

# The Relationship between Challenges Faced by Logistics Industry in Johor and the Implementation of Sustainable Logistics Practices

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## Abstract

Sustainable logistics is garnering increased attention within the logistics industry. With increasing environmental concerns and regulatory pressures, logistics companies nowadays are embracing green practices. However, there is a gap in understanding the specific challenges that logistics companies face when implementing these sustainable practices in Johor. Hence, this study focuses on identifying the relationship between the extent of challenges faced by the logistics industry in Johor and the implementation of sustainable logistics practices. A stratified sampling method was applied to divide the logistics companies in Johor into subgroups based on different logistics sector such as freight forwarding, maritime logistics, road freight, air freight and warehousing to ensure each logistics sector is adequately represented. By using the quantitative method, a survey was conducted among 153 logistics companies in Johor with a response rate of 66%. The data collected were analysed using descriptive and correlation analysis. The results indicated that challenges related to technology, government and policy, supplier and partner engagement, and organizational and management support have a significant relationship with sustainable logistics practices. Considering these outcomes, logistics companies should prioritize addressing challenges related to adoption of technology, government policies, supplier and partner engagement, and organizational management support to enhance their operational efficiency, achieve compliance with environmental regulations, gain a competitive advantage, and foster a sustainable and resilient logistics ecosystem.

## 1. Introduction

Logistics is a multifaceted discipline that integrates various components, including information, transportation, inventory management, warehousing, material handling, packaging, and security. The complexity of logistics stems from differing interpretations and scopes within the field, leading to varying definitions (Islam *et al.*, 2013). According to Robert (2021), logistics serves as the "connecting arrows" throughout the entire supply chain, facilitating the movement of labor, equipment, and materials. According to Calixto *et al.*'s (2016), logistics management consists of elements such as lead times, supply and demand management, inventories, transport, and such others. In other context, logistics management encompasses the planning, implementation, and control of the efficient and effective flow and storage of goods, services, and related information throughout the supply

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chain. This process spans from the point of origin to the point of consumption, with the goal of meeting customer requirements (Calixto *et al.*, 2016).

Sustainable logistics, also known as green logistics, is the implementation of supply chain management practices to minimize the environmental effects of the supply's distribution (Seroka-stolka, 2019). In recent years, there has been increasing attention on sustainable development, and the logistics industry, being one of the most highlighted sectors in global market, holds significant importance (Zagloel *et al.*, 2024). The attention had pushed logistics industry to evaluate their policies to minimize their negative effects on the environment. Its rapid growth has not only led to economic advancements and efficiency enhancements but also brought a various of environmental concerns. For instance, with the continuous rise in global trade, logistics activities have expanded rapidly, leading to higher energy consumption, waste generation, and carbon emissions (Rupp *et al.*, 2022). In past years, Malaysia's logistics sector has engaged in initiatives to promote sustainable development. However, as a developing country, Malaysia faces challenges and obstacles in implementing sustainable development practices. The logistics industry is crucial to Malaysia's economy, facilitating trade and significantly contributing to national growth. According to World Bank's Logistics Performance Index (2023), Malaysia ranks 26th out of 139 countries, indicating strong logistics performance. However, environmental issues remain a major concern. The rapid growth of the logistics sector has led to increased pollution, waste, and natural resource consumption (Khan *et al.*, 2019). Based on IQAir (2023), in Johor Bahru, the PM2.5 concentration exceeds the WHO's annual air quality guideline by a factor of 4.1, with pollutants including NO<sub>2</sub>, SO<sub>2</sub>, CO, black carbon, and VOCs primarily from freight transportation (Fen *et al.*, 2020). Despite the severity of these environmental issues, efforts are being made to implement sustainable logistics practices in Malaysia. These include labor practices, logistics service execution, pricing practices, and service offerings (Khan *et al.*, 2019). Notable efforts at the Digital Free Trade Zone logistics hub at KLIA have reduced transportation and emissions (Davasagayam, 2019). Companies like Lazada and Cainiao Smart Logistics Network are actively participating in these initiatives. Additionally, reverse logistics is being introduced to encourage sustainable practices (Aziz *et al.*, 2016). Embracing sustainable logistics practices mitigates environmental harm and enhances the quality of life for Malaysians. However, challenges such as high costs (Bešković & Jakomin, 2012), funding issues (Orji *et al.*, 2019), and technology integration (Abbasi & Nilsson, 2016) hinder implementation. Continuous research and innovation are essential, requiring collaboration between industry players and research institutions to develop practical solutions tailored to Malaysia's needs. To promote sustainable logistics practices, it is crucial to identify the challenges specific to Malaysia, particularly in Johor. These challenges include limited access to environmentally friendly technology, lack of incentives, and financial constraints (Sinha, 2021). There is a lack of studies focusing on these issues in the context of Johor. Therefore, this study aims to identify the challenges faced by the logistics industry in Johor and the adoption of sustainable logistics practices. Understanding these factors will help make logistics operations more environmentally friendly and economically sustainable. Addressing environmental issues and promoting sustainable practices require collaboration among stakeholders, governmental bodies, environmental groups, and academic institutions. Comprehensive strategies focusing on reducing carbon emissions, conserving natural resources, and promoting renewable energy are necessary. Implementing sustainable logistics practices should be seen as an investment in the long-term resilience and competitiveness of Malaysia's logistics industry, aligning with global sustainability goals and enhancing Malaysia's reputation internationally.

