FACTORS INFLUENCE THE IMPLEMENTATION OF GREEN LOGISTICS TRANSPORTATION

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Abstract: *This study aims to analyze the factors influencing the implementation of transportation within the concept of green logistics through a Systematic Literature Review (SLR) approach. The literature search was conducted systematically using the IEEE Xplore, SpringerLink, ScienceDirect, and Google Scholar databases, and the selected studies were subsequently analyzed and synthesized to identify the key determinants of environmentally friendly transportation implementation. The findings indicate that technological factors in logistics operations hold the dominant weight at 35%, followed by regulatory factors at 25%, customer relationships at 21%, and cost considerations at 19%. These results highlight that technological innovation serves as the primary driving force, strengthened by policy support, economic considerations, and market pressure in achieving sustainable transportation. Overall, the implementation of green transportation requires synergy among technological, regulatory, economic, and customer-related aspects to establish an efficient and sustainable logistics system.*

Keywords: *Green Logistics, Green Transportation, Regulation, Tecnologies, Logistics Operational, Cost, Customer Relationship Management (CRM), Systematic Literature Review (SLR)*

Introduction

Global climate change, environmental degradation, and the increasing concentration of greenhouse gas emissions have become strategic issues in international development discourse over the past few decades. The growth of global trade, the expansion of the manufacturing industry, and the rising volume of cross-border goods distribution have positioned the transportation and logistics sector as one of the major contributors to global carbon emissions. Carbon dioxide (CO_2) emissions from global industrial and energy processes have continued to rise year by year; in 2024, total CO_2 emissions increased by 0.8% (IEA, 2024).

These conditions have encouraged various countries, international organizations, and industry actors to develop more sustainable economic development approaches through the implementation of environmentally friendly supply chain systems, including the concept of green logistics. This approach focuses on reducing carbon emissions, improving energy efficiency, minimizing operational waste, and utilizing low-emission transportation technologies throughout all distribution activities (Zhang & Li, 2022). Research indicates that optimizing transportation systems in logistics can reduce fuel consumption by 10–30% through more efficient route planning and the use of fleet monitoring technologies (Rahman, 2023).

Several recent studies emphasize the importance of transforming logistics transportation toward greener systems. Research conducted by Santos and Oliveira (2022) indicates that route

optimization based on digital systems can reduce fuel consumption in distribution companies by approximately 18%. Furthermore, Lee et al. (2023) found that the use of low-emission vehicles and energy consumption monitoring systems can enhance operational efficiency while reducing fuel costs by up to 12% annually. Kumar and Singh (2024) also revealed that government incentive policies can increase corporate investment in environmentally friendly transportation technologies by up to 25% compared to the previous period.

More recent research by Putra and Nugroho (2025) demonstrates that the integration of digital technology and collaboration among supply chain actors can reduce distribution time by up to 15% while simultaneously lowering transportation emissions. Meanwhile, Chen et al. (2026) found that companies implementing data-driven sustainability strategies are able to reduce transportation emissions by up to 20% and significantly improve logistics cost efficiency. These findings indicate that green transportation not only provides environmental benefits but also generates economic advantages for companies. Nevertheless, the implementation of transportation systems based on green logistics continues to face various structural challenges in many developing countries. These obstacles include limited green infrastructure, relatively high initial investment costs, organizational resistance to operational changes, and a lack of economic incentives for companies to shift toward low-emission transportation systems (Kumar, 2021). In addition, technological limitations and insufficient human resource readiness also hinder widespread implementation.

In the national context, Indonesia, as an archipelagic country with highly intensive logistics distribution activities, faces significant challenges in reducing the environmental impact of the logistics transportation sector. Indonesia's national logistics costs still range between 20–23% of Gross Domestic Product (GDP), which is higher than those of several developed countries in the Asian region. These high logistics costs indicate substantial potential to improve distribution efficiency while simultaneously reducing carbon emissions through the implementation of more efficient and environmentally friendly logistics transportation systems (Sari, 2022). Moreover, the rapid growth of the e-commerce industry has led to a significant increase in the volume of goods deliveries, directly contributing to higher emissions in the distribution transportation sector.

However, the implementation of green logistics transportation in companies in Indonesia is influenced by various factors that determine its success. These factors may originate from internal aspects of the company, such as management commitment, investment capacity, technological readiness, human resource competence, and organizational culture toward sustainable innovation. In addition, external factors—including government regulations, transportation infrastructure readiness, market pressure, consumer demand, and supply chain partner support—also play a crucial role in determining the level of adoption of green transportation practices within companies (Putra, 2023). The complexity of these factors indicates that the implementation of environmentally friendly transportation is not merely a technical operational issue, but also relates to business strategy, public policy, and market dynamics.

