioners in Green Logistics Management Practices (GLMP). This study highlights the significant impact of GLMP on sustainability performance, emphasizing

the critical role of sustainable practices in enhancing organizational outcomes. This adds to the growing body of evidence supporting the adoption of sustainable practices in business.
A comparative analysis between Ghana and Indonesia reveals that while the overall benefits of GLMP are consistent, regional variations significantly influence the specific outcomes observed. This finding suggests that GLMP strategies should be tailored to align with the unique socioeconomic conditions of each region. For example, in Ghana, where infrastructural challenges are more pronounced, the focus should be on improving the operational efficiency through GLMP to achieve substantial economic benefits. On the other hand, in Indonesia, where there is a stronger emphasis on community and social responsibilities, GLMP can be leveraged to enhance corporate social responsibility initiatives and improve social performance. This study's use of structural equation modelling (SEM) provides a nuanced understanding of the relationships between different dimensions of sustainability and GLMP. This methodological approach allows for a comprehensive perspective on how GLMP can simultaneously improve environmental, social, and economic performance. This information is valuable for both academics and practitioners.

Implications

Implications for Management Science

Implications for management science based on this study. Organizations should embed GLMP into their core strategic framework. By positioning GLMP as a central element in organizational strategy, companies can align their operations with global sustainability goals and enhance their competitive advantage in sustainability-focused markets. Besides, mManagers can use a robust decision-making framework to evaluate the trade-offs and synergies between different sustainability dimensions. Structural equation modelling (SEM) provides a comprehensive tool for understanding the complex relationships between GLMP and various performance outcomes. This understanding enables more informed and strategic decisions and optimizes sustainability efforts across the environmental, social, and economic domains. GLMP fosters innovation within supply chains. The adoption of green practices drives technological advancements and process improvements that are crucial for maintaining competitiveness in the global market. By promoting innovation, organizations can adapt to the evolving demands of sustainability and remain at the forefront of industrial development. This study offers actionable guidance for managers on how to implement and benefit from GLMP within their organizations. The insights provided can help managers effectively leverage GLMP to achieve both sustainability and a competitive advantage. This study highlights the importance of integrating GLMP into an organizational strategy using a decision-making framework to optimize sustainability efforts and foster innovation within supply chains. These implications provide valuable insights for management science and offer practical guidance to managers seeking to enhance the sustainability of their firms.

Environmental Perspectives

The environmental implications of this study are significant for emerging economies, such as Ghana and Indonesia. The adoption of sustainable industrial practices is crucial as these nations continue to develop. The study shows that adopting Green Logistics Management Practices (GLMP) leads to substantial reductions in environmental impact, such as lower carbon emissions, reduced waste generation, and more efficient use of natural resources. Implementing GLMP can help mitigate the adverse environmental effects associated with rapid industrialization in these economies. These findings also support the development and implementation of environmental policies that promote green logistics practices. Policymakers should design incentives and regulations to encourage the adoption of GLMP in the logistics and manufacturing sectors. Tax incentives, subsidies for green technologies, and recognition programs can drive the broader adoption of these practices and contribute to more sustainable industrial sectors. Sustainable resource management within supply chains is therefore critical. In the era of resource scarcity and environmental degradation, efficient resource use has become paramount. Investing in technologies and practices that optimize resource use can contribute to long-term environmental sustainability. Sustainable resource management reduces the immediate environmental impact, ensures access to necessary materials, and reduces costs associated with waste and inefficiency. The adoption of GLMP can significantly reduce environmental degradation while promoting sustainable industrial practices. This study provides a clear pathway for companies in emerging economies to align their operations with their global sustainability objectives. This emphasizes that economic development should not occur at the expense of environmental health. These findings have the potential to influence corporate strategies and public policies, fostering a more sustainable approach to industrial growth in Ghana and Indonesia.

Societal Perspectives

The societal implications of this research are profound, as they highlight how GLMP can positively impact social well-being and corporate social responsibility. Implementing GLMP in developing countries, such as Ghana and Indonesia, can lead to more equitable and sustainable development. GLMP can enhance social equity by promoting fair labor practices, strengthening community relations, and contributing to overall societal well-being. By prioritizing fair wages, safe working conditions, and workforce development, businesses can reduce social inequality and promote inclusive economic growth. GLMP also enhance CSR initiatives by integrating environmentally and socially responsible logistics practices into operations, building trust with communities, and ensuring long-term operational stability. The positive social outcomes of the GLMP align with the United Nations SDGs, supporting decent work, economic growth, and responsible consumption and production. Adopting GLMP not only improves organizational performance but also contributes to a global movement towards a more equitable and sustainable future. In emerging economies, GLMP offers a pathway to balance economic growth with social responsibility, supporting long-term sustainability and prosperity.

Conclusion

In conclusion, this study confirms that the implementation of GLMP has a substantial and positive impact on sustainability performance in Ghana and Indonesia. These practices improve environmental performance, reduce emissions and waste, and enhance the social and economic outcomes. However, there are significant regional differences, highlighting the need for localized strategies when implementing GLMP. In Ghana, the focus should be on maximizing economic benefits, whereas in Indonesia, emphasis should be on strengthening social and community-oriented initiatives. To support the widespread adoption of GLMP, policymakers should develop regulations and incentives such as tax incentives, subsidies, and recognition programs. Public awareness and education campaigns are crucial in promoting the benefits of GLMP. However, the study is limited to two countries and the manufacturing sector; therefore, future research should expand the analysis to include other developing regions and industries. Despite these limitations, this study offers practical insights for businesses and policymakers, supporting the integration of GLMP into organizational and governmental practices. The findings of this study provide a strong basis for future studies in other developing regions. These studies can explore the effectiveness of GLMP in different cultural, economic, and environmental contexts. Future research can include longitudinal studies to track the long-term impacts of GLMP and comparative analyses across a wider range of developing countries. These studies will enhance the understanding of GLMP's role of GLMPs in sustainable development and contribute to the development of more effective strategies for achieving sustainability goals on a global scale.

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