Therefore, to achieve the research objectives the extent of challenges faced by logistics industry in adopting sustainable logistics practices in Johor are identified. Furthermore, the level of sustainable logistics practices implemented by the logistics industry in Johor also identified. Consequently, the relationship between challenges faced by the logistics industry in Johor and the implementation of sustainable logistics practices is identified.

## 2. Literature Review

### 2.1 Logistics Industry Malaysia

The logistics industry in Malaysia has experienced significant growth, driven by the rise of e-commerce and the essential nature of logistics services, especially highlighted during the COVID-19 pandemic when the sector was deemed essential and allowed to operate under MCO (Kafi *et al.*, 2022). Nowadays, the logistics industry in Malaysia is experiencing a significant sustainability trend, with logistics companies seeking government support for financial and non-financial incentives to integrate green motor vehicles and develop sustainable policies to reduce environmental impacts (Ramli & Shakir, 2021). According to Rusli *et al.* (2022), the industry is seeing a push towards innovative green logistics practices, particularly in the manufacturing sector, to enhance sustainability and operational efficiency.

The implementation of green logistics by global companies like DB Schenker Malaysia demonstrates practical steps being taken, including the development of green logistics models to guide industry practices (Fen, 2017). Overall, the industry's move towards green logistics is supported by organizational, economic, and environmental

performance awareness, which are crucial for formulating sustainable business strategies and mitigating environmental impacts.

## 2.2 Sustainable Logistics Practice

Sustainable logistics balances economic, social, and environmental concerns, aiming to reduce negative environmental impacts while promoting long-term efficiency and social benefits (Shageeva, 2023; Paprzyca, 2020). It involves creating eco-friendly transportation systems and efficient operations. Practices in sustainable logistics include preserving environmental, economic, and social aspects for current and future generations (Gherardi, 2019; Okrent, 2022). Companies are increasingly adopting these practices due to the recognized benefits, such as reduced environmental impact, enhanced customer satisfaction, and lower operational costs (Mohsen, 2022; Scaburi *et al.*, 2019; Jayarathna *et al.*, 2022). Strategies include sustainable transportation, packaging, and warehousing is shown in Table 1.

**Table 1** Sustainable logistics definition and measurement

| Rank | Challenges                 | Author   |
|------|----------------------------|--|
| 1    | Sustainable transportation | Ventura (2023); Bentalha <i>et al.</i> (2023); Pradap & Alisherova (2023); Beredugo (2024); Hafizyar <i>et al.</i> (2022). |
| 2    | Sustainable packaging      | Pradap & Alisherova (2023); Beredugo (2024); Shaikh and Hyder (2023).  |
| 3    | Sustainable warehousing    | Pradap & Alisherova (2023); Tantra & Dadhich (2023).   |

### 2.2.1 Sustainable Transportation

Sustainable transportation encompasses various aspects of sustainable and environmentally friendly modes of transport. It involves reducing vehicular greenhouse gas emissions, promoting energy-efficient vehicles, and incorporating affordable options like electric and alternative fuel vehicles (Ventura, 2023). Additionally, sustainable transport focuses on minimising waste, improving supply chain ecology, and considering ethical and environmental factors alongside economic considerations through approaches like the balanced scorecard or fuzzy methods (Bentalha *et al.*, 2023). Furthermore, in the context of logistics, green transportation aims to decrease the carbon intensity of supply chains by utilizing dynamic vehicle routing and considering the Environmental Cost of Transportation, especially in the e-commerce industry (Pradap & Alisherova, 2023). Overall, sustainable transportation is crucial for mitigating environmental impacts, reducing pollution, and fostering sustainable urban mobility in developing countries (Hafizyar *et al.*, 2022).