Based on these conditions, a comprehensive study is required to identify and analyze the factors influencing the implementation of green logistics transportation in companies in order to obtain a systematic understanding of the opportunities and challenges associated with its implementation. This study employs a Systematic Literature Review (SLR) approach as its problem-solving method. The SLR method is conducted by systematically and structurally collecting, selecting, evaluating, and synthesizing various previous research findings to provide a comprehensive overview of the development of the concept, determining factors, and

implementation trends of green logistics transportation across different research contexts (Tranfield et al., 2003). This approach enables the identification of patterns in prior research findings, thereby generating more objective and comprehensive conclusions. Therefore, research on the factors influencing the implementation of green logistics transportation is expected to contribute academically to the advancement of sustainable logistics studies, while also offering practical benefits for companies and policymakers in designing strategies to implement more efficient, competitive, and environmentally friendly logistics transportation systems in the future.

Literature Review

Definition of Key Concepts

a. **Logistics:** Logistics is a strategic process that manages procurement, movement, storage, and information flows to meet customer needs efficiently and achieve profitability (Christopher, 2022).
b. **Transportation in Logistics Systems:** Transportation refers to the movement of goods or passengers from one location to another, involving physical relocation with or without transport modes (Sehlleier et al., 2017).
c. **Green Logistics**: Green logistics integrates supply chain management with environmental considerations to improve energy efficiency, reduce carbon emissions, minimize waste, and apply eco-friendly technologies in distribution processes (Wisner et al., 2012).
d. **Relationship between Transportation and Green Logistics:** Transportation is central to green logistics, as it accounts for the largest share of energy consumption and carbon emissions in distribution activities. Therefore, sustainable transport management determines the success of green logistics implementation.

Theoretical Framework

a. **Regulation:** Environmental regulations and international policies drive firms to adopt sustainable transportation practices, making regulation a key factor in green logistics implementation (Rucha, 2022).
b. **Technology in Logistics Operations:** Technology adoption depends on organizational readiness and external pressures. Digital transportation systems enhance operational and environmental performance (Zhang et al., 2023).
c. **Cost:** Since transportation is the largest logistics cost component, improving transport efficiency strengthens com: petitiveness and profitability (Hu et al., 2022).
d. **Customer Relationship:** CRM theory emphasizes long-term engagement. Rising environmental awareness encourages firms to adopt green logistics to enhance customer loyalty (Bupu et al., 2023).

Previous studies have examined the determinants of sustainable logistics service quality. Rauf and Sari (2024), in *From Emissions to Efficiency: A Narrative Review on Sustainable Transportation and Logistics*, show that integrating eco-friendly technologies such as electric vehicles, biodiesel, IoT, and AI alongside sustainable distribution models enhances efficiency and reduces emissions.

Oliveira and Santos (2024), in *Regulatory Frameworks and Green Logistics Adoption: A Comparative Analysis between ASEAN Countries*, find that ASEAN countries providing fiscal incentives for low-emission vehicles achieve green logistics adoption rates 25% higher than those without such policies.

Gupta and Kumar (2023), in *Cost Efficiency and Green Transportation: A Study of Logistics Firms in Emerging Economies*, report that route optimization and hybrid vehicles reduce

transportation costs by up to 12%, with cost efficiency and reliability identified as key success factors.

Finally, Lisa Maria et al. (2025), in *Intergenerational Differences of Consumers' Perception Related to the Value of Green Logistics*, reveal generational differences in perception: younger consumers are more sustainability-oriented, while older consumers prioritize price and reliability. Collectively, these findings indicate that green logistics implementation is shaped by operational factors and cross-generational consumer preferences.

Method

His study employs the Systematic Literature Review (SLR) method to synthesize scientific evidence and address a specific research question systematically and transparently (Putra Wijaya et al., 2025). The review follows four main stages (Stage 1–Stage 4) adapted from Bodduluri et al. (2024). The research question guiding this study is: *"What factors influence the implementation of Green Logistics transportation?"* Using predefined inclusion and exclusion criteria, relevant articles were rigorously selected to ensure quality and relevance (Yuliandari et al., 2023). The SLR approach enables the identification of emerging research trends and provides a structured analysis of factors influencing Green Logistics transportation implementation.

