

## **Drivers and Barriers Implementing Green Logistics Among Logistics Companies in Selangor, Malaysia**

**Chen Chiaw Fen<sup>1</sup>, Nor Kamariah Kamaruddin<sup>1,\*</sup>, Norasmiha Mohd Nor<sup>1</sup> &**

<sup>1</sup>Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia, Batu Pahat, Johor, 86400, MALAYSIA

\*Corresponding Author

DOI: <https://doi.org/10.30880/rmtb.2020.01.01.004>

Received 30 September 2020; Accepted 01 November 2020; Available online 01 December 2020

**Abstract:** Nowadays, the environmental issue in Malaysia has become more severe due to the increase in environmental activities of human and industrial companies. Thus, one of the largest contributors of carbon dioxide (CO<sub>2</sub>) is freight transportation. Due to the increasing environmental awareness among the logistic sectors, most of the logistic companies preparatory to implement green logistics. Therefore, the purpose of this study is to identify what are the drivers and barriers in implementing green logistics among the logistic companies in Selangor, Malaysia. The population of the research is logistics companies in Selangor, Malaysia, which engaged with global business and ISO certified. The quantitative analysis was conducted in this study through a survey. The unit of analysis is the individual who employed in the logistics companies. Sampling random sampling was used in this study. The descriptive analysis was conducted to measure the drivers and barriers in implementing green logistics among logistics sectors in Selangor. Out of 113 sets of questionnaires distributed, only 105 sets were returned. The findings showed the highest mean value of 4.46 for drivers in implementing green logistics was "greener the environment of Malaysia". In contrast, "lack of government regulation and legislation" showed the highest mean value of 4.30 for barriers in implementing green logistics. Limitation in this study was time constraint and hawthorn effect. This study is vital as it will contribute a vital input and platform for decision-maker in implementing green logistics in Malaysia.

**Keywords:** Logistics, Green logistics, Drivers, Barriers

### **1. Introduction**

Recently, a severe worldwide threat of air pollution has become one of the significant challenges facing humankind and environment. Based on the reports of the air quality control data, the primary contaminants in several large cities in Malaysia include Nitrogen Dioxide (NO<sub>2</sub>) and Suspended

---

\*Corresponding author: [nkamariah@uthm.edu.my](mailto:nkamariah@uthm.edu.my)

2020 UTHM Publisher. All rights reserved.

[publisher.uthm.edu.my/periodicals/index.php/rmtb](http://publisher.uthm.edu.my/periodicals/index.php/rmtb)

Particulate Matter (SPM). These pollutions come mainly from unsustainable activities such as industrial emissions, land transportation, and open burning sources. Thus, among them, air pollution was most affected by land transportation (Afroz *et al.*, 2003). As a consequence, the Malaysia government has established the strategies, guidelines and initiative to the industry player in order to find a solution for those environmental issues. One of the strategies is to encourage the implementation of green logistics amongst the logistics industry.

Logistic can be defined as transportation, storage and, handling of products as they transfer from the raw material source, through the production system to their final point of consumption or sale (Piecyk *et al.*, 2015). Green logistics as defined by (Seroka-stolka, 2014) is the implementation of greenness into traditional logistics in order to reduce the negative externalities and environmental issues. Green logistics practices include assessing the effect of various delivery technique on the environment, minimizing the use of resources in logistics activities, decreasing and controlling the waste management (Sibihi & Eglese, 2009). Green logistics can be described from the point of view of sustainable manner, taking environment and social factors into account (Sibihi & Eglese, 2009).

### 1.1 Research Background

The logistics industry is known to be significant driver towards economic growth, for movement of people and goods. Most of the companies realize chances to increase their competitiveness and transform the company's operations when having a bigger focus on logistics. Malaysia logistics industrial include four main types of transportation which consists of air transportation, land transportation, sea transportation and rail transportation. The demand of logistics services in Malaysia growth continually from the year 2013 to 2018 and expected to continue the growth until the year of 2023. Consequently, logistics industry in Malaysia has been acknowledged as the significant contributor to boost economic growth and stimulate the trade activities. Logistic as the mainstay to the supply chain and is known as a key to stimulate trade, assist business efficiency and stimulate economic growth (Aziz, Jaafar, & Tajuddin, 2016).