### 2.2.2 Sustainable Packaging

According to Shaikh and Hyder (2023), sustainable packaging in logistics refers to environmentally friendly packaging practices aimed at reducing carbon footprints, waste, and pollution in the supply chain. It involves utilizing sustainable materials, implementing efficient packaging designs, and focusing on the 4 Rs (remove, reduce, reuse, and recycle) strategy (Pradap & Alisherova, 2023). Nowadays, companies are increasingly adopting green logistics practices to minimize the environmental impact of packaging in the supply chain (De Souza *et al.*, 2022). By integrating eco-oriented logistic management principles, businesses can enhance the sustainability of packaging.

### 2.2.3 Sustainable Warehousing

Sustainable warehousing refers to the implementation of environmentally friendly practices within warehouse operations to reduce carbon emissions and promote sustainability (Pradap & Alisherova, 2023). This concept is part of the broader scope of green logistics, which aims to minimize the negative impact on the environment while optimizing resource allocation in distribution activities. In the finding of Tantra & Dadhich (2023), Green warehousing involves initiatives such as utilizing energy-efficient systems, reducing waste generation, and implementing eco-friendly packaging solutions. By focusing on green warehousing strategies, companies can align their operations with sustainability goals and meet the increasing consumer demand for environmentally responsible practices in logistics.

## 2.3 Challenges in Adopting Sustainable Logistics Practices

Challenges in adopting sustainable logistics practices in the logistics industry include but not limited to the technology integration, government and policies support, infrastructure, and management support (Sinha, 2021). These challenges hinder the industry's ability to achieve sustainable economic and environmental outcomes, highlighting the importance of addressing them for long-term sustainability. Overcoming these challenges is

crucial for the advancement of green supply chain management and combating climate change effectively. Table 2 shows the challenges in adopting sustainable logistic practices.

**Table 2** Challenges in adopting sustainable logistics practices

| Rank | Challenges                            | Author  |
|------|---------------------------------------|---|
| 1    | Technology                            | Bosona (2020); Mangla <i>et al.</i> (2019); Orji (2019); Orji <i>et al.</i> (2019); Sinha (2021).               |
| 2    | Government and Policy                 | Gardas <i>et al.</i> (2019); Mangla <i>et al.</i> (2019); Orji (2019); Orji <i>et al.</i> (2019); Sinha (2021). |
| 3    | Supplier and Partner Engagement       | Gardas <i>et al.</i> (2019); Orji (2019); Orji <i>et al.</i> (2019); Sinha (2021).                              |
| 4    | Management and Organizational Support | Mangla <i>et al.</i> (2019); Orji (2019); Orji <i>et al.</i> (2019); Sinha (2021).                              |

### 2.3.1 Technology

Logistics industries are facing challenges which are related to technology integration. Sinha's (2021) observation regarding limited access to technology suggests that not all logistics stakeholders may have the necessary technological resources to adopt sustainable solutions. Based on research by Orji (2019), The lack of technology integration is a common issue in adoption of sustainable logistics practice, where disparate systems and technologies fail to communicate effectively. Without seamless integration, organizations may struggle to streamline processes and leverage data-driven insights to optimize their logistics practices for sustainability. Insufficient technological infrastructure, such as outdated equipment or inadequate internet connectivity, can impede the adoption of advanced logistics solutions and inhibit progress toward sustainability goals (Mangla *et al.*, 2019). Hence, overcoming technology challenges is crucial for the successful implementation of green logistics and achieving sustainable economic and environmental outcome.

### 2.3.2 Government and Policy

Government and policy present significant barriers to the implementation of sustainable logistics practices within the industry. The absence of government incentives creates a disincentive for companies to invest in sustainable initiatives (Sinha, 2021). Besides that, the unavailability of government support and policies had caused logistics companies lack of clear guidance or resources to pursue sustainable strategies effectively (Orji, 2019). According to Orji *et al.* (2020), a poor legal framework causes the regulatory uncertainties hinder compliance efforts and the investment in sustainable logistics practices. Moreover, the licensing hurdles as one of the challenges can lead to a complicated regulatory landscape (Gardas *et al.*, 2019). Therefore, overcoming government and policy challenges is essential for successfully implementing green logistics and attaining sustainable economic and environmental benefits.

