Print ISSN: 1738-3110 / Online ISSN 2093-7717
JDS website: http://accesson.kr/jds
http://doi.org/10.15722/jds.22.11.202411.39

Factors Affecting Green Logistics – An Empirical Study on Logistics Firms in Vietnam

Quyet PHAN[1], Phuong-Linh NGUYEN[2], Uyen NGUYEN[3]

Received: September 23, 2024. Revised: October 16, 2024. Accepted: November 05, 2024.

Abstract

Purpose: This study aims to investigate the effects of external factors on logistics firms' green logistics (GLs). Based on the literature review, the factors affecting GLs are determined, including the Government's regulatory pressure, the GLs system's perfection, the GLs industry's development level, and customer pressure. This study also identifies five components reflecting GLs practices: green packaging practices, fuel efficiency practices, optimization of routes practices, carbon emissions measurement practices, and reserve GLs. This research proposes hypotheses that indicate the direct impact of external factors on GLs practices of logistic firms. **Research design, data, and methodology:** By surveying 281 middle and senior managers who are representative of 281 logistics firms operating in Vietnam, the PLS-SEM was used to analyze data. **Results:** The research findings reveal the significant effect of three external factors, including the perfection of the GLs system, the development level of the GLs industry, and customer pressure to encourage logistics firms to apply GL practices in their business. **Conclusion:** By investigating the multi-dimensional constructs of GLs, this study has provided a comprehensive picture of GLs in Vietnam and clarified the importance of external factors from government, industry context, and customer requirements in promoting GLs activities in logistics firms in Vietnam.

Keywords: Green Logistics, Green Practices, Logistics Firms, Sustainable Development

JEL Classification Code: L80, L81, L91, M1

1. Introduction

The environment has consistently been a matter of societal concern throughout history. It is increasingly recognized as a pressing issue, with various industries and sectors prioritizing it in their strategic development. One contemporary environmental phenomenon drawing significant attention is climate change, which is evolving in increasingly severe ways and has been a cause for alarm in Vietnam and around the globe.

According to the International Transport Forum (ITF) report in 2019, logistics activities account for approximately 10-11% of global CO_2 emissions, with freight transport causing 80-90% of the carbon emissions within logistics activities, equating to 7% of global CO_2 emissions. Among these, road transport is the largest emitter. Global transportation demand is projected to increase substantially over the next three decades, with an anticipated threefold increase by 2050. Consequently, CO_2 emissions from transportation activities are expected to rise by 4%.

1 First Author. PhD, Lecturer, Institute of Business Administration, Thuongmai University, Vietnam. Email: quyetphan@tmu.edu.vn
2 Second and Corresponding Author: PhD, Lecturer, Institute of Business Administration, Thuongmai University, Vietnam. Email: linhnguyen@tmu.edu.vn
3 Third Author. PhD, Lecturer, Institute of Business Administration, Thuongmai University, Vietnam. Email: uyennguyen@tmu.edu.vn

Therefore, the sustainable development theory necessitates that businesses modify traditional, energy-intensive logistics models to reduce noise, waste, and emissions. This has led to the emergence of Green Logistics (GLs) due to sustainable development theory. The advancement of modern logistics models must first be evaluated from environmental and efficiency perspectives. GLs catalyze global environmental progress and are fundamental to sustainable development.

GLs originated in the mid-1980s and describe logistics systems and methods that employ advanced technologies and equipment to minimize environmental damage while optimizing resource utilization to meet customer demands. GLs refer to logistics firms' procedures for delivering commodities from the sellers through warehousing and distribution to the consumer. GLs are increasingly vital to logistics firms and other businesses. Consequently, recent studies have examined the features of GLs and their cause and effect (Agyabeng-Mensah & Tang, 2021; Baah et al., 2020; Cheng et al., 2023). However, while research often considers GLs from a simplistic perspective (Agyabeng-Mensah et al., 2020; Baah et al., 2020) and examines the impact of single factors such as government support (Wang & Wang, 2023; Zhang et al., 2020), industry environment (Chu et al., 2017), and customer factors (Chu et al., 2019), it is evident that GLs can be influenced by all these factors simultaneously. Thus, there is a need for research that verifies the simultaneous impact of external factors on GLs. Additionally, since both traditional logistics and GLs encompass various functions, evaluating GLs from a few simple aspects of a 1st- order structure may not provide a comprehensive view of GLs. Hence, a practical study is needed to examine GLs from the perspective of a multi-dimensional structure, reflecting simultaneously through five critical functions: Green Packaging, Fuel Efficiency, Optimization of Routes, Carbon Emissions Measurement, and Reverse Green Logistics.

Vietnam, with its unique topographical characteristics and long-term severe environmental risks, is one of the ten countries most severely affected by climate change. Moreover, transportation is a crucial factor in economic growth due to increased productivity, but it also significantly contributes to carbon emissions from fossil fuel use. According to the World Bank's 2019 report, CO_2 emissions in Vietnam's transportation sector are primarily from road transport. Specifically, in 2020, road transport accounted for 79.4% of CO_2 emissions, expected to rise to 80% by 2025 and 80.4% by 2030. Thus, greening the transportation sector, particularly road transport due to its substantial cargo volume, is essential for reducing inefficiencies in the supply chain, lowering emissions from transport activities, and ultimately reducing costs and enhancing supply quality in Vietnam’s logistics sector.

While previous studies have often focused on developed economies such as Europe, China, Japan, and South Korea, there is a lack of studies concentrating on developing countries with potential logistics industry growth, like Vietnam. This gap necessitates research that provides solutions and recommendations to help logistics firms in these countries effectively implement green practices in their logistics services.

Based on the aforementioned arguments, this study titled “Factors Affecting Green Logistics – An Empirical Study on Logistics Firms in Vietnam” is conducted to determine the effects of external factors on the green logistics practices of logistics firms in a typically developing country like Vietnam. By examining the simultaneous outside factors, the study provides an overall picture of their impacts on the GLs of logistics firms in Vietnam. Additionally, GLs practices will be comprehensively investigated using its multi-dimensional structure. The research findings suggest discussions and implications for encouraging logistics firms in Vietnam to apply green practices in their logistics services. To fulfill the research purposes, the structure of the study comprises seven parts: Part 1 focuses on the introduction, Part 2 reviews the literature and proposes research hypotheses and models, and Part 3 outlines the research methodology before presenting the research results in Part 4. While Part 5 indicates the discussions and identifies the theoretical contributions, Part 6 details practical contributions. Finally, Part 7 concludes with limitations and future directions.

2. Literature Review

2.1. Green Logistics

Logistics is recognized as a crucial sector with a profound impact on the economic growth of nations (Karaman et al., 2020). Logistics encompasses a range of activities related to border clearance, transportation, delivery, and warehousing (Mariano et al., 2017).

In recent years, the perspective and development orientation towards a green, environmentally friendly, sustainable economy, society, and environment have garnered significant attention from domestic and international scholars (Vienažindienė et al., 2021). The sustainability perspective has significantly altered the direction and competitive strategies of businesses (Vienažindienė et al., 2021). Numerous studies have highlighted the necessity of applying environmentally friendly logistics methods in logistics operations - GLs being necessary for development (Vienažindienė et al., 2021). Logistics is considered a significant consideration of environmental pollution and the excessive use of resources within the supply chain (Agyabeng-Mensah & Tang, 2021;

Karaman et al., 2020). Essential logistics functions include information and sharing, goods transportation, inventory storage, and material handling within the supply chain (Baah et al., 2020). Since logistics involves transportation through various modes, minimizing CO_2 emissions, reducing the use of fossil fuels, and actively employing recycled materials in packaging are core aspects of environmentally friendly logistics (Centobelli et al., 2017).

From this perspective, the concept of GLs is approached from various approaches. While many scholars define GLs in terms of specific methods for environmental friendliness, such as minimizing environmental and atmospheric pollution through material handling, waste management, packaging, and transportation (Centobelli et al., 2017; Rakhmangulov et al., 2018; Seroka-Stolka & Ociepa-Kubicka, 2019; Solaja & Adetola, 2017), Hutomo et al. (2018) view GLs from the perspective of economic efficiency and benefits for stakeholders including businesses, customers, suppliers, and societal effects. In alignment with this view, Oksana Seroka-Stolka and Ociepa-Kubicka (2019) emphasize the effective management of product flows and information from an ecological standpoint, ensuring customer needs are met and value is enhanced. Similarly, GLs are an effective solution designed to benefit the environment and the economic welfare of the firm and society (Pazirandeh & Jafari, 2013). In other words, GLs are considered activities that reflect an organization's capability to conserve resources, reduce waste, improve operational efficiency, and meet societal expectations for environmental protection (Lai & Wong, 2012). From the perspective of integrating environmental issues with logistics activities, GLs can be understood simply as incorporating environmental thinking into the management and operation of logistics activities (Srivastava & Gupta, 2023).