The process began with the selection of databases, including IEEE Xplore, Emerald Insight, ScienceDirect, SpringerLink, and Google Scholar, with most articles sourced from international journals. Keywords were defined and combined using Boolean operators ("AND" and "OR"), including: "Green Logistics implementation," "logistics transportation," and "factors influencing Green Logistics implementation." Following a meta-database search strategy (Bodduluri et al., 2024), articles meeting the criteria were included, while irrelevant studies were excluded. The final selected articles were reviewed comprehensively to generate structured summaries of each study.

The findings of this study are based on the Systematic Literature Review (SLR) method, which is used to identify the factors influencing the implementation of Green Logistics, as illustrated in Figure 3. The article selection process was conducted in several sequential stages, as follows:

a. Stage 1: Identification of database sources collected based on the predefined search criteria. At this stage, a total of 3,493 articles were identified.
b. Stage 2: Screening of the articles selected in the first stage based on titles relevant to the research topic. At this stage, 1,379 articles were identified as relevant.
c. Stage 3: Selection of articles based on the relevance of their abstracts and keywords, resulting in 210 articles.

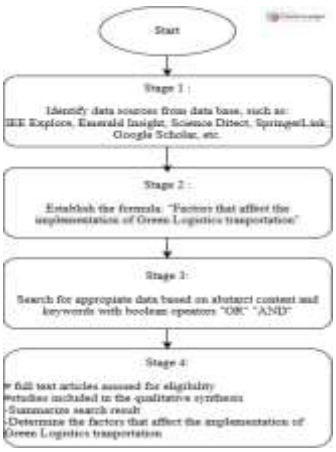

Figure 1. Steps in a Systematic Literature Review (SLR)
Source : (Author's Analysis, 2026)

Table 1. The performance of ...

No	Source of Database	#of paper (stage 1)	of tittles (stage 2)	of abstract and keyword (stage 3)	Selected for the final review (stage 4)
1	*IEEE Xplore*	478	115	24	8
2	*Emerald Insight*	70	52	19	6
3	*Science Direct*	627	158	59	17
4	*SpringerLink*	1268	689	68	20
5	*Google Scholar*	752	356	40	21
	Total	3493	1379	210	72

Source : (Author's Analysis, 2026)

d. Stage 4: In the final stage, articles that did not meet the inclusion criteria were excluded, resulting in a total of 72 eligible studies. The annual distribution of these publications (from 2021 to 2025) is summarized in Table 1.

Based on Table 1, the SLR process resulted in 72 articles that were subsequently examined in greater detail by the researchers. These articles were sourced from various databases: IEEE Xplore (8), SpringerLink (20), Emerald Insight (6), ScienceDirect (17), and Google Scholar (21).In the final selection stage, the researchers summarized the relevant findings and proposed solutions from each study.

Result and Discussion

This section presents the results of the article selection process based on the Systematic Literature Review (SLR). The final number of selected articles is 72 (seventy-two), all of which are relevant to the factors influencing the implementation of Green Logistics transportation.The identified articles were categorized into thematic groups, namely: factors influencing the implementation of green logistics transportation. Based on this classification, an annual analysis was conducted, followed by a discussion of the key factors affecting the implementation of Green Logistics.

a. Publications year

The results of the article selection conducted in accordance with the objectives of the Systematic Literature Review (SLR) indicate that a total of 72 articles were selected. The number of articles related to the factors influencing the implementation of green logistics transportation from 2021 to 2025 is presented in detail in Figure 2 and Table 2 below.

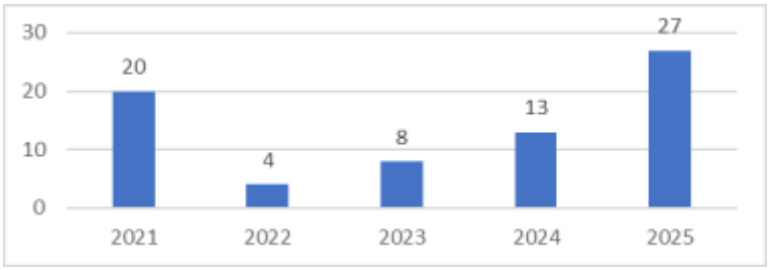

Figure 2. Number of Studies by Year
Source : (Author's Analysis, 2026)
Tabel 1. Number of Articles by Year

Year	2021	2022	2023	2024	2025
Jml	20	4	8	13	27
Persentase (%)	27,8%	5,6%	11,1%	18,1%	37,5%

Source : (Author's Analysis, 2026)

Based on the data above, a trend can be observed in the number of articles published between 2021 and 2025 concerning the factors influencing the implementation of green logistics transportation.

b. Analisis State of The Art tentang faktor-faktor yang mempengaruhi penerapan transportasi green logistic

Based on Table 1, as explained in Section 2, a total of 72 articles were identified as relevant to the research topic concerning the factors influencing the implementation of green logistics transportation. The results of the analysis reflect the recent developments in these articles.