Green logistics within organizations can be one of the important part influence the entire value and supply chains of the organization and their existence has recognized as the backbone of the company in maximizing profit through sustainability performance. According to The World Bank (2019), green logistics is rapidly gaining high-income and emerging economies and is likely to become more important elsewhere (Rose, Chew, & Hamid, 2018). In order to enhance capabilities of logistics service providers towards sustainability performance, the implementation of green logistics is vital. Hence, the implementation of green logistic is promoting energy efficiency and reduce carbon dioxide emission for environmental protection (Raju and James, 2017). Therefore, by addressing the barriers and drivers of green logistics implementation, the ability and effectiveness of logistics providers in becoming competitive and frontier in sustainable logistics industry can be realized.

### 1.2 Problem Statements

The government of Malaysia has put a number of efforts in order to protect environment especially among the industrial player. Hence, the research on environmental and sustainable development has become an important priority from the academic and industrial player. Thus, it is becoming more and more significant to exhibit that the organizations are concerned about their actions on the environment and offering activities that not only support the environment but also minimizing the operation cost which resulted the efficiency within the organization.

As discuss earlier, freight transportation is one of the main contributor to the environmental pollution. Therefore, it is important to adopt a practices and strategies which aims to reduce the environmental pollution such as green logistics. Green logistics covers all stages related to the eco-efficient management of forward and reverse products flows and data between the starting point and

the consumption point to satisfy or surpass consumer demand (Mesjasz-Lech 2011; Saroha, 2014 ; Pannirselvan *et al.*, 2016). Consequently, the implementation of green logistics practices is recognized to be important to integrate the environmental features into logistics activities, reducing the cost and managing the environmental aspects in every decision making process across logistics networks (Aziz *et al.*, 2016). Accordingly, green logistics practices among industry players have been noticed as one of the critical issues which are associated primarily with climate change, air pollution, noise, and other environmental features (Abduaziz *et al.*, 2015).

Regrettably, the level of readiness in implementing green logistics is still lack (Aziz *et al.*, 2016; Pannirselvan *et al.*(2016); Majumdar and Sinha (2019); Ojo, Mbowe & Akinlabi (2014) and need to be fully practice. These issues impede a logistics companies to be stay competitive and remain sustainable (Patil & Dolas (2015); Nadarajah, (2015) in the industry. Therefore, by addressing the drivers and barriers of green logistics implementation, the ability and effectiveness of logistics providers in becoming competitive and frontier in sustainable logistics industry can be realized.

In order to achieve a successful green logistics implementation, it is important to identify the drivers of green supply chain management (GSCM) within Malaysia context. Drivers of green supply chain management (GSCM) refer to the internal or external factors which motivate the logistics companies to reduce their environmental hazardous substances in their supply chain management (Sakundarini *et al.*, 2015). According to Rahman, Ho, and Rusli (2014) the green logistics implementation drivers within Malaysia context may be different from those western countries due to the differences in organizational cultures, legislation, and economic conditions. Therefore, this study conducted to identify the drivers and barriers in implementing green logistics amongst logistics industries in Selangor to represent Malaysia context.

Additionally, based researcher review, it is found that there are still limited studies focus in identifying the drivers and barriers of implementing green logistics in Malaysia. This resulting a gap and motivated the researcher to focus current study to identify the drivers and barriers in implementing green logistics activities.

### 1.3 Research Questions

- (i) What are the main drivers of implementing green logistic?
- (ii) What are the main barriers preventing companies from implementing green logistic?

### 1.4 Research Objectives

- (i) To identify the main drivers of implementing green logistic.
- (ii) To examine the main barriers preventing companies from implementing green logistic.

### 1.5 Significance of the Study

Although Malaysia government and NGO is starting to concern on environmental issues, but there is only few Malaysia ISO certified logistics companies implement the green logistic. This is because most of the companies are not really clear about what are the benefits when implementing green logistics to their companies, what is the barrier they need to consider when implementing it. Since is only a few and limited studies about the green logistic in Malaysia, this study contribute to the additional knowledge about the green logistic practices in Malaysia.