More comprehensively, many studies have integrated the sustainable development approach from economic, environmental, and social perspectives into logistics activities (Centobelli et al., 2017; Evangelista et al., 2018; Karaman et al., 2020). Accordingly, GLs are an operational mechanism based on energy consumption efficiency and minimal environmental harm while enhancing competitiveness and labor productivity. It represents a structure designed to align with human benefits and needs and outlines the trend toward implementing sustainable development strategies. GLs involve efforts by firms to create logistics systems that are energy-efficient and less polluting. Economically, GLs practices focus on selecting cost-effective routes, combining multiple transportation modes to provide affordable, high-quality services, enhancing a firm’s competitiveness, and adding value to customers. When GLs activities choose appropriate routes and transportation modes, they contribute to economic efficiency for logistics firms and the whole economy. Environmentally, alongside the efficient exploitation of resources, GLs practices emphasize investing in clean vehicles with low fuel consumption, utilizing recycled energy, and reducing emissions, thereby improving air quality indices. This allows logistics firms to fulfill environmental commitments effectively and, in the long term, enables firms to achieve significant cost benefits such as reduced transportation time and lower fuel consumption. Socially, the effective implementation of GLs highlights corporate social responsibility, contributes to occupational safety, and creates a favorable, environmentally friendly working environment for employees. This fosters employee motivation and demonstrates the firm's social responsibility to the community and stakeholders.

In examining the functions of logistics related to sustainable development, numerous authors have identified critical aspects of GLs, including green transportation, green warehousing, green packaging, green management, GLs data collection and management, waste measurement, and Reverse Green Logistics (Richnák & Gubová, 2021; Sureeyatanapas et al., 2018). Research has demonstrated that green transportation involves selecting environmentally friendly vehicles and materials, while green warehousing focuses on optimizing storage space, layout, and methods to reduce energy consumption. Green packaging involves optimizing packaging processes and techniques and considering the reuse of packaging to enhance economic, environmental, and social efficiency. Green management enables firms to plan, implement, monitor, and evaluate GLs strategies to simultaneously achieve economic, environmental, and social benefits. GLs data collection and management involve investing in and utilizing modern software technologies to manage logistics databases efficiently and reduce office costs (e.g., paper, ink). Waste measurement helps assess, establish, and implement measures to reduce carbon emissions and manage solid waste, such as metal scraps, materials, packaging, and other organic waste (Hampus & Henrik, 2015; Weng et al., 2015). Finally, Reverse Green Logistics, or reverse logistics, has garnered attention in recent years (Baah et al., 2020). Reverse Green Logistics focuses on planning, executing, and controlling the flow of raw materials and inventory in the reverse direction of the supply chain: from the consumer back to the manufacturer for recovery or proper disposal. Subsequent scholars have also aligned with the view of Reverse Green Logistics, focusing on the return mechanism for recycling components, products, or tools (González-Benito & González-Benito, 2006). Logistics firms' commitment to engaging in Reverse Green Logistics can lead to positive feedback and goodwill from stakeholders, demonstrate environmental compliance, and significantly improve the green orientation of the supply chain (Baah et

al., 2020). Additionally, for logistics firms, Reverse Green Logistics involves commitments to reducing emissions and mitigating negative social impacts from transportation (Baah et al., 2020). By committing to clean fuels, prioritizing green energy, investing in low-emission transportation systems, and optimizing routes and transportation methods to reduce travel time, fuel costs, and emissions, firms address crucial elements of Reverse Green Logistics.

Thus, promoting the implementation of GLs practices plays a crucial role for logistics firms today, allowing them to achieve sustainable development goals and realize benefits across economic, environmental, and social dimensions.

2.2. Factors Affecting GLs

2.2.1. Regulatory Pressure

Regulatory pressure is one of the foremost factors affecting firms' survival, development, and operational activities in the market. Macro-level management capacity regarding green practices refers to the economic, legal, and regulatory measures implemented by authoritative macro-level agencies to achieve the set green development goals (Wang & Wang, 2023). In alignment with this, Zhang et al. (2020) argue that the state's practical green management capacity involves the government's efforts, policies, and programs to contribute to achieving GLs objectives. These green development goals are established based on the sustainable development vision of the local or national context (Wang & Wang, 2023). To effectively implement green practices within businesses, establishing a legal framework, policy mechanisms, and macro-level green development objectives from macro agencies is particularly crucial (Ngwakwe, 2022; Zhang et al., 2020).

Regulatory pressure plays a decisive role in the implementation of GLs activities within firms (Wang & Wang, 2023). The better the regulatory pressure on GLs, the more effectively macro-level orientations for GLs activities, such as goal setting, priority establishment, action program issuance, and monitoring mechanisms, can be implemented (Wang & Wang, 2023). Firms in general and logistics firms in particular operating in the market must adhere to local macro-level orientations and strictly comply with state management agencies' regulatory requirements. Thus, when regulatory pressure on GLs is more robust, it establishes more precise and more detailed guidelines, facilitating logistics firms in effectively implementing GLs activities within their operations (Ngwakwe, 2022; Zhang et al., 2022; Zhang et al., 2020). Based on these arguments, the hypothesis concerning the relationship between regulatory pressure on GLs and the GLs activities of logistics firms in Vietnam is stated as follows:

H1: Regulatory pressure has a positive and significant impact on the GLs activities of logistics firms.

2.2.2. The Perfection of the GLs system

The policy framework for GLs established by the government and macro-level regulatory agencies is a crucial prerequisite in creating rules, procedures, and detailed guidelines for logistics firms in implementing GLs activities (Aibin Li et al., 2020). Alongside macro-level management capacity, the policy system contributes to supportive policies and incentives for general logistics activities and GLs.

According to Aibin Li et al. (2020), the perfection of GLs systems should consider establishing mandatory regulations for environmentally protective business activities. The perfection of GLs systems includes setting overarching goals for green development, implementing supportive policies and mechanisms for green implementation, green management policies, and guidelines for firms' green development (Zhang et al., 2020). First, it involves establishing specific and clear green development goals, using quantitative criteria to measure and evaluate results (Akgün et al., 2019; Khan et al., 2017; Timms, 2011). Typical green development goals include energy saving and emission reduction from a macro perspective. Second, supportive policies and mechanisms for green implementation issued by macro agencies may include tax incentives, access to land and real estate (van den Heuvel et al., 2013), establishing support funds, participating in training and education, and developing human resources (Chang & Lai, 2017). Specifically for logistics firms, support policies may also involve developing port and warehousing infrastructure (Khan et al., 2017). Third, green management policies related to creating and enforcing a strict legal framework to ensure compliance and penalize violations of green practices laws and regulations (Zhang et al., 2020). Establishing these guidelines helps firms enhance their awareness of green growth roles, encouraging them to adopt green practices such as using clean energy and green technologies (Lee et al., 2017). According to Kuei et al. (2015), the perfection of GLs systems can be reflected in government and local agency support mechanisms to assist firms in accessing financial, technical, technological, and human resources for GLs activities. Thus, along with establishing and enacting regulations, policies, and sanctions for managing and monitoring environmental compliance, the perfection of GLs systems plays a significant role in providing macro-level guidance for logistics firms to implement and apply green practices in their logistics service operations.

Alongside the state's macro-level management capacity, the GLs policy system directly and strongly influences firms' readiness to implement GLs activities (Aibin Li et al.,

2020). This is also considered a prerequisite for ensuring successful adoption of practices in general and logistics firms (Zhang et al., 2020). The timely and comprehensive issuance of policies to perfect the GLs system helps firms engaged in GLs to plan and implement GLs effectively (Aibin Li et al., 2020). Prior research consistently supports the positive and significant relationship between GLs policies and the promotion of GLs activities in logistics firms. In the particular context of Vietnam, this relationship is also expected to be positive and significant. Therefore, the research hypothesis regarding the impact of the perfection of GLs systems on the GLs activities of logistics firms in Vietnam is stated as follows:

H2: The perfection of GLs systems has a positive and significant impact on the GLs activities of logistics firms.