Tabel 3. Number of Articles by Year

Topik Artikel	Penulis	Kesimpulan
International Journal of Advanced Engineering Technology Role of Logistics and Transportation in green supply chain management: An exploratory study of Courier service industry in India	(Singh et al., 2021)	The implementation of green logistics in the courier industry is influenced by environmental regulations, operational cost efficiency, the utilization of transportation technologies, and customer demand for sustainable services.
Green Transportation and the Role of Operation Research	(Salimifard et al., 2021)	Operations research approaches and optimization technologies play a significant role in minimizing costs and emissions, while ensuring compliance with environmental regulations.
The Development of Green Logistics for Implementation Sustainable Development Strategy in Companies	(Seroka-Stolka, 2021)	Green transportation models emphasize cost optimization and emission reduction through the support of technological innovation and environmental policies.
Study on transportation problem in green logistics	(Sun & Ying, 2021)	Green transportation models place strong emphasis on cost optimization and emission reduction through the integration of technological support and environmental policy frameworks.
Green Logistics for sustainable development: an analytical review	(Kumar, 2021)	The development of green logistics is influenced by government policies, investment in environmentally friendly technologies, cost efficiency considerations, and market pressure.
An integrated approach to evaluating and selecting green logistics providers for sustainable development	(C. N. Wang et al., 2021)	The selection of green logistics providers is determined by cost factors, technological capabilities, regulatory compliance, and orientation toward customer needs.
Eco-labeling and ustainable urban freight transport: tow much are people willing to pay green logitiscs	(Gatta et al., 2021)	Urban regulations and customers' willingness to pay for green services are important factors in the implementation of sustainable transportation.
The green logistics impact on international trade: Evidence from developed and developing countries.	(D. F. Wang et al., 2021)	Green logistics enhances trade competitiveness when supported by environmental regulations and cost-efficient technological innovation.

Green transportation and logistics performance: An improved composite index.	(M. Lu et al., 2021)	The performance of green transportation is influenced by cost efficiency, the adoption of low-emission technologies, and support from environmental policies.
Green Logistics Development Decision-Making: Factor Identification and Hierarchical Framework Construction.	(M. Zhang et al., 2021)	Regulatory factors, technological readiness, financial capacity, and stakeholder pressure serve as the primary determinants in the development of green logistics.
Impacts of non-recurrent events on pheromone-based green transportation system.	(Soon et al., 2021)	The resilience of green transportation systems depends on optimization technologies, cost efficiency, and adaptability to transportation policies.
The Green Vehicle Routing Problem from a Smart Logistics Perspective.	(Su & Fan, 2021)	Smart technology-driven route optimization facilitates the reduction of operational costs and carbon emissions, aligning with established environmental regulatory frameworks.
A new solution for city distribution to achieve environmental benefits within the trend of green logistics: A case study in China.	(Bi et al., 2021)	Eco-friendly distribution requires the support of regulatory frameworks, technological innovation, and the control of operational costs.
Pakistan management of green transportation and environmental pollution: a nonlinear ARDL analysis.	(Sohail et al., 2021)	Environmental regulations and public expenditure exert a significant impact on mitigating transportation emissions and enhancing cost efficiency.
Green logistics of crude oil transportation: A multi-objective optimization approach	(Atmayudha et al., 2021)	Multi-objective optimization prioritizes the trade-off between operational expenditures and emission mitigation via technology-driven methodologies.
Green logistics practices seeking development of sustainability: Evidence from lithuanian transportation and logistics companies	(Vienažindienė et al., 2021)	Green logistics practices are influenced by regulation, technological readiness, cost efficiency, and market orientation.
Green logistics - Modern transportation process technology	(Larina et al., 2021)	The modernization of transportation technology supports cost efficiency and compliance with environmental standards.
Comparative Perspectives on Modern Logistics Transportation Based on Green Logistics in Europe and Indonesia: Concept of Sustainable Economy	(Setiawan & Koestoer, 2021)	The effectiveness of cross-border green logistics is influenced by national regulations, technological readiness, and cost structures.
Sustainable Developement in Logistic-A Strategy for Management in Terms of Green Transport	(Klimecka-Tatar et al., 2021)	The implementation of sustainable transport strategies necessitates a synergy between regulatory frameworks, technological advancements, cost-effectiveness, and customer-centricity.
Effect of economic development, income inequality, transportation, and environmental expenditures on transport emissions: evidence from OECD countries	(Hussain et al., 2022)	Transportation emission reduction is influenced by government policies, environmental expenditure, and cost management in the transport sector.
Sustainable urban transportation development in China: A behavioral perspective	(Ling et al., 2022)[21]	Government policies and changes in societal behavior support the adoption of green transportation technologies.
Green Vehicle Routing Problem: State of the Art and Future Directions	(Sabet & Farooq, 2022)	Green route optimization models focus on cost efficiency and emission reduction through intelligent technology.
Model of Operational Planning of Freight Transportation By Tram As Part of a Green Logistics System	(Shramenko et al., 2022)	The integration of technology-based alternative modes enhances cost efficiency and supports sustainable transportation regulations.
Agent-based models in urban	(Bastarianto et	Agent-based simulation assists in policy