### 2.3.3 Supplier and Partner Engagement

Engaging suppliers and partners pose challenges in implementing sustainable logistics practices. According to Sinha (2021), the interest and support from both suppliers and logistics partners is important to achieve an effective implementation of sustainable practices. Furthermore, improper communication and collaboration among logistics partners contribute to inefficiencies and difficulties in coordinating efforts towards sustainability goals. According to Carbollo-Penela *et al.* (2017), concentrating reduction efforts in specific stages of the supply chain through collaborative strategies is more effective in reducing the carbon footprint of products compared to individual actions by participants. Besides that, Han and Yuan (2019) had emphasized that communication, collaboration, learning, and trust are essential for managing a green supply chain effectively. Therefore, fostering strong communication channels and collaborative initiatives among logistics partners is vital for promoting sustainable practices in the logistics industry.

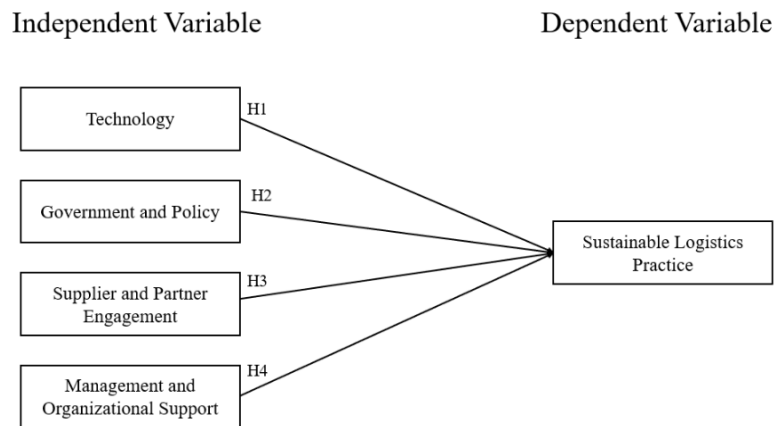
### 2.3.4 Management and Organizational Support

Management and organizational support play crucial roles in implementing green logistics. According to Setyadi *et al.* (2023), top management support is vital for reorienting human resource practices towards environmental sustainability goals, the lack of management support and commitment undermines efforts to drive sustainable change (Orji, 2019). Besides that, the shortage of human resources and requisite skillsets presents challenges in executing sustainable logistics practices, while an incompetent workforce may struggle to adapt to eco-innovation initiatives (Sinha, 2021). Inadequate training can cause employees may lack the necessary knowledge and skills to implement environmentally friendly practices effectively (Sinha, 2021) (Orji *et al.*, 2019). Hence, a combination

of supportive management, organizational learning, and stakeholder engagement is vital for effectively integrating green practices into logistics operations.

## 2.4 Research Framework and Hypothesis Development

Based on Fig. 1, the conceptual framework shows the independent variable is challenges in adopting sustainable logistics practices and the dependent variable is sustainable logistics practices. The dimensions of independent variables in this study include technology, government and policy, supplier and partner engagement, and management and organizational support. In this study, implementation of sustainable logistics practice is variable depending on challenges in adopting sustainable logistics practice. Based on the framework outlined above, several hypotheses were developed for testing, as shown in the proposed structure.



**Fig. 1** Conceptual framework

## 3. Research Methodology

### 3.1 Research Design

Research design, defined as the framework of methods and techniques chosen by a researcher to conduct their study, aimed for accuracy, reliability, validity, and generalizability (Wisenthige, 2023). The research design for this study involved a quantitative approach to assess the extent of challenges in adopting sustainable logistics practices and the level of their implementation. This study focused on dimensions such as technology, government and policy, supplier and partner engagement, and organizational support for challenges, and sustainable transportation, packaging, and warehousing for practices. Data were collected via an online questionnaire distributed to logistics companies in Johor, with statistical analysis employed to identify relationships between challenges and implementation levels.

### 3.2 Population and Sampling Design

In this study, the target population focused on logistics companies in Johor. According to the Johor Freight Forwarders Association (2024), this population consisted of 253 logistics firms, distributed across various sectors, including maritime logistics, road freight, air freight, and warehousing. The target population consisted of 253 logistics firms, distributed into 113 in freight forwarding, 30 in maritime logistics, 30 in air freight, 20 in road freight, and 20 in warehousing. From this total, a sample of 153 companies was selected using a stratified sampling method. The companies were selected proportionally from each logistics sector based on their distribution within the target population. Sampling design referred to a strategic plan for selecting samples in research, categorized into probability and non-probability methods (Burger & Silima, 2006). Non-probability methods included accidental, purposive, quota, and referral sampling. This study adopted stratified sampling to ensure proportional representation of diverse sectors within the logistics industry in Johor, allowing for more accurate analysis and reducing variance between groups.