2.2.3. The development level of the GLs industry

The level of development within an industry significantly impacts the competitiveness and operational scale of firms within the market. The level (or degree) of development of an industry, including logistics, can be assessed through factors such as the industry's scale, infrastructure system, and technological advancement (Zhang et al., 2020). According to Chu et al. (2017), one crucial factor contributing to the development of the GLs industry is the presence of competitors. Logistics firms may face significant pressure and challenges from competitors, especially those leading in applying green practices in logistics (Chu et al., 2017). Firms in the logistics sector are often influenced by other industry players and tend to learn from and emulate the GLs practices of their competitors (Henisz & Delios, 2001). Additionally, when firms adopt green practices in logistics, it contributes to a green-oriented structure within the logistics sector, promoting a more substantial implementation of GLs in business operations (Carter & Carter, 1998). Therefore, the development level of the GLs industry can be examined from various perspectives. This study adopts Chu et al. (2017) perspective to analyze the development level of the GLs industry in terms of competitive pressure within the sector.

Regarding the relationship between the development level of the GLs industry and the GLs activities of logistics firms, recent studies have shown that industry environment variables significantly and positively impact the prompt implementation of green practices in business operations (Zhang et al., 2020). The industry development level is a significant factor that drives firms to adopt GLs (Yao et al., 2019). By adopting new, safe, and environmentally friendly technologies, advanced logistics firms contribute to creating a sustainable industry structure, thus encouraging other firms to adopt GLs practices more swiftly (Zhang et al., 2020). Furthermore, our study approaches the GLs industry (GS) development level from the perspective of firms and competitors, focusing on the GS factors related to current industry players' strategies, standards, and GLs application methods (Chu et al., 2019). Thus, when competitors adopt effective and efficient GLs practices, other firms can implement GLs more efficiently and cost-effectively while significantly reducing risks (Vega et al., 2019). Consequently, research on industrial factors in general and the development level of the GLs industry, in particular, indicates a significant and positive impact of the development level on the implementation of GLs by logistics firms. Given the particular context and the research purposes, we expect a positive and robust relationship between these two factors. Therefore, the research hypothesis regarding the impact mechanism of the development level of the GLs industry on GLs practices is stated as follows:

H3: The development level of the GLs industry has a positive and significant impact on the GLs activities of logistics firms.

2.2.4. Customer Pressure

As a support service crucial in the supply chain system, the logistics sector's customers include organizational customers (B2B) and individual consumers (B2C). The trend of customers increasingly prioritizing logistics firms with green practices is becoming more prominent (Chu et al., 2017). In the supply chain system, logistics service providers and GLs play an essential role in providing solutions and services that integrate environmental thinking into supply chain management (Colicchia et al., 2013; Lam & Dai, 2015). As a result, firms implementing GLs contribute to economic and social benefits for their customers (Bask et al., 2016). Customer requirements for environmental management or adherence to environmental standards in GLs activities can pressure GLs firms to comply (Sarkis et al., 2011). With the growing attention to GLs in both developed and developing countries (Colicchia et al., 2013; Ellram, 1996; Guarnieri et al., 2015; Perotti et al., 2012), customers today are not only concerned about price, service quality, and timely delivery of logistics (Wolf & Seuring, 2010) but also prioritize choosing services from firms that practice GLs (Björklund & Forslund, 2013). Nowadays, customers, particularly manufacturers, face significant pressure to minimize adverse environmental impacts to enhance ecological efficiency. Consequently, they seek logistics partners who can help address these pressures (Lai & Wong, 2012). Therefore, along with providing excellent support and logistics services, the prompt implementation of green practices, such as reducing emissions and helping manufacturing customers rationalize environmental management activities, is seen as an

advantage in acquiring and retaining customers (Lai & Wong, 2012; Lam & Dai, 2015).

Regarding the relationship between customer pressure and the GLs activities of logistics firms, it is evident that customer requirements and proposals are crucial factors that influence firms. These pressures strongly impact the decision to implement green logistics activities in logistics service firms (Baz & Laguir, 2017). Logistics customers are diverse, seeking service providers to assist with transportation and sometimes warehousing (Wolf & Seuring, 2010). Today's customers not only care about service quality, price, or delivery times but also prefer to choose logistics firms that apply green practices in warehousing, packaging, and transportation (Bask et al., 2016). Recent studies have highlighted the strong influence of customer pressures in driving the GLs activities of logistics firms (Björklund & Forslund, 2013; Chu et al., 2019; El Baz & Laguir, 2017; Lai & Wong, 2012). In the context of logistics firms in Vietnam, the implementation of GLs is anticipated to be significantly influenced by Customer Pressures. Therefore, the hypothesis regarding the relationship between these two factors is stated as follows:

H4: Customer pressures have a positive and significant impact on the GLs activities of logistics firms.

2.2.5. Research Hypotheses and Model

The research model is established based on the hypotheses indicating the relationships between the external factors and GLs activities, as shown in Figure 1.

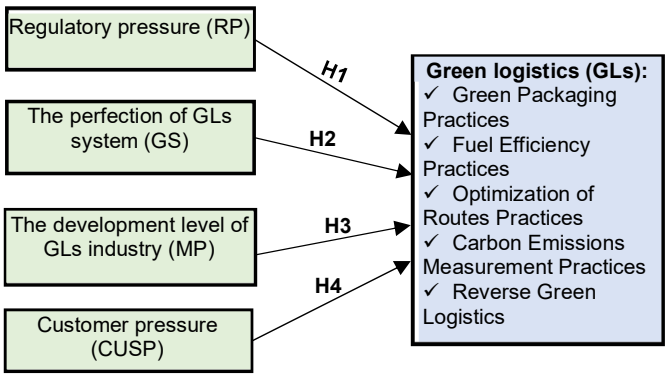

Figure 1: The Research Model

3. Research Methodology

3.1. Measurement and Questionnaire Design

The measurements for the constructs in the model are adapted and developed from previous studies. Accordingly, "Regulatory pressure" is a reflective and 1st-order construct, coded RP (RP – RP2), its measurement is adapted from Kuei et al. (2015) and Lin et al. (2021). "The perfection of GLs system" is a reflective and 1st-order construct, coded GS (GS1 – GS3); its measurement is adapted from Kuei et al. (2015) and Lin et al. (2021). Also, "The development level of GLs industry" is a reflective and 1st-order construct, coded MP, including 03 observation variables (MP1 to MP3), which is adapted from Chu et al. (2017). "Customer pressures" is a reflective and 1st-order construct, coded CUSP, with the measurement including 04 observation variables (CUSP1 – CUSP4) adapted from Lai & Wong (2012). For GLs, which is a reflective and 2nd-order construct, coded GLs, with the measurement adapted and developed from McKinnon et al. (2015), Molina-Besch & Pålsson (2014), and Weng et al. (2015). Accordingly, there are five 1st-order variables reflecting GLs, including Green Packaging Practices (GPP) with 07 observation variables (GPP1 to GPP7); Fuel Efficiency Practices (FEP) with 07 observation variables (FEP1 to FEP7); Optimization of Routes Practices (ORP) with 04 observation variables (ORP1 to ORP4); Carbon Emissions Measurement Practices (CEMP) with 06 observation variables (CEMP1 to CEMP6); and Reverse Green Logistics (RGL) with ten observation variables (RGL1 to RGL10). Detailed information on the constructs and their items is expressed in Table 1.

3.2. Sampling

The unit sample of this study is a logistics firm operating in Vietnam. Due to the high cost and impracticality of a comprehensive survey, a sampling method was used. The authors first stratified logistics firms in Vietnam by geographic region to select a representative sample. Firms were chosen based on having a headquarters or branch in key markets representing Northern, Central, and Southern Vietnam. The sample consisted of the Vietnam Logistics Association (VLA) members as of June 2023. Within each stratum, a random sampling method was applied.

To obtain reliable and valuable information about the current state of the research issue, the study distributed questionnaires to middle and senior management within logistics firms in Vietnam. The choice of this group of managers is based on the following: first, middle and senior managers are primarily responsible for the business performance; therefore, they have the most comprehensive and accurate understanding of the firm's overall status and specifically the GLs activities; second, these managers are responsible for or involved in planning and implementing GLs strategies. Consequently, surveying this group allows the researchers to gather precise and comprehensive information about the research issue. Therefore, the survey included a question about the respondent's position to facilitate classification and filtering of responses. Surveys

not filled out by managers at the Department Head/Deputy Department Head or higher level were excluded from subsequent analysis. Additionally, the current position's duration significantly impacts the responses' quality. Managers with longer tenure will likely have a more precise and more detailed understanding of the logistics firm. Thus, to ensure the reliability of the responses, a question about the length of time in the current position was included in the survey. The study will select responses from those who have held their current position for at least one year.