transportation: review, challenges, and opportunities	al., 2023)	formulation, cost efficiency, and green transportation technology planning.
Improving suitability of urban canals and canalized rivers for transportation, thermal energy extraction and recreation in two European delta cities	(van der Meulen et al., 2023)	The optimization of water transport infrastructure supports cost efficiency and compliance with environmental regulations.
Trade-off between critical metal requirement and transportation decarbonization in automotive electrification	(C. Zhang et al., 2023)	Transportation decarbonization requires policy support, electric vehicle technology innovation, and material cost considerations.
Dynamic simulation research on urban green transformation under the target of carbon emission reduction: the example of Shanghai	(Shang & Yin, 2023)	Urban green transformation is influenced by emission reduction regulations, technology investment, and cost management.
Connectedness and spillovers in the innovation network of green transportation	(Inglesi-Lotz et al., 2023)	Collaborative technological innovation accelerates green transportation efficiency and regulatory compliance.
Green road transportation management and environmental sustainability: The impact of population density	(Din et al., 2023)	Sustainable transportation management is influenced by regulation, population density, and operational cost efficiency.
Exploring green logistics practices in freight transport and logistics: a study of biomethane use in Sweden	(Osman et al., 2023)	The use of biomethane underscores the importance of regulatory support, technological readiness, and cost feasibility in meeting market demand.
Green Transportation Model in Logistics Considering the Carbon Emissions Costs Based on Improved Grey Wolf Algorithm	(Osman et al., 2023)	The integration of carbon costs into optimization models enhances cost efficiency and regulatory compliance through algorithmic technology.
Sustainability performance assessment of freight transportation modes using an integrated decision-making framework based on m-generalized q-neutrosophic sets	(Görçün et al., 2024)	Green transportation performance assessment is influenced by cost efficiency, low-emission technology, and regulatory standards.
Matheuristic approaches to the green sequencing and routing problem	(Lanza et al., 2024)	Heuristic and mathematical approaches enhance cost efficiency and technology-based emission reduction.
Promoting green transportation through changing behaviors with low-carbon-travel function of digital maps	(L. Zhang et al., 2024)	Digital technology drives changes in customer behavior and supports low-carbon transportation policies.
Comparative Analysis of Countries in Terms of Sustainable and Green Transportation Using Multi-Criteria Decision Making Approach	(Kabakus & Eyuboglu, 2024)	The performance of international green transport systems is driven by governmental mandates, technological maturity, and financial capacity.
A Deep Reinforcement Learning-Based Adaptive Search for Solving Time-Dependent Green Vehicle Routing Problem	(Yue et al., 2024)	The application of artificial intelligence enhances cost efficiency and emission reduction in accordance with environmental regulations.
Efficient Green Supply Chain Management for Transit Manufacturing Enterprises Integrating AHP, K-NN, and MILP in the Context of Sustainable Development	(L. Wang, 2024)	The integration of analytical methods shows that green logistics decisions are influenced by costs, technology, and regulatory compliance.
Efficient Green Supply Chain Management for Transit Manufacturing Enterprises Integrating AHP, K-NN, and MILP in the Context of Sustainable Development	(L. Wang, 2024)	Green hydrogen has the potential to support transportation decarbonization, but it requires high investment costs and policy support.
Green hydrogen: A clean energy solution for electricity and heat	(Aydin et al., 2024)	The implementation of green logistics is influenced by government regulations, cost constraints, technological readiness, and customer support.
Challenges and Factors Influencing the Implementation of Green Logistics: A Case	(Khayyat et al., 2024)	The implementation of data-driven methodologies improves operational cost-effectiveness, planning