### 3.3 Research Instrument

Research instruments served as tools for systematically and objectively collecting, examining, and presenting data, primarily through an online questionnaire method (Oben, 2021). In this study, the online questionnaire method was applied. The questionnaire comprised three parts: Part A covered demographic information, Part B addressed the extent of challenges in adopting sustainable logistics practices, and Part C focused on the level of implementation of sustainable logistics practices. Nominal and interval scales were employed, with nominal scales

for demographic profiles and interval scales for variables like the level of involvement in sustainability decisions and company sustainability efforts rating in Part B and Part C.

There are two types of measurement scales used in this study, which are nominal scale and interval scale. The nominal scale is applied in mostly Part A, which are demographic profiles, while variables like the level of involvement in sustainability decisions and company's sustainability efforts rating will apply the interval scale. Furthermore, Part B and C used the 5-point Likert scale, known as the interval scale, when gathering data from respondents.

**Table 3** Questionnaire structure design

| Part | Variable   | Measurement | Scale of measurement                           |   |
|------|--|-------------|--|---|
| A    | Gender   | Nominal     | Multiple Choice Questions Scale                |   |
|      | Educational background                               | Nominal     |  |   |
|      | Role within company                                  | Nominal     |  |   |
|      | Year of professional experience                      | Nominal     |  |   |
|      | Type of logistics job position held                  | Nominal     |  |   |
|      | Size of Company                                      | Nominal     |  |   |
|      | Level of involvement in sustainability decisions     | Interval    |  | 5-point Likert scale (Level of involvement) |
|      | Company's sustainability efforts rating              | Interval    |  | 5-point Likert scale (Rating Level)         |
| B    | Technology   | Interval    | 5-point Likert scale (Level of agreement)      |   |
|      | Government and policy                                | Interval    | 5-point Likert scale (Level of agreement)      |   |
|      | Supplier and partner engagement                      | Interval    | 5-point Likert scale (Level of agreement)      |   |
|      | Management and organizational support                | Interval    | 5-point Likert scale (Level of agreement)      |   |
| C    | Level of sustainable logistics practices implemented | Interval    | 5-point Likert scale (Level of implementation) |   |

### 3.4 Data Collection

Data collection was a crucial process involving the gathering and measurement of information on targeted variables. It was the foundation of statistics, requiring careful planning and adherence to established protocols or expert advice. According to Schneider *et al.* (2023), primary data referred to original data collected firsthand by researchers for a specific research project. This data was gathered directly from the source through methods like surveys, interviews, observations, or experiments. Primary data collection methods varied from quantitative approaches like questionnaires to qualitative methods such as interviews and focus groups. In this study, the researcher used a questionnaire as the main source of primary data collection from the respondents. According to De Wever *et al.* (2018), secondary data referred to information collected by others for purposes other than the researcher's own project, which could be reused for various studies. It was readily available online, such as on platforms like Google Scholar, Science Direct, and others, as well as in libraries, museums, and archives. In this study, the researchers used online journal references to enhance knowledge acquisition. Additionally, the researchers referred to the Johor Freight Forwarders Association (2024) to obtain statistics on logistics companies in Johor. This study was conducted in Johor. The survey method was employed in a quantitative research approach. The logistics companies in Johor were the respondents in this study. The survey was developed and distributed to a sample size of 153 companies (Krejcie and Morgan, 1970). This study focused on Johor due to its critical role as an economic hub with major ports and an airport, essential for Malaysia's import and export activities (Daeman, 2020).

### 3.5 Pilot Study

A pilot study, according to Von Klinggraeff *et al.* (2022), preceded the main research project, assessing the feasibility, reliability, and validity of methods and procedures (Persaud, 2022). Typically, researchers tested their instruments on a small sample to address potential issues (Persaud, 2022). This helped refine the research design and methods. Hair *et al.* (2016) suggested a Cronbach's Alpha of 0.6 or higher for scale reliability. Bujang *et al.* (2018) recommended over 30 participants for pilot testing. Thus, the pilot study conducted in this study required at least 30 survey respondents.