To collect data, the research team used a direct approach by arranging meetings and delivering questionnaires directly to the representatives of logistics businesses. The data collection process was as follows: First, the research team selected 400 logistics firms with headquarters, branches, or offices in all three regions of Northern, Central, and Southern Vietnam from the list of logistics firms that are members of the Vietnam Logistics Association. Within each region, firms were randomly selected in proportion to the regional distribution. Next, the team called and emailed invitations to respond to the questionnaire. Upon agreement, the person responsible for collecting the surveys visited the logistics firms to deliver the questionnaires and schedule a time to collect the completed surveys. With 400 questionnaires distributed, the research team expects to collect at least 400 responses, with a validity rate of 70% or higher, to meet the analysis requirements.

3.3. Data Analysis

The collected data will be cleaned and classified before being processed and analyzed. Due to the complexity of the variables and the short survey period, which results in a relatively small sample size, this study chose PLS-SEM as the data analysis technique, using Smart-PLS version 4.0 for analysis.

The content of the data analysis process in quantitative research includes two steps: (1)- Assessment of the Measurement Model and (2)- Assessment of the Structural Model.

4. Research Results

4.1. Descriptive Statistics of Samples

With 400 surveys distributed between early July 2023 and mid-November 2023, 350 responses were returned. The cleaning data process removed 69 invalid answers due to: (1)- All responses were identical (18 surveys); (2)- Answers were marked in a zigzag pattern (13 surveys); (3)- More than one option was marked for a single question (18 surveys); (4) The response was not marked on any option (6 surveys); (5) The respondent was not a mid-level or higher manager in logistics firms (5 surveys); (6) The respondent indicated less than one year in the current position (9 surveys). Ultimately, the number of valid surveys was 281, representing 80.29% of the total surveys distributed.

Regarding the representatives of logistics firms answering the survey: In terms of age, respondents aged 30 to under 40 years make up the largest group, over 38% (108 out of 281 respondents), followed by the middle-aged group, aged 40 to under 50 years, at 27.4%; representatives under 30 years are the third largest group, equivalent to 61 out of 281 respondents. Regarding gender, the proportion of male respondents is approximately 5% higher than that of female respondents. Regarding educational background, over 61% of respondents indicated they had a bachelor's degree or equivalent; the figure of respondents with master's and doctoral degrees is also significant, totaling 78 out of 281 respondents.

Regarding job title, the highest proportion of survey respondents hold the position of department head or equivalent, accounting for 123 out of 281 respondents, followed by managers holding the position of Deputy General Director and/or Deputy Director of logistics firms. This data ensures the respondents' comprehensive understanding of the firm's situation, allowing them to provide detailed answers. Regarding experience, most managers representing logistics firms who responded to the survey have substantial experience, with more than two-thirds having been in their current position for three years or more, followed by managers with one to less than three years of experience, with 31%. These numbers indicate that managers can effectively grasp the operations of logistics firms in general and the GLs practices in particular, ensuring they provide quality responses for the study.

4.2. The Measurement Model

Given that a dependent variable is a reflective and second-order construct (GLs), construct reliability and convergent validity must be assessed twice. The measurement for all nine first-order latent variables was assessed in the first instance. A second round of testing was conducted after ensuring the measurement quality for all first-order variables. Initially, the second-order variable (GLs) needed to be processed by sequentially incorporating the latent scores of the first-order variables to transform these first-order variables into measures for the corresponding second-order variable. The test results showed:

Firstly, when assessing the reliability and convergent validity for all 9 first-order variables, it was observed that: (1) The outer loading for most variables met the requirement, with values exceeding 0.7. However, there were five

observation variables with outer loadings below the minimum threshold: GPP5 = 0.602 < 0.7; GPP7 = 0.682 < 0.7; ORP1 = 0.666 < 0.7; CEMP4 = 0.520 < 0.7; RGL3 = 0.658 < 0.7. Consequently, the authors decided to exclude these five observation variables (CEMP4, GPP5, GPP7, ORP1, RGL3) and conducted a second round of testing for the measurement model involving the remaining 9 first-order variables. The results of the reliability and convergent validity of the first-order variables, after excluding the 5 observation variables, showed that all observation variables met the requirements for outer loading, and Cronbach's Alpha, CR (rho_C), and AVE for all constructs were all satisfactory. Detailed results regarding Outer loading, Cronbach's Alpha, and CR (rho_C) are presented in Table 1.

After confirming the reliability and convergent validity of the first-order variables, the model was constructed, and the measurement model for the second-order variables was tested. As previously described, latent scores were used to map the first-order variables reflecting the second-order variable, thereby transforming these reflecting first-order variables into measures for the corresponding second-order variable. The specific results are presented in Table 1.

The results of the construct reliability test (Table 1) indicate that all constructs meet the requirements, with Cronbach's Alpha and CR (rho_C) being high, ranging [0.874, 0.957] and [0.925, 0.967], respectively. Thus, it can be affirmed that all the constructs in the model exhibit satisfactory reliability. Subsequently, the convergent validity was assessed through Outer Loadings and Average Variance Extracted (AVE) (Table 1). Because all observation variables have outer loadings exceeding 0.7 and the AVE scores for all constructs are above the recommended minimum threshold of 0.5 (Hair et al., 2014), the measurements ensure adequate convergent validity.

Table 1: The Examination of the Construct Reliability and Convergent Validity

Items and constructs	Outer loading	Cronbach's Alpha	CR (rho_C)	AVE
Regulatory pressure (RP)		**0.874**	**0.940**	**0.886**
RP1: Government sets environmental regulations for logistics operations	0.926			
RP2: Industrial associations require us to conform to environmental regulations	0.957			
The perfection of GLs system (GS)		**0.949**	**0.967**	**0.908**
GS1: Government provides financial support for adopting green practices	0.952			
GS2: Government provides technical assistance for adopting green practices	0.951			
GS3: Government helps training the manpower with green logistics skills	0.956			
The development level of GLs industry (MP)		**0.948**	**0.967**	**0.906**
MP1: Our competitors' earlier implementation of green practices provided a benchmark and guidance for our company's green practices implementation.	0.943			
MP2: Competitors have a strong influence on our company's green practices implementation.	0.958			
MP3: The green environmental management of our firm will be affected by competitors' green environmental protection strategy	0.955			
Customer pressures (CUSP)		**0.897**	**0.927**	**0.762**
CUSP1: Our customers consider that it is our responsibility to retrieve reusable products from the markets	0.840			
CUSP2: Our customers require us to be ISO 14000 certified	0.841			
CUSP3: Our customers carry out environmental audits of our firm.	0.919			
CUSP4: Our customers take part in our product return program.	0.889			
Green logistics (GLs)		**0.945**	**0.958**	**0.820**
Green Packaging Practices (GPP)	***0.897***	***0.921***	***0.937***	***0.683***
GPP1: Our firm uses recyclable materials (bioplastic. paperboard. cardboard) when packaging for vendors	0.905			
GPP2: Our organization is packaging using natural materials like dye-free paper which are less hazardous to the environment.	0.916			
GPP3: Our firm has created packaging boxes to preserve materials and made space throughout the process of distribution	0.897			
GPP4: Our organization is making a continuous effort to find new reusable materials for packaging	0.886			
GPP6: Our firm is cooperating with vendors to use life cycle assessment to evaluate environmental impact of packaging during design and to standardize packaging	0.923			