Study of Saudi Arabia		precision, and emission mitigation.
Data-Driven and Sustainable Transportation Route Optimization in Green Logistics Supply Chain	(Q. Chen, 2024)	Government policies and technological innovation enhance the financial efficiency of companies and strengthen customer relationships.
Exploring the impact of green logistics practices and relevant government policy on the financial efficiency of logistics companies	(Kim et al., 2024)	Green packaging and green transportation are influenced by regulations, cost efficiency, operational technology, and global customer demands.
Multicriteria Assessment of Green Logistics in Taiwan's Maritime Freight Transport: Green Packaging and Green Transportation as Driving Aspects	(Sujanto et al., 2024)	Implementation of green transportation is characterized by a conflict between operational cost pressures, consumer mandates, and regulatory adherence.
The paradoxical nature of greening transportation: an analysis of tensions in buyer–supplier dyads	(Björklund et al., 2024)	Smart transportation technology innovation accelerates cost efficiency and environmental performance in accordance with government policies.
The power of technology innovation: can smart transportation technology innovation accelerate green transportation efficiency?	(Zhao, 2024)	Multimodal cooperation based on cost and technology optimization supports the achievement of emission targets in accordance with regulations.
Min-cost route problems for multimodal sustainable logistics cooperation	(Cerrone et al., 2025)	Route optimization for waste collection prioritizes cost-effectiveness and emission mitigation, leveraging algorithmic frameworks aligned with environmental mandates.
The green marine waste collector routing optimization with puma selectison-based neighborhood search algorithm[46]	(Abdollahzadeh et al., 2025)	The transformation of urban transportation systems is influenced by policy, technological innovation, and cost structures in supporting sustainability.
Exploring urban typologies using comprehensive analysis of transportation dynamics	(Kuncheria et al., 2025)	Comprehensive analysis of transportation dynamics reveals a critical synergy between technological innovation, regulatory compliance, and cost-efficiency structures as the primary drivers of sustainable urban transformation.
Carbon emissions and economic growth decoupling in the city of medellín and its metropolitan area: a longitudinal sectoral analysis (2000–2023)	(Gómez-Ríos et al., 2025)	The decoupling of economic growth from carbon emissions is influenced by progressive environmental policies, low-carbon technology investments, and transport sector cost control.
Synergy of blockchain-enabled supply chains, resilience, and sustainability performance in Chinese logistic firms	(T. Wang et al., 2025)	Blockchain implementation enhances transparency, cost efficiency, and sustainability performance for logistics companies, aligned with regulatory and market demands.
Carbon reduction strategies for logistics based on emission prediction under multi-scenarios in coastal developed region	(J. Chen et al., 2025)	Carbon reduction strategies based on emission prediction require the support of analytical technology, stringent environmental policies, and efficient cost planning.
Improving the resilience of urban transportation to natural disasters: the case of Changchun, China	(Z. Wan et al., 2025)	Urban transportation resilience is determined by technology-based infrastructure readiness, governance policies, and efficient cost allocation.
Influential effect analysis of digital transportation policies on urban economic green transition	(Li et al., 2025)	Digital transportation policies contribute to the green economic transition through the adoption of smart technologies and operational cost efficiency.
The state-of-the-art review on biochar as green additives in cementitious composites: performance, applications, machine learning predictions, and environmental and economic implications	(Ye et al., 2025)	Eco-friendly material innovations support emission reduction in the transport construction sector, with implications for production costs and environmental regulations.
Green supply chain management and SMEs sustainable performance in developing	(Junejo et al., 2025)	The performance of Small and Medium Enterprises (SMEs) is driven by green knowledge exchange,