### 3.6 Data Analysis

In this study, data analysis involved utilizing various statistical techniques with SPSS software version 27. Descriptive, reliability, and correlation analyses were conducted to interpret the survey results, aligning closely with the research objectives. The insights gleaned from this phase were pivotal in addressing the research questions and achieving the study objectives.

#### 3.6.1 Descriptive Analysis

Descriptive analysis in research involved summarizing and describing data through measures of frequency, central tendency, and variability (Fulk, 2023). It provided a comprehensive understanding of sample characteristics and assisted in selecting appropriate inferential statistics and determining sample sizes for future studies (Lamaj, 2023). In this study, respondents' demographic data were analyzed using descriptive statistics, including mean, median, mode, range, and standard deviation.

#### 3.6.2 Reliability Analysis

Reliability analysis, crucial for assessing consistency in measuring constructs, often employed Cronbach's alpha (Tavakol & Dennick, 2011). This coefficient, ranging from 0 to 1, indicated internal consistency, with higher values signaling greater reliability (George & Mallery, 2003). A value of 0.60 or above was deemed reliable (Daud *et al.*, 2018). In this study, reliability analysis ensured measurement instruments yielded dependable results, enhancing validity and trustworthiness.

#### 3.6.3 Correlation Analysis

Correlation analysis, as per Morgan *et al.* (2010), assessed relationships between variables, measuring the strength and direction of the association. The correlation coefficient, "r," ranged from -1 to +1, with positive ( $r > 0$ ) indicating both variables increased together, negative ( $r < 0$ ) suggesting one increased as the other decreased, and 0 indicating no linear relationship (Schober *et al.*, 2018; Mukaka, 2012). This study employed correlation analysis to determine if challenges in adopting sustainable logistics practices correlated positively with their implementation level, aiding in understanding data patterns and associations.

## 4. Results and Discussion

### 4.1 Demographic Analysis

Table 4 shows the demographic profile of a total of 101 respondents involved in this study. Based on the table, most of the respondents were male (58.4%), held a Degree, Master's, or PhD qualification (58.4%), occupied an executive position (48.5%), and had 5 to 7 years of professional experience (29.7%). Additionally, the majority of respondents worked in procurement and supply chain/operation (28.7% and 27.7%, respectively), were employed by small-sized companies (45.5%), and had a high level of involvement in sustainability decisions (56.4%), which accounted for more than half. Most respondents rated their company's sustainability efforts as good (37.6%) and reported that their company had been in operation for 5 to 10 years (53.5%), also representing

**Table 4** Demographic profile of respondents

| Demographic            | Category                               | Frequency | Percentage (%) |
|------------------------|--|-----------|----------------|
| Gender                 | Male                                   | 59        | 58.4           |
|                        | Female                                 | 42        | 41.6           |
| Educational Background | Degree/ Master/ PhD                    | 59        | 58.4           |
|                        | STPM/ Diploma/ A-level                 | 34        | 33.7           |
|                        | O level /SPM/ Professional certificate | 4         | 4              |
|                        | Below SPM                              | 4         | 4              |
| Role within company    | Top management                         | 3         | 3              |
|                        | Head of department                     | 12        | 12             |
|                        | Supervisory positions                  | 23        | 22.8           |
|                        | Executives                             | 49        | 48.5           |
|                        | Operational staff                      | 11        | 11             |
|                        | Support staff                          | 3         | 3              |
|                        | Below 5 years                          | 17        | 16.8           |