Items and constructs	Outer loading	Cronbach's Alpha	CR (rho_C)	AVE
Fuel Efficiency Practices (FEP)	***0.916***	***0.932***	***0.945***	***0.710***
FEP1: We train drivers to practice driving techniques which are fuel efficient	0.880			
FEP2: We ensure correct tyre maintenance to enhance fuel efficiency	0.835			
FEP3: We use fuel efficient vehicles	0.812			
FEP4: We are implementing a continuous preventive maintenance program for our vehicles	0.827			
FEP5: We leverage technology (i.e. taking advantage of on-board diagnostics systems and new telematics) that aid in analyzing fuel purchases and vehicle performance	0.853			
FEP6: We are integrating real-time visibility of inventory in the warehouses aimed at reducing unnecessary trips	0.857			
FEP7: We have organized supplier consignments to combine freight costs and negotiate better rates and leverage multiple modes (e.g. use of railway line)	0.833			
Optimization of Routes Practices (ORP)	***0.897***	***0.914***	***0.939***	***0.795***
ORP2: Our firm directs drivers by automatically providing driving directions based on run sheet data to the trucks next stop	0.902			
ORP3: Our company provides a graphical view of the calls to a driver. re-calculating automatically the route when a driver selects a manual stop which is out-of-sequence	0.932			
ORP4: Our organization has statistics on driver and fleet to offer an enhanced level of understanding of fleets operational efficiency and help in pinpointing areas where costs can be reduced or improve productivity like in regrouping of goods	0.910			
Carbon Emissions Measurement Practices (CEMP)	***0.916***	***0.898***	***0.925***	***0.678***
CEMP1: Our company obtain from vehicle manufacturers a Life Cycle Assessment (LCA) showing the complete carbon emission from the vehicle assembly to its usage and its disposal.	0.847			
CEMP2: Our company has a purchased carbon offsets to compensate all carbon emissions caused by our vehicles e.g. tree planting	0.885			
CEMP3: Our firm often replaces older vehicles with newer ones which emit less to the environment	0.846			
CEMP5: Our firm's carbon emission report has all information needed for decision making by both the external and internal users.	0.908			
CEMP6: Our firm's carbon emission information is reported in a coherent. neutral and factual manner based on audit trail which is clear	0.871			
Reverse Green Logistics (RGL)	***0.923***	***0.957***	***0.963***	***0.723***
RGL1: Our company offers product vendors. the product recall or packaging return or take-back service	0.822			
RGL2: Our firm makes customers aware of product recall service provided by the company	0.867			
RGL4: Our organization provides logistics service for reusable containers to product vendors	0.822			
RGL5: Our firm provides logistics service for on-site disposition	0.855			
RGL6: Our company provides to product vendors. rework services for their returned products	0.859			
RGL7: Our organization receives logistics services from a vendor for liquidation of returned products	0.895			
RGL8: Our firm offers special incentives to those who return packaging materials	0.859			
RGL9: Our company provides suitable guidance to clients on the environmental aspects of handling usage and disposal of the vendor's products	0.898			
RGL10: Our firm returns used packaging and products to suppliers for recycling or reuse	0.893			

Next, the discriminant validity was assessed through the HTMT (Heterotrait-Monotrait Ratio) indices between pairs of variables. Henseler et al. (2015) state that the HTMT ratio should be less than 0.900 to ensure discriminant validity. Table 2 shows that all indicator pairs have HTMT values below the recommended maximum threshold. This result also implies that the research model ensures accuracy in discriminant validity.

Table 2: The HTMT score

	GS	MP	CUSP	GLs
RP	0.647	0.631	0.583	0.643
GS		0.846	0.778	0.879
MP			0.836	0.863
CUSP				0.785

The results in Table 2 indicate that the HTMT indices for all indicator pairs are below 0.900. Specifically, the lowest HTMT value is $HTMT_{RP\text{-}SPr} = 0.523$, and the highest is

$HTMT_{GS\text{-}GLs}$ = 0.897, less than 0.900. Thus, the variables in the research model demonstrate apparent independence and distinctiveness. In other words, the measurement indicators in the research model achieve accurate discriminant validity. Therefore, the measurement model meets the required criteria, and the subsequent analysis steps can proceed.

4.3. The Structural Model

As previously described, the evaluation of the structural model is conducted after the assessment of the measurement model (Hair et al., 2014). This process simplifies and streamlines the structural model assessment. Figure 2 illustrates the structural model after replacing the first-order latent variables with observed variables for the corresponding second-order variables.

4.3.1. Assessment of Multicollinearity

In the initial step of structural model evaluation, it is necessary to check for multicollinearity in the model. Since all the constructs in the model are reflective, multicollinearity is assessed by examining the Inner VIF (Variance Inflation Factor) indices. The results of the Inner VIF test are reported in Table 3. According to Henseler et al. (2015), the Inner VIF value must be less than 10 to ensure that multicollinearity does not exist within the model. The results presented in Table 3 show that the Inner VIF indices for the relationships within the research hypotheses are substantially below the recommended maximum of 10. Thus, it can be confirmed that the research model does not exhibit multicollinearity, and the subsequent research steps can proceed.

Table 3: The VIF Scores

	RP	GS	MP	CUSP
GLs	1.646	3.235	3.832	2.920

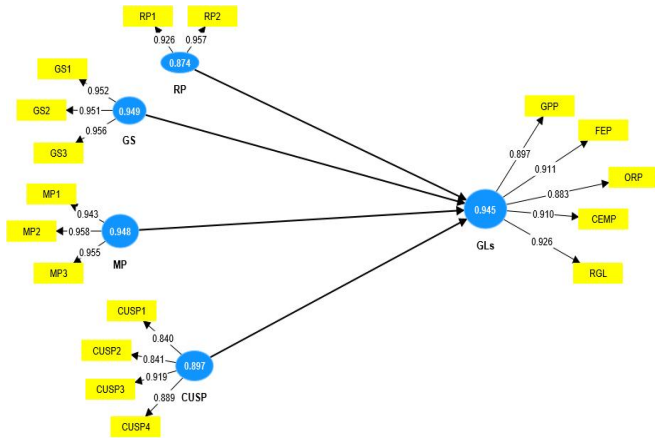

Figure 2: The structural model with latent scores for the first-order variables of GLs and FPr

4.3.2. Hypothesis Testing

First, check the R^2 and R^2_{adj} (Table 4). The results in Table 4 indicate that GLs are powerfully explained, up to 80.9% (R^2_{adj}), by all four independent constructs: Regulatory Pressure (RP), the Perfection of the GLs System (GS), the Development Level of the GLs Industry (MP), and Customer pressure (CUSP).

Table 4: R^2 and R^2_{adj}

	R^2	R^2_{adj}
GLs	0.772	0.768

Next, the direct relationships are tested. Hair et al. (2014) recommend examining the path coefficients, T-values, P-values, Confidence Intervals (Bias Corrected), and effect sizes (f^2). Table 5 and Figure 3 present a detailed report on the results of hypothesis testing for direct relationships.

Table 5: The Results of Hypothesis Testing

Hypothesis	Relationships	β	Std. deviation	T-Value	P-Value		CI		f^2	Results
							5%	95%		
H1	RP => GLs	0.077	0.070	1.099	0.136		-0.018	0.204	0.016	Not supported
H2	GS => GLs	0.433	0.060	7.181	0.000		0.326	0.525	0.254	Supported
H3	MP => GLs	0.323	0.071	4.574	0.000		0.204	0.433	0.119	Supported
H4	CUSP => GLs	0.133	0.060	2.228	0.013		0.034	0.231	0.003	Supported

In which:

RP : Regulatory pressure
GS : The Perfection of GLs System
MP : The development level of GLs industry
CUSP : Customer pressures
GLs : Green logistics

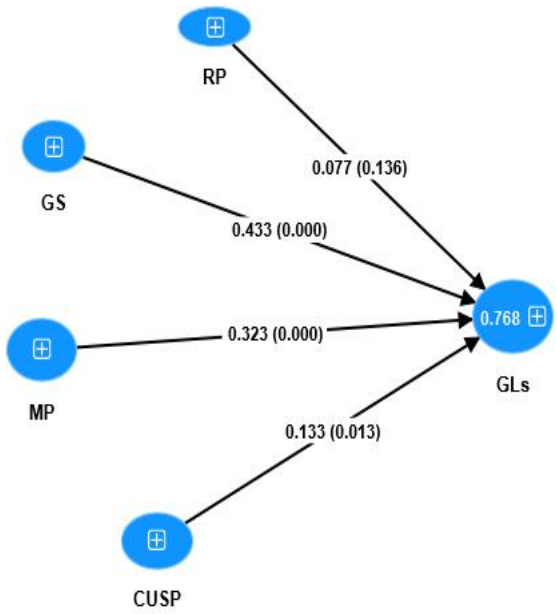

Figure 3: Results of Hypothesis Testing

The results in the table show that three hypotheses have met the criteria for P-Value, T-Value, and Confidence Interval Bias Corrected. Therefore, hypotheses H2, H3, and H4 are accepted in this study. Specifically, three exogenous factors significantly and positively impact the GLs (Green Logistics) activities of firms, including The Perfection of the GLs System (GS – H2), The Development Level of the GLs Industry (MP – H3), and Customer Pressure (CUSP – H4). However, hypothesis H1, which examines the relationship between Regulatory Pressure and GLs, is not supported in this study (T-Value = 1.099 < 1.65; P-Value = 0.136 > 0.05).