country: role of green knowledge sharing, green innovation and big data-driven supply chain		technological innovation, regulatory frameworks, and supply chain cost optimization.
Synthetic population and urban mobility modeling using open and publicly available data - a Washington, DC COVID case study	(Ruan et al., 2025)	Open-data-based mobility modeling enhances the effectiveness of green transportation policies and cost planning efficiency.
Assessing AI-based eco-driving solutions for reducing GHG emissions in green transportation systems	(Alyamani et al., 2025)	AI-based eco-driving solutions have been proven to reduce emissions and fuel costs through the optimization of driving behavior in accordance with environmental policies.
Energy-based FCEV Optimization Services: Toward Greener Transportation	(Pitsiavas et al., 2025)	Hydrogen vehicle optimization requires the support of clean energy technology, high cost investment, and green energy regulations.
Exploring the mediating role of green logistics in enhancing green supply chain performance: Evidence from Bangladesh	(Emon & Khan, 2025)	Green logistics acts as a mediator in improving supply chain performance through technological innovation, cost efficiency, and response to market demands.
Green transportation – Environmental sustainability within the purview of green energy, green innovation, and institutional quality: New evidence from belt and road initiatives economies an application of quasi-experimental approach	(Rehman et al., 2025)	The efficacy of technological innovation and green energy in reducing transport emissions is significantly bolstered by institutional quality and robust governmental frameworks.
Intergenerational differences of consumers' perception related to the value of green logistics: A focus on transport, packaging, and waste management	(Putz-Egger et al., 2025)	Cross-generational customer perceptions influence the demand for green logistics services, thus driving companies to invest in technology and cost efficiency.
Towards green transportation: Predictive modeling of intersection congestion using machine learning for sustainable urban traffic management	(Muktar et al., 2025)	The implementation of predictive models leveraging machine learning optimizes sustainable traffic management by improving cost-effectiveness and mitigating carbon emissions.
A multi-perspective framework to address manufacturing and transportation challenges in green hydrogen supply chains	(Klumpp et al., 2025)	The development of a green hydrogen supply chain requires policy support, technological readiness, and sustainable financing strategies.
Which green path to follow: The development of green transportation technology under the EU ETS and its interplay with carbon emission reduction	(Lambrecht & Willeke, 2025)	Emission trading schemes encourage green transport technology innovation, with implications for cost structures and regulatory compliance.
Eco-Efficiency in Logistics and Cross-Docking: A Systematic Literature Review on the Usability of Green Vehicles	(Altaf et al., 2025)	The use of green vehicles in cross-docking enhances cost efficiency and environmental performance in accordance with regulations.
The Impact of Green Finance on Carbon Emissions Based on Fixed Effects Model	(Tu et al., 2025)	Green financing mechanisms contribute significantly to facilitating low-carbon technological investments and mitigating emissions within the transportation sector.
Navigating green transport sustainability model (GTSM) under socio-economic and environmental goals for road-mapping sustainability and mitigating carbon footprints	(Kottala et al., 2025)	The transport sustainability model emphasizes the integration of regulations, technological innovation, cost management, and stakeholder orientation.
Assessing the co-evolution of intermodal freight transport research and patenting technology trends for advancing green and intelligent logistics	(Arsenio et al., 2025)	Technological developments and patent innovations accelerate cost efficiency and regulatory compliance in multimodal green logistics.
Can electric trucks be a viable green	(Yu et al., 2025)	Electric truck implementation depends on charging

logistics and transportation solution? Modeling a joint logistics-and-charging-infrastructure network design problem		infrastructure readiness, policy support, and investment cost feasibility.
Barriers and enablers to dual use of transportation tunnels for heating and cooling decarbonisation	(Barns & Hitchcock, 2025)	The utilization of transport infrastructure for energy decarbonization is influenced by regulations, technology investment, and long-term cost considerations.
Assessment of international competitiveness and its driving factors for the Shandong Port Cluster	(G. Wan et al., 2025)	Port competitiveness is influenced by environmental policies, logistics technology innovation, and operational cost efficiency.
Integrating big data into sustainable supply chain management : a pathway to enhanced firm performance in Ghana ' s food and beverage sector	(Nyamah et al., 2025)	Big data integration enhances cost efficiency, operational transparency, and corporate sustainability performance in response to market demands and regulations.

Source : (Author's Analysis, 2026)