### 1.6 Scope of the Study

The purpose of this research is to determine the main drivers and barriers implementing green logistics among logistics companies in Selangor, Malaysia which conducting a global business and listed in Selangor Freight Forwarders and Logistics Association. Logistics companies been selected is

because they are main contributor of economy growth and trend of Malaysia. Besides, this study is focused on companies with certificate of International Organization for Standardization (ISO). According to The Sun Daily (2019), Selangor was chosen as the research area because it was a leading port (Port Klang) of maritime center and a cargo logistic hub established by the government in the year 2019. Most of the headquarter (HQ) of logistics companies which had been implement green logistics was also in the state of Selangor.

## 2. Literature Review

### 2.1 Green Supply Chain Management (GSCM)

Green supply chain management, one of the most important organization strategy used in current companies in integrating each operational stages to fulfill market needs and obtain profit is supply chain management. Choong, Chew, Syaiful, and Abdul (2015), defined supply chain management as a management and planning of all actions which include sourcing and purchasing, entirely logistics management activities and conversion. Besides, the SCM also includes matching and collaboration with a partner, which included suppliers, third party service providers (3PLs), mediators, and customers. Due to a strong public awareness and increasing of government rules, environmental issues cannot be ignored. Therefore, there is an urgency to find a way to include green strategy in an ordinary SCM called green supply chain management (Villanueva & Garcia, 2013).

Implementing green properties into the existing SCM is known as GSCM, which is fully integrate environmental consideration into a traditional way of SCM. It can be another view in GSCM which an industries have been slowly shifting towards eco-friendly supply chains by adding green technologies into their manufacturing process, product designs and distribution processes (Choong *et al.*, 2015).

According to Khairani, Rajamanoharan, and Thirumanickam (2012), GSCM can be stated as a SCM with the addition of environmental thinking which included product design, manufacturing processes, material selection, and sourcing that delivers the final product to the consumers. GSCM is aiming to reduce the environmental risks and impact produced by the company in order to balance the economic, operational and environmental performance of the organisation and supply chain partners.

There was no specific or clear definition to describe the GSCM since every researcher defined the concept with different way and it is difficult to explain it by a single definition (Islam, Karia, Fauzi, and Soliman, 2017). Even though every researcher defined the meaning differently but there were several terms still involved in, which is the sustainable supply network, demand sustainability social networks, maintainable of supply chains, green purchasing or green procurement, supply chain environmental management, green logistic, and green purchasing.

$$\text{Green Supply Chain Management (GSCM)} = \text{Green Manufacturing/Materials Management} + \text{Green Distribution or Marketing} + \text{Reverse Logistics} + \text{Green Purchasing}$$

**Figure 1: Green supply chain management**

### 2.2 Logistics

A short description of logistics is the task of handling the material and information flow across the supply chain. While it can be distinct as the organization, control, planning and execution of the flow of goods from purchasing and development, through manufacturing and distribution to the consumer

which can also be called an end user (Jonker, 2014). Logistic as the mainstay to the supply chain and is known as a key to stimulate trade, assist business efficiency and prod economic growth (Aziz, Jaafar, & Tajuddin, 2016). Logistics assist in getting a product and services when needed by the customer, it as a most important enabler growth of commerce and trade in an economy due to it is helpful in economic transactions (Kumar, 2015). The logistical activities include warehouse, merchandise transport, inventory management, managing of materials and all the information processing that is related. Lastly, the main aims of logistics are to meet the market demand in a way that meets customer satisfactions in the stage of lowest cost with the best use of resources and builds long term relationship with the customers (Saroha, 2014).