5. Discussions and Theoretical Contributions

The research results show that The Perfection of the GLs System (GS) has the most substantial and positive impact on the application of GLs (H2: β = 0.433; T-value = 7.181; P-value = 0.000; and f^2 = 0.254). This result highlights the critical role of developing, implementing, and refining GLs policies to support and promote the adoption of GLs activities among firms in Vietnam. This finding provides valuable empirical evidence reinforcing the positive relationship between GS and GLs, as previously reported by Aibin Li et al. (2020) and Zhang et al. (2020). As a macro-level factor, the synchronous implementation of supportive policies by the government and local authorities facilitates logistics firms' ability to adopt green practices in their business operations. This research reaffirms the pivotal role of governmental agencies, precisely The Perfection of the GLs System, in promoting GLs activities within firms, a role acknowledged by earlier studies. Additionally, it offers compelling evidence on how to encourage logistics firms to adopt GLs based on the issuance and coordinated implementation of supportive mechanisms from GS, including access to financial resources, human resources, and advanced technologies, thereby enhancing the effectiveness of GLs across five dimensions: Green Packaging Practices, Fuel Efficiency Practices, Optimization of Routes Practices, Carbon Emissions Measurement Practices, and Reverse Green Logistics. Moreover, while some previous studies have examined this relationship in economically advanced countries such as China and India, this research, conducted in a developing country with moderate economic potential like Vietnam, underscores the urgent need for state policies to encourage and support logistics firms in keeping pace with sustainable and environmentally friendly logistics trends.

Regarding the relationship between The Development Level of the GLs Industry (MP) and GLs in logistics firms, the research results demonstrate a positive effect of the industry factor, specifically The Development Level of the GLs Industry, on the application of GLs within firms (H3: β = 0.323; T-value = 4.574; P-value = 0.000; and f^2 = 0.119). This finding confirms the significant role of industry-level variables in promoting green practices among logistics firms. It provides reliable and valuable results to reinforce the positive relationship between these factors further, as previously discussed by Yang et al. (2019). Yao et al. (2019), Zhang et al. (2020). The research introduces a new perspective on industry-level awareness, focusing on direct pressures from competitors, which has been less explored in previous studies. Our results suggest that applying GLs by competing firms, especially pioneers in GLs, strongly motivates other logistics firms to follow suit. This finding also provides a new perspective on the mechanism of industry impact on current firms' GLs activities, particularly in developing countries like Vietnam. The results suggest that competitors create pressures and offer lessons, knowledge, experience, and standards to help firms adopt GLs more rapidly, efficiently, and cost-effectively while minimizing risks. Although Porter (1980) suggests that industry variables can be viewed from multiple perspectives, such as customers, suppliers, and competitors, our study approaches this from the perspective of industry development based on the current application and development status of firms within the industry, separating customer factors into an independent variable with equal importance to industry development. Thus, this represents a novel contribution, demonstrating the significant role of competitive pressures in shaping industry development and, consequently, influencing GLs activities within firms. Furthermore, while some previous studies have acknowledged this positive effect in developed and large

economies, our research provides reliable evidence that this effect is also significant in developing countries like Vietnam, affirming the impact of The Development Level of the GLs Industry on GLs activities in logistics firms.

For the effect of Customer Pressure (CUSP) on GLs in logistics firms, the research results affirm the significant role of customer pressures in accelerating the adoption of green practices in business operations (H4: $\beta = 0.133$; T-value = 2.228; P-value = 0.013; and $f^2 = 0.003$). This finding strengthens the previously established positive relationship, as noted by Baah et al. (2020), Chu et al. (2019) El Baz and Laguir, (2017), Lai and Wong (2012), Van den Berg and De Langen (2017). However, with $\beta = 0.133$, the slightest impact among the three accepted hypotheses implies that in the specific market context of Vietnam, customer pressure is not a particularly critical factor in influencing GLs adoption among logistics firms. This result contrasts with the recommendations of (Chu et al., 2019), which identified customer pressure as a significant influencing factor. This difference highlights the varying importance of factors influencing GLs adoption in Vietnamese logistics firms.

Despite these findings, the hypothesis concerning the effect of Regulatory Pressure (RP) on GLs (H1) was not supported. Although prior research by Ngwakwe (2022), Wang and Wang (2023), Zhang et al. (2022), Zhang et al. (2020) has indicated a significant relationship between these factors, our study did not find such an effect. This could be attributed to the lack of strong environmental regulations and enforcement of GLs practices in Vietnam. Although supportive policies are a strong influencing factor for GLs, the macro-management capability of the government has not significantly impacted the practical application of GLs among logistics firms. This finding suggests that further comprehensive research is needed to explore this relationship more thoroughly.

6. Practical Contributions

Based on the research findings, the following recommendations for logistics firms in Vietnam are proposed: (1)- Enhance Financial Support Policies: Strengthen financial support policies for logistics firms in Vietnam, such as preferential loan policies and interest rate subsidies for companies investing in environmentally friendly technologies, such as electric trucks, energy-efficient vehicles, or the use of renewable energy in their business operations. Consider providing loan guarantees to logistics firms to mitigate financial risks associated with investing in green solutions. Implement tax incentives and fee reductions. (2)- Increase Technical Support Policies: Establish Green Research Associations/Centers to provide specialized training and technical support on green technology in logistics. Develop certification systems for green technology applicable to logistics equipment and solutions. Invest in green technology infrastructure, such as installing electric vehicle charging stations and developing infrastructure in industrial zones and port areas to support logistics firms in adopting automation technology and energy-saving equipment in warehousing. (3)- Enhance Human Resource Training Policies: Collaborate with universities and vocational training centers to develop advanced training programs on green logistics, focusing on green technology, energy management, and emission reduction solutions. The Vietnam Logistics Association should work with companies and training institutions to organize short courses and certifications in relevant functional areas such as sustainable supply chain management, green data analysis skills, green warehousing equipment operation, and fuel-efficient truck operation.

Furthermore, as displayed in the research findings, to encourage logistics firms to deploy green practices in the logistics services, it is necessary to enhance all five functions of GLs, including Green Packaging, Fuel Efficiency, Optimization of Routes, Carbon Emissions Measurement, and Reverse Green Logistics. Hence, we suggest some solutions as follows:

Firstly, logistics firms must: (1)- Invest in R&D to explore new recyclable materials and improve existing materials through collaboration with research institutes, universities, and innovation centers. Engage with packaging material suppliers to encourage participation in green initiatives, such as designing reusable packaging (packaging that can be easily disassembled and recycled after use). (2)- Promote Innovative Packaging Solutions: Encourage innovative packaging ideas through competitions, internal programs, and collaboration with external partners. (3)- Establish Efficient Waste Management and Recycling Processes: Develop and implement efficient waste management and recycling processes, including collection, sorting, and recycling of materials, ensuring effective packaging waste handling. (4)- Implement and Adhere to Green Policies: Build and effectively implement green policies internally, ensuring strict compliance and enforcement.

Secondly, logistics firms must adopt automation technology to enhance transportation efficiency and reduce costs. For example, installing GPS technology and positioning systems for transport vehicles enables drivers and companies to track location, routes, and speed in real-time. This capability allows for more effective transportation planning, route optimization, reduced travel time, and improved performance. Additionally, it is necessary to perform regular maintenance, servicing, and repairs on truck systems to ensure optimal operational conditions, minimize breakdowns, and reduce repair costs.

Moreover, monitoring fuel consumption through software systems is essential for detecting anomalies and finding ways to reduce fuel usage. Furthermore, it is essential to enhance drivers' skills and operational proficiency. Organizing training programs for drivers on safe driving techniques and efficient vehicle operation is crucial.

Thirdly, balance finances to gradually transition to green transportation modes such as electric trucks, hybrid trucks, or trucks using biofuels (e.g., biodiesel) or natural gas (e.g., CNG/LNG). This transition significantly reduces emissions and helps logistics firms improve fuel efficiency.