|  |  |    |      |
|--|--|----|------|
| Year of professional experience  | 5-7 years  | 30 | 29.7 |
|  | 8-10 years   | 25 | 24.8 |
|  | 11-15 years  | 16 | 15.8 |
|  | Above 15 years   | 13 | 12.9 |
| Type of logistics position held  | Warehouse/ Distribution                                  | 23 | 22.8 |
|  | Procurement  | 29 | 28.7 |
|  | Transportation/Fleet                                     | 21 | 20.8 |
|  | Supply Chain/Operations                                  | 28 | 27.7 |
| Size of company  | Micro (5 and below)                                      | 1  | 1    |
|  | Small (5-74)   | 46 | 45.5 |
|  | Medium (75-200)  | 45 | 44.6 |
|  | Large (200 and above)                                    | 9  | 8.9  |
| Level of involvement in sustainability decisions   | No involvement   | 4  | 4    |
|  | Minimal involvement                                      | 12 | 11.9 |
|  | Moderate involvement                                     | 13 | 12.9 |
|  | High involvement   | 57 | 56.4 |
|  | Full involvement   | 15 | 14.9 |
| Company's sustainability effort rating   | Poor   | 6  | 5.9  |
|  | Fair   | 4  | 4    |
|  | Average  | 28 | 27.7 |
|  | Good   | 38 | 37.6 |
|  | Excellent  | 25 | 24.8 |
| How long has your company been operating in logistics industry?  | Less than 5 years  | 9  | 8.9  |
|  | 5-10 years   | 54 | 53.5 |
|  | 11-20 years  | 30 | 29.7 |
|  | Over 20 years  | 8  | 7.9  |
| Has your company obtained any sustainability-related certifications for its logistics operation (e.g., ISO 14001)? | Yes, we hold multiple certifications                     | 10 | 9.9  |
|  | Yes, we have one certification                           | 28 | 27.7 |
|  | No, but we are in the process of obtaining certification | 46 | 45.5 |
|  | No, we do not have any certifications                    | 17 | 16.8 |

## 4.2 Reliability Analysis

Table 5 shows the result of reliability analysis for actual study. The reliability test for the actual study indicated high internal consistency, with Cronbach's Alpha values for each item exceeding 0.8. According to Ahady, Gupta, and Malik (2017), Cronbach's alpha coefficient ranges from 0.0 to +1.0, with higher values indicating greater reliability of the variables being measured. Overall, the Cronbach's Alpha values above 0.8 for each variable indicated a good level of reliability. Furthermore, for the dependent variable, sustainable logistics practices, the Cronbach's Alpha coefficient was 0.968, indicating an excellent level of reliability.

**Table 5** Actual study

| Variables  | Cronbach's Alpha | N- item in scale | Interpretation |
|--|------------------|------------------|----------------|
| Independent Variables (Challenges in adopting sustainable logistics practices) |                  |                  |                |
| Technology   | .840             | 4                | Good           |
| Government and policy  | .830             | 4                | Good           |
| Supplier and partner engagement  | .851             | 4                | Good           |
| Management and organizational support  | .855             | 4                | Good           |
| Dependent Variables (Sustainable logistics practices)                          |                  |                  |                |
| Sustainable Logistics Practices  | .968             | 15               | Excellent      |

### 4.3 Descriptive Analysis

Table 6 shows the result of descriptive analysis of this study. Based on Table 6, the results showed that all challenges in adopting sustainable logistics practices revealed a high level of central tendency, with scores ranging from 3.21 to 4.20, categorized as "High" according to Moidunny (2009). Technology received the highest average mean score of 4.2, followed by supplier and partner engagement and government and policy, with average mean scores of 4.18 and 4.17, respectively. Management and organizational support had the lowest average mean score of 4.14. Thus, the findings reflected that respondents agreed with the challenges faced in adopting sustainable logistics practices. Additionally, the results for sustainable logistics practices also indicated a high level of central tendency, with an average mean score of 3.81. The findings highlighted a strong emphasis on sustainability in transportation, packaging, and warehouse operations.

**Table 6** Descriptive analysis

| Variables  | Average Mean Score | Average Standard Deviation | Level |
|--|--------------------|----------------------------|-------|
| Independent Variables (Challenges in adopting sustainable logistics practices) |                    |                            |       |
| Technology   | 4.2                | 0.923                      | High  |
| Government and policy  | 4.17               | 0.944                      | High  |
| Supplier and partner engagement  | 4.18               | 0.933                      | High  |
| Management and organizational support  | 4.14               | 0.916                      | High  |
| Dependent Variables (Sustainable logistics practices)                          |                    |                            |       |
| Sustainable Logistics Practices  | 3.81               | 1.148                      | High  |

### 4.4 Normality Test

Table 7 shows the result of normality test of this study. A normality test was conducted before proceeding with correlation analysis to determine the appropriate type of analysis. According to Steinskog *et al.* (2007), the Kolmogorov-Smirnov test was applied in this study, as the sample size exceeded 50 respondents. According to Razali and Wah (2011), the Kolmogorov-Smirnov test assessed data normality; if the p-value was less than 0.05, the null hypothesis of normality was rejected, indicating the data was not normally distributed. Since the significance values for all variables were  $p < 0.01$ , it was concluded that the data for both independent and dependent variables were not normally distributed. Hence, Spearman's rho correlation analysis was conducted to identify the relationship between the extent of challenges faced by the logistics industry in Johor and the implementation of sustainable logistics practices.