### 2.3 Green Logistics

Green logistics refers as a logistics system responsible for the environment, which not only involves forward logistics process from the purchase of raw materials, production, packaging, transportation, warehouse, to the delivery to customer's hands but also involve the reverse logistics dealing with the disposal and waste recycling (Cosimato and Troisi, 2015). It is also a supply chain management practices and strategies which aims to reduce the environmental and energy footprint of the warehouse, merchandise transport, inventory management, waste management, packaging, handling of materials and all the information processing that is related (Kumar, 2015). Green logistics consists of all activities related to the eco-efficient management of the forward and reverse flows of products and information between the point of origin and the point of consumption which the purpose is to meet or exceed customer demand (Mesjasz-Lech 2011; Saroha, 2014; Pannirselvan, Rahamaddulla, Muhammad, Maarof, & Sorooshian, 2016). In the nutshell, green logistics is the process of reducing damage to the environment due to the logistics operations of an industry. Which also a smart way to reduce supply chain waste and carbon impact.

#### 2.3.1 Elements of Green Logistics

There are six elements of green logistics as illustrate in figure 2, which include green packaging, green storage, green transportation, green technology, green purchasing and reverse logistics (Karia, 2016; Manjunath, 2014; Tuzun Rad and Gulmez, 2017; Rose, Chew, and Hamid, 2018).



**Figure 2: Elements of green logistics**

### 2.3.1.1 Green Packaging

Green packaging can be defined as a method of using packaging resources that improve the environment, economic and socially sustainable development (Karia, 2016). While green packaging can be clarify as packaging that can economically meet its functional requirements through its life cycle without any harm to the atmosphere or biological health, can be recycled and reused to meet the sustainable development needs (Rose *et al.*, 2018). Green packaging is most important part of a product and green supply chain, since many customers will look at the packaging of a product before quality of the product (Bohdan, 2018). The two major aims of green packaging are to protect the environment and saving resources. Redesign a product packaging is one of the ways every organization trying to apply it to meet the main aims of green packaging. The main decision should be considered before redesign a packaging is the selection of materials, dimensions, grouping and graphic artwork.

### 2.3.1.2 Green Storage

Green storage can be known as green warehouse, which can be, define as reasonable layout and design of organization facility such as storage area, building or warehouse that not only safeguards the merchandises but also help the organization to save the cost of operation and reduce the environment effect (Rose *et al.*, 2018). According to Zheng and Zhang (2010), reasonably required warehouse layout in order to save transportation costs and reduce transport mileage. It cannot be too loose or too dense, if too loose it will increase load rate and reduce efficiency. If too dense, it would rise the number of transport, the energy consumption and emissions of pollutants would be increase. Green storage will bring out a lot of benefits which allows logistics companies to easily manage and utilize the facility as arranging and storing of merchandises are temporarily take place in them before the merchandises are ship or send to the planned destination, estimated up to 50% of electricity can be saved if adopting green storage (Rose *et al.*, 2018).

### 2.3.1.3 Green Transportation

Green transportation can be defined as a method of handling delivery and using green vehicles that improve the environment, economic and social sustainable development, for example, use less fuel, biofuels, solar and natural green vehicles (Karia, 2016). The layout of cargo outlets and distribution centre will affect the transport system, a rational choice of routes can overcome repeated transport and circuitous by shortening the routes and unloaded rate. This strategy would ultimately reduce noise pollution and emissions from transportation (Rose, Chew, & Hamid, 2018).

### 2.3.1.4 Green Technology

Green technology is one element in green logistics use to cutting edge of innovation, technology or system that lets companies improve management and administration efficiently. It's also can be stated as an implement of information and communication technology, biological technology, a mixture of particular technologies and checking technology in the logistics management process. Four most beneficial technologies towards Logistics Company is freight forwarding software, transport management system, warehouse management system and e–shipping documents, RFID technology for tracking and tracing inventory (Rose *et al.*, 2018).

### 2.3.1.5 Green Purchasing

Green purchasing also can be referred to as green procurement which can be defined as environmental purchasing involve activities that include the reuse, reduction, and recycling of materials in the procedure of purchasing. This is a process of selection and purchase of product and services have a lesser or reduced effect on human health and the environment when compared with competing

products or services that serve the same purpose (Manjunath, 2014). This is a strategy with proven success record that includes purchasing products with recycled content.