Fourthly, actively and proactively participate in emission offset programs such as tree planting projects to compensate for CO_2 emissions. Support and engage in renewable energy projects like wind and solar energy to offset emissions and reduce dependence on fossil fuels. Logistics firms should also consider participating in carbon credit or offset certification programs to reduce emissions, build the company's reputation, comply with environmental regulations, and contribute financially to environmental protection projects such as reforestation programs, renewable energy development, or energy efficiency improvements.

Fifthly, logistics firms should diversify their transportation methods and flexibly combine different modes of transport to reduce emissions on long journeys. Consider integrating rail or water transport options. Given the advantages of sea and river routes, logistics firms transporting goods in Vietnam can easily access these transportation modes. Additionally, utilizing public transport systems or shared transport services is a viable solution to reduce the number of trucks needed.

Sixthly, it is essential to rapidly develop Reverse Green Logistics into a key service on par with other logistics services that companies are implementing. Concurrently, logistics firms must clearly and comprehensively disclose policies and procedures for Reverse Green Logistics, including processes and regulations for product and packaging returns, recycling, waste management, and goods returns.

7. Conclusion, Limitations, and Future Directions

This study aims to assess the impact mechanisms of external factors from various sources, such as the macro environment, competitors, and customers, on the application of GLs in logistics firms in Vietnam. Based on a survey of 281 logistics firms operating in Vietnam, the research confirmed the significant influence of three factors: the government's perfection of the GLs system, the development level of the GLs industry, and customer pressure on GLs within logistics firms in Vietnam. The study provided a relatively comprehensive picture of the factors affecting GLs from multiple perspectives: macroeconomic, industry-specific, and customer-related, which previous research had only evaluated from one or a few specific aspects. Based on the research findings, several implications for logistics firms' managers were suggested to encourage the adoption of green practices in their logistics services.

Nevertheless, this study has limitations that also serve as directions for future research expansion. Some limitations include: First, limited external factors: Although our study identified external factors influencing GLs and considered them exogenous variables in the research model, other factors were still not explored. Further studies on this topic should be conducted to expand to other influencing factors covering the macro environment and other industry-specific agents. Second, comprehensive evaluation of GLs impact: There is a need to continue researching to comprehensively evaluate the contribution of GLs to establishing and maintaining competitive advantages and enhancing firm performance.

Funding: This research is funded by the Vietnamese Ministry of Education and Training's scientific research project titled "Study of Factors Influencing Green Logistics in Vietnam and Its Impact at the Enterprise and Social Levels" code number: B2023 - TMA - 04.

References

Agyabeng-Mensah, Y., Afum, E., Acquah, I. S. K., Dacosta, E., Baah, C., & Ahenkorah, E. (2020). The role of green logistics management practices, supply chain traceability and logistics ecocentricity in sustainability performance. *International Journal of Logistics Management*, *32*(2), 538–566. https://doi.org/10.1108/IJLM-05-2020-0187

Agyabeng-Mensah, Y., & Tang, L. (2021). The relationship among green human capital, green logistics practices, green competitiveness, social performance and financial performance. *Journal of Manufacturing Technology Management*, *32*(7), 1377–1398. https://doi.org/10.1108/JMTM-11-2020-0441

Aibin Li, Chen, Y., & Wang, D. (2020). An empirical study of the factors influencing the willingness to implement green coal logistics in China. *Journal of Cleaner Production*, *245*. https://doi.org/10.1016/j.jclepro.2019.118932

Akgün, E. Z., Monios, J., Rye, T., & Fonzone, A. (2019). Influences on urban freight transport policy choice by local authorities. *Transport Policy*, *75*, 88–98. https://doi.org/10.1016/j.tranpol.2019.01.009

Baah, C., Jin, Z., & Tang, L. (2020). Organizational and regulatory stakeholder pressures friends or foes to green logistics practices and financial performance: Investigating corporate reputation as a missing link. *Journal of Cleaner Production*, *247*. https://doi.org/10.1016/j.jclepro.2019.119125

Bask, A., Rajahonka, M., Laari, S., Solakivi, T., Töyli, J., & Ojala, L. (2016). Environmental sustainability in shipper-LSP relationships. *Journal of Cleaner Production*, *172*, 2986–2998. https://doi.org/10.1016/j.jclepro.2017.11.112

Björklund, M., & Forslund, H. (2013). The inclusion of environmental performance in transport contracts. *Management of Environmental Quality: An International Journal*, *24*(2), 214–227. https://doi.org/10.1108/14777831311303092

Carter, C. R., & Carter, J. R. (1998). Interorganizational Determinants of Environmental Purchasing: Initial Evidence from the Consumer Products Industries*. *Decision Sciences*, *29*(3), 659–684. https://doi.org/10.1111/j.1540-5915.1998.tb01358.x

Centobelli, P., Cerchione, R., & Esposito, E. (2017). Environmental sustainability in the service industry of transportation and logistics service providers: Systematic literature review and research directions. *Transportation Research Part D: Transport and Environment*, *53*, 454–470. https://doi.org/10.1016/j.trd.2017.04.032

Chang, C.-H., & Lai, P.-L. (2017). An evaluation of logistics policy enablers between Taiwan and the UK. *Maritime Business Review*, *2*(1), 2–20. https://doi.org/10.1108/MABR-09-2016-0018

Cheng, Y., Masukujjaman, M., Sobhani, F. A., Hamayun, M., & Alam, S. S. (2023). Green Logistics, Green Human Capital, and Circular Economy: The Mediating Role of Sustainable Production. *Sustainability (Switzerland)*, *15*(2). https://doi.org/10.3390/su15021045

Chu, S. H., Yang, H., Lee, M., & Park, S. (2017). The impact of institutional pressures on green supply chain management and firm performance: Top management roles and social capital. *Sustainability (Switzerland)*, *9*(5). https://doi.org/10.3390/su9050764

Chu, Z., Wang, L., & Lai, F. (2019). Customer pressure and green innovations at third party logistics providers in China: The moderation effect of organizational culture. *International Journal of Logistics Management*, *30*(1), 57–75. https://doi.org/10.1108/IJLM-11-2017-0294

Colicchia, C., Marchet, G., Melacini, M., & Perotti, S. (2013). Building environmental sustainability: empirical evidence from Logistics Service Providers. *Journal of Cleaner Production*, *59*, 197–209. https://doi.org/10.1016/j.jclepro.2013.06.057

El Baz, J., & Laguir, I. (2017). Third-party logistics providers (TPLs) and environmental sustainability practices in developing countries. *International Journal of Operations & Production Management*, *37*(10), 1451–1474. https://doi.org/10.1108/IJOPM-07-2015-0405

Ellram, L. M. (1996). The use of the case study method in logistics research. *Journal of Business Logistics*, *17*(2).

Evangelista, P., Santoro, L., & Thomas, A. (2018). Environmental sustainability in third-party logistics service providers: A systematic literature review from 2000–2016. *Sustainability*, *10*(5), 1627.

González-Benito, J., & González-Benito, Ó. (2006). The role of stakeholder pressure and managerial values in the implementation of environmental logistics practices. *International Journal of Production Research*, *44*(7), 1353–1373.

Guarnieri, P., Sobreiro, V. A., Nagano, M. S., & Marques Serrano, A. L. (2015). The challenge of selecting and evaluating third-party reverse logistics providers in a multicriteria perspective: a Brazilian case. *Journal of Cleaner Production*, *96*, 209–219. https://doi.org/10.1016/j.jclepro.2014.05.040

Hair, J. F., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research. *European Business Review*, *26*(2), 106–121.

Hampus, G., & Henrik S. (2015). *Green Logistics in South Africa: A study of the managerial perceptions in the road transportation industry in South Africa.* Umea University, South Africa.

Henisz, W. J., & Delios, A. (2001). Uncertainty, Imitation, and Plant Location: Japanese Multinational Corporations, 1990-1996. *Administrative Science Quarterly*, *46*(3), 443–475. https://doi.org/10.2307/3094871

Henseler, J., Ringle, C. M., & Sarsstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, *43*(1), 115–135.