**Table 7** Kolmogorov-Smirnov test of normality

| Variables   | Kolmogorov-Smirnov |     |       |
|---|--------------------|-----|-------|
|   | Statistics         | df  | Sig.  |
| Independent Variable (Challenges in adopting sustainable logistics practices) |                    |     |       |
| Technology  | .349               | 101 | <0.01 |
| Government and policy   | .351               | 101 | <0.01 |
| Supplier and partner engagement   | .312               | 101 | <0.01 |
| Management and organizational support   | .318               | 101 | <0.01 |
| Dependent Variable (Sustainable logistics practices)                          |                    |     |       |
| Sustainable logistics practices   | .209               | 101 | <0.01 |

### 4.5 Correlation Analysis

Table 8 shows the correlation analysis for challenges in adopting sustainable logistics practices and sustainable logistics practices. The correlation results showed that technology, government and policy, supplier and partner engagement, and management and organizational support had statistically significant positive relationships with sustainable logistics practices at  $r = 0.437$ ,  $r = 0.340$ ,  $r = 0.237$ , and  $r = 0.327$ , respectively, with a p-value of 0.000. Therefore, all the hypotheses investigating the relationship between technology, government and policy, supplier and partner engagement, and management and organizational support with sustainable logistics practices were accepted. Hence, the findings indicated that technology, government and policy, supplier and partner engagement,

and management and organizational support were all significantly associated with the adoption of sustainable logistics practices.

**Table 8** Correlation analysis for challenges in adopting sustainable logistics practices and sustainable logistics practices

| Challenges in adopting sustainable logistics practices |                         | Sustainable logistics practices |
|--|-------------------------|---------------------------------|
| Technology   | Correlation Coefficient | .437**                          |
|  | Sig. (2-tailed)         | .000                            |
| Government and Policy                                  | Correlation Coefficient | .340**                          |
|  | Sig. (2-tailed)         | .000                            |
| Supplier and Partner Engagement                        | Correlation Coefficient | .237*                           |
|  | Sig. (2-tailed)         | .000                            |
| Management and Organizational Support                  | Correlation Coefficient | .327**                          |
|  | Sig. (2-tailed)         | .000                            |

## 5. Conclusion

This study aimed to examine the relationship between the challenges faced by the logistics industry in Johor and the implementation of sustainable logistics practices. The findings were based on data collected from 101 logistics companies using quantitative methods. The first objective identified the extent of challenges in adopting sustainable logistics practices. The results indicated that challenges related to technology, government and policy, supplier and partner engagement, and management support were all at a high level. This suggested that these factors played a significant role in hindering the adoption of sustainable practices and required focused attention.

The second objective evaluated the level of sustainable logistics practices implemented by the logistics industry in Johor. The findings showed a high level of implementation across all dimensions of sustainability, including transportation, packaging, and warehousing practices. Practices such as obtaining green building certifications and adopting recyclable packaging materials achieved the highest levels of implementation. The third objective examined the relationship between the identified challenges and the level of sustainable logistics practices implemented. The analysis revealed significant positive relationships, suggesting that addressing these challenges, particularly in areas like technology and government policy, led to greater adoption of sustainability practices within the logistics sector.

Overall, this study provided valuable insights into the challenges and opportunities within the logistics industry in Johor, particularly in the adoption of sustainable practices. By identifying key barriers and examining their relationship with the level of sustainable logistics implementation, this research underscored the importance of addressing critical issues such as technology, government policy, and stakeholder engagement. These findings not only contributed to a deeper understanding of the current state of sustainability in the logistics sector but also paved the way for future studies and actionable strategies. The study emphasized the need for collaborative efforts among industry players, policymakers, and researchers to drive meaningful progress toward sustainable logistics practices, ensuring long-term benefits for the environment, businesses, and society as a whole.

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## Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

## Author Contribution

The authors confirm contribution to the paper as follows: **study conception and design:** Ong Chia Seng and Wan Nurul Karimah Wan Ahmad; **data collection:** Ong Chia Seng and Wan Nurul Karimah Wan Ahmad; **analysis and interpretation of results:** Ong Chia Seng and Wan Nurul Karimah Wan Ahmad; **draft manuscript preparation:** Ong Chia Seng and Wan Nurul Karimah Wan Ahmad. All authors reviewed the results and approved the final version of the manuscript.

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