### 2.3.1.6 Reverse Logistics

Rose, Chew, and Hamid (2018), defined reverse logistics is terms all activity related to a product and service after the point of sale, the final goal to improve or make more efficient aftermarket action and saving money. Reverse logistics aims to reuse unwanted materials such as waste materials, paper, etc. and repurposing it for production, use of returned or damaged products by sales through different networks (Kactioglu and Sengul, 2010).

### 2.4 Drivers of Green Logistics

Due to the increasing of greenhouse gas emission (GHG) and the amount of waste that comes from the supply chain system, many companies trying to find a different way to solve the aforementioned problem. According to Dhull and Narwal (2016), drivers can be defining as factors which inspire the logistics companies to reduce environmental hazardous sources in their logistics management system. Drivers can be referred to as benefits and initiatives linked with the Spurs for ecological awareness (Rensburg, 2015). Based on Table 1, there are top five drivers of implementing green logistics have been identified from the review of past studies. These drivers include government regulation and legislation, support from top management, gain economic benefits, gain competitive advantages and commitment of top management.

Government regulation and legislation was the top one drivers ranked by the previous studies. As the government started to strengthen the regulation and rising the awareness of environment conditions. Pressure from the government regulation and legislation become a crucial drivers. Top management support was another significant drivers, top management is vital in providing the resources and encourage the employees to learn new technology. A companies will gain economic benefits when implemented green logistics, due to the previous studies a good and well planned green system could lead to the waste reduction, less transportation costs, less energy cost, less material usage and increase the profit, indirectly which is a big motivator for the firms to make changes. Companies will make changes to fulfil the customer's needs, stronger their market position among the competitors, this cause the competitive advantages would be gained. Commitment of top management proved as one of the drivers affect the adoption of green logistics. The top management represent the decision maker in the company, they decide whether a company implement or not implement the green logistics.

**Table 1: Top five drivers implementing green logistics**

Rank	Drivers	Author
1	Government regulation & Legislation	Loke <i>et al.</i> (2017); Seyal and Rahman (2014); Lin and Ho (2011); Murthy <i>et al.</i> (2018); Seroka-stolka (2014); Zhang <i>et al.</i> (2014); Xianqmeng <i>et al.</i> (2015)
2	Support from top management	Loke <i>et al.</i> (2017); Kumar Piaralal <i>et al.</i> (2015); Lin and Ho (2011); Ho and Lin (2012); Lew <i>et al.</i> (2017); Murthy <i>et al.</i> (2018)
3	Gain economic benefits	Bohdan (2018); Lin and Ho (2011); Ho and Lin (2012); Murthy <i>et al.</i> (2018); Lew <i>et al.</i> (2017); Zhang <i>et al.</i> (2014).
4	Gain competitive advantage	Bohdan (2018); Seyal and Rahman (2014); Murthy <i>et al.</i> (2018); Lew <i>et al.</i> (2017); Zhang <i>et al.</i> (2014); Rui (2017)
5	Commitment of top management	Loke <i>et al.</i> (2017); Kumar Piaralal <i>et al.</i> (2015); Lin and Ho (2011); Ho and Lin (2012); Lew <i>et al.</i> (2017)

## 2.5 Barriers in Implementing Green Logistics

Barriers can be classified into two categories which are internal barriers and external barriers. Matters that involve organization external matters are categorized as external barriers, while issues involve an organization that will hinder a company from accomplishing its innovation initiatives known as internal barriers (Abdullah, Zailani, Iranmanesh, and Jayaraman, 2016). Based on the review of past studies conducted in this study, top five barriers that impede green logistics implementation as depicted in Table 2.

Mentioned high investment cost was one of the barriers due to different company size have different amount of revenue and SMEs rated this barrier as main. Purchasing of advanced and modern technologies, teaching employees through different educational programs and training or even hiring already qualified specialist will require huge expenses. Lack of top management support was another significant barriers, top management is vital in providing the resources and encourage the employees to learn new technology. Without the support from top management the employees might not willing to learn the new technology. Lack of knowledge or skill of green logistics was another barriers, top management was found have a strong relationship with the adoption since certain companies especially SMEs always lack internal expertise. The top management with green knowledge or skill was able to assess the benefits of new IT. Lack of commitment of top management was another vital barriers is because top management was the one who decide whether a company adopt or not adopt green logistics. Poor organizational culture was ranked as top five barriers because it directs towards the participation of top level management in motivating the employee.