Tabel 4. Influence factors based on state-of-the-art result

No.	Factor	Author	Total	Percentage
1	**Regulation**	Seroka-Stolka (2021); Gatta et al. (2021); D.F. Wang et al. (2021); M. Zhang et al. (2021); Sohail et al. (2021); Setiawan & Koestoer (2021); Klimecka-Tatar et al. (2021); Hussain et al. (2022); Ling et al. (2022); Din et al. (2023); Shang & Yin (2023); Rehman et al. (2025); Lambrecht & Willeke (2025); Tu et al. (2025); Gómez-Ríos et al. (2025); Li et al. (2025); Khayyat et al. (2024); Kottala et al. (2025)	**18**	**25%**
2	**Technology in logistics operations**	Salimifard et al. (2021); Sun & Ying (2021); M. Lu et al. (2021); Soon et al. (2021); Su & Fan (2021); Sabet & Farooq (2022); Yue et al. (2024); Lanza et al. (2024); Zhao (2024); Q. Chen (2024); Alyamani et al. (2025); T. Wang et al. (2025); Yu et al. (2025); Arsenio et al. (2025); Nyamah et al. (2025); Pitsiavas et al. (2025); Muktar et al. (2025); Bastarianto et al. (2023); Y. Lu & Li (2023); Shramenko et al. (2022); Osman et al. (2023); Klumpp et al. (2025); Altaf et al. (2025); Ruan et al. (2025); Barns & Hitchcock (2025)	**25**	**35%**
3	**Cost**	Kumar (2021); C.N. Wang et al. (2021); Atmayudha et al. (2021); Aydin et al. (2024); Cerrone et al. (2025); Gómez-Ríos et al. (2025); G. Wan et al. (2025); van der Meulen et al. (2023); Bi et al. (2021); Shramenko et al. (2022); Lambrecht & Willeke (2025); Tu et al. (2025); Pitsiavas et al. (2025); Yu et al. (2025)	**14**	**19%**
4	**Customer relationship**	Singh et al. (2021); C.N. Wang et al. (2021); Vienažindienė et al. (2021); Putz-Egger et al. (2025); Björklund et al. (2024); Emon & Khan (2025); Kim et al. (2024); Junejo et al. (2025); Gatta et al. (2021); Rehman et al. (2025); Nyamah et al. (2025); Inglesi-Lotz et al. (2023); Kottala et al. (2025); Sujanto et al. (2024); Din et al. (2023)	**15**	**21%**
Total			**72**	**100%**

Source : (Author's Analysis, 2026)

Figure 3. Trends in factors influencing the implementation of green logistics transportation.
Source : (Author's Analysis, 2026)

Based on the literature review results in Table 4 and Figure 1, several key factors influencing the implementation of transportation within the green logistics concept are identified as follows:

a. Regulations (25%): Government regulations and environmental policies play a crucial role in encouraging the adoption of sustainable transportation systems. Policies related to emission standards, fossil fuel restrictions, carbon reduction targets, and vehicle operation limitations act as both mandatory and incentive-based mechanisms. These regulations often shape corporate strategic decisions, as compliance is necessary to avoid sanctions while maintaining competitiveness and corporate legitimacy.
b. Technology in Logistics Operations (35%): The implementation of green transportation is supported by the use of Electric Vehicles (EVs), real-time GPS tracking systems, and distribution route optimization. Electric vehicles contribute to reducing greenhouse gas emissions and fossil fuel dependency. Real-time tracking systems enable live monitoring of vehicle positions and performance to enhance operational efficiency. Meanwhile, route optimization based on the Vehicle Routing Problem (VRP) model helps minimize travel distance, delivery time, and energy consumption. This technological combination significantly enhances efficiency while supporting the sustainability of logistics transport.
c. Costs (19%): Cost considerations are fundamental in implementing green transportation. Although the adoption of eco-friendly fleets and advanced technologies requires substantial initial investment, long-term benefits include reduced fuel consumption, lower maintenance costs, and avoidance of environmental taxes or penalties. Therefore, companies must conduct careful cost–benefit analyses to balance short-term expenditures with long-term financial and environmental gains.
d. Customer Relationships (21%): Customer relationships also influence green logistics implementation. Increasing environmental awareness among customers drives demand for sustainable distribution practices. Green procurement requirements and Corporate Social Responsibility (CSR) commitments encourage firms to integrate environmental considerations into logistics operations, strengthening customer trust and long-term business relationships.

Conclusion

Based on the analysis of 72 articles in this Systematic Literature Review (SLR), it can be concluded that the implementation of green logistics transportation is influenced by four primary factors: regulations, technology in logistics operations, costs, and customer relationships. Technology in logistics operations emerges as the most dominant aspect, indicating that digital innovation, route optimization, and the use of low-emission vehicles are the main drivers of efficiency and environmental impact reduction. Regulatory factors serve as a policy framework that encourages compliance with emission standards and carbon reduction. Meanwhile, the cost factor remains a strategic consideration in balancing initial investment with long-term benefits. Finally, customer relationships reflect the influence of market demands on sustainable logistics practices. Overall, the implementation of green logistics transportation requires synergy between policy, technology, economic, and market aspects to achieve optimal sustainability.

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