Hutomo, A., Mohd Saudi, M. H., & Sinaga, H. O. (2018). The part of role relational bonding: moderating relationship between green logistics and sustainability performance. *Journal of Fundamental and Applied Sciences*, *10*(1S), 732–751. https://doi.org/10.4314/jfas.v10i1s.55

Karaman, A. S., Kilic, M., & Uyar, A. (2020). Green logistics performance and sustainability reporting practices of the logistics sector: The moderating effect of corporate governance. *Journal of Cleaner Production*, *258*. https://doi.org/10.1016/j.jclepro.2020.120718

Khan, S. A. R., Qianli, D., SongBo, W., Zaman, K., & Zhang, Y. (2017). Environmental logistics performance indicators affecting per capita income and sectoral growth: evidence from a panel of selected global ranked logistics countries. *Environmental Science and Pollution Research*, *24*(2), 1518–1531. https://doi.org/10.1007/s11356-016-7916-2

Kuei, C. H., Madu, C. N., Chow, W. S., & Chen, Y. (2015). Determinants and associated performance improvement of green supply chain management in China. *Journal of Cleaner Production*, *95*, 163–173. https://doi.org/10.1016/j.jclepro.2015.02.030

Lai, K. hung, & Wong, C. W. Y. (2012). Green logistics management and performance: Some empirical evidence from Chinese manufacturing exporters. *Omega*, *40*(3), 267–282. https://doi.org/10.1016/j.omega.2011.07.002

Lam, J. S. L., & Dai, J. (2015). Environmental sustainability of logistics service provider: an ANP-QFD approach. *The International Journal of Logistics Management*, *26*(2), 313–333. https://doi.org/10.1108/IJLM-08-2013-0088

Lee, C. T., Hashim, H., Ho, C. S., Fan, Y. Van, & Klemeš, J. J. (2017). Sustaining the low-carbon emission development in Asia and beyond: Sustainable energy, water, transportation and low-carbon emission technology. *Journal of Cleaner Production*, *146*, 1–13. https://doi.org/10.1016/j.jclepro.2016.11.144

Lin, W. L., Ho, J. A., Sambasivan, M., Yip, N., & Mohamed, A. Bin. (2021). Influence of green innovation strategy on brand value: The role of marketing capability and R&D intensity. *Technological Forecasting and Social Change*, *171*.

https://doi.org/10.1016/j.techfore.2021.120946

Mariano, E. B., Gobbo, J. A., Camioto, F. de C., & Rebelatto, D. A. do N. (2017). CO2 emissions and logistics performance: a composite index proposal. *Journal of Cleaner Production*, *163*, 166–178. https://doi.org/10.1016/j.jclepro.2016.05.084

McKinnon, A., Browne, M., Whiteing, A., & Piecyk, M. (2015). *Green logistics: Improving the environmental sustainability of logistics*. Kogan Page Publishers.

Molina-Besch, K., & Pålsson, H. (2014). *Packaging for Eco-Efficient Supply Chains: Why Logistics Should Get Involved in the Packaging Development Process* (pp. 137–163). https://doi.org/10.1108/S2044-994120140000006006

Ngwakwe, C. (2022). Top Management Background and Corporate Green Energy Investment. *HOLISTICA – Journal of Business and Public Administration*, *13*(1), 133–142. https://doi.org/10.2478/hjbpa-2022-0009

Pazirandeh, A., & Jafari, H. (2013). Making sense of green logistics. *International Journal of Productivity and Performance Management*, *62*(8), 889–904. https://doi.org/10.1108/IJPPM-03-2013-0059

Perotti, S., Zorzini, M., Cagno, E., & Micheli, G. J. L. (2012). Green supply chain practices and company performance: the case of 3PLs in Italy. *International Journal of Physical Distribution & Logistics Management*, *42*(7), 640–672. https://doi.org/10.1108/09600031211258138

Porter, M. (1980). *Competitive Advantage: Techniques for Analysing industries and competitors*. Free Press.

Rakhmangulov, A., Sladkowski, A., Osintsev, N., & Muravev, D. (2018). Zelena logistika: sustav metoda i instrumenata – 2. dio. *Naše More*, *65*(1), 49–55. https://doi.org/10.17818/NM/2018/1.7

Richnák, P., & Gubová, K. (2021). Green and Reverse Logistics in Conditions of Sustainable Development in Enterprises in Slovakia. *Sustainability*, *13*(2), 581. https://doi.org/10.3390/su13020581

Sarkis, J., Zhu, Q., & Lai, K. (2011). An organizational theoretic review of green supply chain management literature. *International Journal of Production Economics*, *130*(1), 1–15. https://doi.org/10.1016/j.ijpe.2010.11.010

Seroka-Stolka, Oksana, & Ociepa-Kubicka, A. (2019). Green logistics and circular economy. *Transportation Research Procedia*, *39*, 471–479. https://doi.org/10.1016/j.trpro.2019.06.049

Solaja, O. M., & Adetola, O. B. (2017). Situating Green Practices within the Context of Sustainable Development Agenda. *Equidad y Desarrollo*, *30*, 195–220. https://doi.org/10.19052/ed.4250

Srivastava, V., & Gupta, A. K. (2023). Price sensitivity, government green interventions, and green product availability triggers intention toward buying green products. *Business Strategy and the Environment*, *32*(1), 802–819. https://doi.org/10.1002/bse.3176

Sureeyatanapas, P., Poophiukhok, P., & Pathumnakul, S. (2018). Green initiatives for logistics service providers: An investigation of antecedent factors and the contributions to corporate goals. *Journal of Cleaner Production*, *191*, 1–14. https://doi.org/10.1016/j.jclepro.2018.04.206

Timms, P. (2011). Urban transport policy transfer: "bottom-up" and "top-down" perspectives. *Transport Policy*, *18*(3), 513–521. https://doi.org/10.1016/j.tranpol.2010.10.009

Van den Berg, R., & De Langen, P. W. (2017). Environmental sustainability in container transport: the attitudes of shippers and forwarders. *International Journal of Logistics Research and Applications*, *20*(2), 146–162. https://doi.org/10.1080/13675567.2016.1164838

Van den Heuvel, F. P., de Langen, P. W., van Donselaar, K. H., & Fransoo, J. C. (2013). Regional logistics land allocation policies: Stimulating spatial concentration of logistics firms. *Transport Policy*, *30*, 275–282. https://doi.org/10.1016/j.tranpol.2013.09.022

Vega, L., Cantillo, V., & Arellana, J. (2019). Assessing the impact of major infrastructure projects on port choice decision: The Colombian case. *Transportation Research Part A: Policy and Practice*, *120*, 132–148. https://doi.org/10.1016/j.tra.2018.12.021

Vienažindienė, M., Tamulienė, V., & Zaleckienė, J. (2021). Green logistics practices seeking development of sustainability: Evidence from lithuanian transportation and logistics companies. *Energies*, *14*(22). https://doi.org/10.3390/en14227500

Wang, W., & Wang, X. (2023). Does provincial green governance promote enterprise green investment? Based on the perspective of government vertical management. *Journal of Cleaner Production*, *396*, 136519. https://doi.org/10.1016/j.jclepro.2023.136519

Weng, H.-H., Chen, J.-S., & Chen, P.-C. (2015). Effects of Green Innovation on Environmental and Corporate Performance: A Stakeholder Perspective. *Sustainability*, *7*(5), 4997–5026. https://doi.org/10.3390/su7054997

Wolf, C., & Seuring, S. (2010). Environmental impacts as buying criteria for third party logistical services. *International Journal of Physical Distribution and Logistics Management*, *40*(1–2), 84–102. https://doi.org/10.1108/09600031011020377

Yang, W., Wang, W., & Ouyang, S. (2019). The influencing factors and spatial spillover effects of CO2 emissions from transportation in China. *Science of The Total Environment*, *696*, 133900. https://doi.org/10.1016/j.scitotenv.2019.133900

Yao, X., Cheng, Y., & Song, M. (2019). Assessment of collaboration in city logistics: From the aspects of profit and CO2 emissions. *International Journal of Logistics Research and Applications*, *22*(6), 576–591. https://doi.org/10.1080/13675567.2019.1594733

Zhang, B., Yu, L., & Sun, C. (2022). How does urban environmental legislation guide the green transition of enterprises? Based on the perspective of enterprises' green total factor productivity. *Energy Economics*, *110*, 106032. https://doi.org/10.1016/j.eneco.2022.106032

Zhang, W., Zhang, M., Zhang, W., Zhou, Q., & Zhang, X. (2020). What influences the effectiveness of green logistics policies? A grounded theory analysis. *Science of the Total Environment*, *714*, 136731. https://doi.org/10.1016/j.scitotenv.2020.136731