**Table 2: Barriers in implementing green logistics**

Rank	Drivers	Author
1	High implementation cost	Gajendrum (2017); Pannirselvan <i>et al.</i> (2016); Rui (2017); Kumar Piaralal <i>et al.</i> (2015) ; Mirza Abdullah suhaiza <i>et al.</i> (2015); Bohdan (2018)
2	Lack of top management support	Gajendrum (2017); Pannirselvan <i>et al.</i> (2016); Bohdan (2018); Rensburg(2015
3	Lack of knowledge or skill of green logistics	Pannirselvan <i>et al.</i> (2016); Loke <i>et al.</i> (2017); Kumar Piaralal <i>et al.</i> (2015); Rensburg(2015
4	Lack of top management commitment	Pannirselvan <i>et al.</i> (2016); Bohdan (2018); Rensburg(2015)
5	Poor organizational culture	Pannirselvan <i>et al.</i> (2016); Bohdan (2018); Rensburg(2015)

## 3. Research Methodology

In order to analyze drivers in implementing green logistics amongst logistics companies in Selangor, list of 23 drivers adopted from past studies have been used in the questionnaire. Consequently, the list of 18 barriers that identified from previous study have been used to analyze the barriers that impede logistics companies in implementing green logistics. These drivers and barriers have been depicted in Table 3 and Table 4.

Accordingly, the list of drivers and barriers was used to construct a questionnaire for logistics companies using random sampling technique to approach the respondents. As listed in Selangor freight forwarders and logistics association, a total of 163 population of logistics companies with global



business and certified with ISO represent population of this study. The sample size of the current study is 113 as suggested by Krejcie and Morgan (1970). The returned rate of this study was up to 92.93%.

**Table 3: Drivers of green logistics implementation**  
 (Bolhan, 2018, Loke *et al.*, 2017, Kumar Piaralal *et al.*, 2015, Syehal and Rahman, 2014, Lin and Ho, 2011, Ho and Lin, 2012, Murthy *et al.*, 2018, Lew *et al.*, 2017, Seroka-Stolka, 2014, Zhang *et al.*, 2014, Folster and Nystron, 2010, Gangele and Verma, 2011, Xianqmeng *et al.*, 2015, Rui, 2017)

Drivers	Author													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Support from the Government	*			*	*									
Gain economic benefit	*				*	*	*	*		*				
Greener the environment														*
Comply with environment standard	*										*	*		
Social responsibility		*												
Commitment from top management		*	*		*	*		*						
Support from top management		*	*		*	*	*	*						
The green knowledge of top management				*										
Improve company Image			*											
The size of company			*		*									
Government regulation and legislation		*		*	*		*		*	*			*	
Stakeholder pressure				*					*					
Customer pressure				*	*	*							*	
The quality of human resources					*	*		*						
Complexity of technology					*	*		*						
Compatibility of technology					*			*						
Differentiation from competitors							*							
Improve customer perception							*							
Improve public image of the company							*							
Collaboration and integration with suppliers and partner								*						
Public and consumers pressure								*					*	
Decreasing the fuel bills	*													
Gain competitive advantages	*						*	*		*				*

**Table 4: Barriers in implementing green logistics**  
 (Gajendrum, 2017, Pannirselvan *et al.*, 2016, Dube and Gawande, 2014, Loke *et al.*, 2017, Rui, 2017, Kumar Piaralal *et al.*, 2015, Mirza Abdullah suhaiza *et al.*, 2015, Bohdan, 2018, Rensburg, 2015)

Barriers	Author								
	1	2	3	4	5	6	7	8	9
Complicated to implement	*								
Lack of government incentives	*	*							
Lack of government regulation and legislation								*	
Lack of long term contract and professional treatment									*
High implementation cost	*	*			*	*	*	*	
Lack of top management support	*	*						*	*
Lack of top management commitment			*					*	*
Lack of customers awareness		*							
Lack of customers demand							*		

Lack of logistics suppliers or partner interest	*				
Lack of financial resources	*	*			
Lack of IT system	*			*	
Lack of knowledge or skill of green logistics	*	*	*		*
Lack of training	*				*
Poor organization culture	*	*	*		
Complexity of technology			*		
Lack of supplier awareness			*		
Environment resources problem				*	

#### 4. Data Analysis, Results and Discussion

The data has been analyzed using Statistical software SPSS. Descriptive analysis was carried out to achieve the objective of the current study. The findings of this study are discussed in details in the next sub-section.

##### 4.1 Drivers of Green Logistics Implementation

Table 5 showed the distribution of mean and standard deviation for the top 5 main drivers of the green logistics implementation among the Logistics companies in Selangor. As depicted in Table 5, “greener the environment of Malaysia” was ranked as first driver with the highest mean score value 4.46. Greening the environment is the most important driver among the entire identified green logistics driver. It shows that the logistics companies are aware and concern towards greening the environment and the similar result obtained from previous study. Rui (2017) reported most of the logistics companies is aware that adopting green logistics is able lead to greener the environment rather than adopting green logistics can reduce the overall operation cost of the companies. Hence, by reducing the hazardous substance in the logistics activities will lead to greener the environment indirectly (Dhull and Narwal, 2016).

The second rank was the “compatibility of technology”, having mean score value 3.92. The driver “compatibility with technology” is important for implementing green logistics because the companies need to fit into the operational knowledge that a company already exist (Lin and Ho, 2011). A companies need to be compatible with the existing technology in order to enhanced the performance and gain the competitive advantage.

Next, “gain economic benefits” with mean value 3.91 was ranked as third top drivers. There are various of economic benefit derived from the implementation of green logistics practices such as cost saving, increasing customer satisfaction, new market opportunities and higher profits. Study by Zhu *et al.* (2007) found that Chinese enterprise that implemented green logistics has gain straightforward cost reduction and ultimately boosts the profit margin.

Furthermore, “Improve public image” was ranked as the fourth drivers with mean value 3.90. Lastly, “improve company image and differentiation from competitors” ranked as the 5th drivers with mean value 3.87. The growing number of organization implemented the green logistics indicates that they are in the effort to improve the company image and maintain the market share (Rhman & Shrivastava, 2011).

**Table 5: Mean and standard deviation of drivers of green logistics implementation**

	Drivers of implementing green logistics	Mean	Std. Deviation	Interpretation
1	Greener environment of Table Malaysia	4.46	0.734	High
2	Compatibility of technology	3.92	0.631	High
3	Gain economic benefits	3.91	0.539	High
4	Improve public image of the company	3.90	0.553	High
5	Improve company image	3.87	0.556	High
5	Differentiation from competitors	3.87	0.708	High

#### 4.2 Barriers of Green Logistics Implementation

The result in Table 6 portrayed top five main barriers that impede the implementation of green logistics among the logistics companies in Selangor. As reveals in Table 6, “lack of government regulation and legislation” with the highest mean value 4.30 was ranked as the first top five barriers. The absence of regulations, laws and legislations and support systems from the government are considered to be one of the crucial barriers to the implementation of green logistics (Bohdan, 2018).

The second ranked was “lack of government incentives” with the mean value 4.28. Huge bureaucracy systems, time consuming regulatory requirements, high fees and taxes, limitations for business opportunities demotivate and discourage companies to adopt environmental sustainability in their business activities

The following barriers is “lack of long term contract and professional treatment” with mean value 4.19. Since green logistics in Malaysia was still in the primary stage, only a few professional was specific in this field.

The fourth and Fifth ranked was “High implementation cost” with mean value 4.09. A high starting cost or initial cost was needed for the companies with purchasing a new technology, connected IT enablement and hiring employees who know the uses of such systems (Gajendrum, 2017).

The fifth ranked “complicated to implement” with mean value 4.01. Adopting green logistics need a complicated process with five stages, the first two steps were preparing for the strategy. The strategy was aimed in the three factors which is economic, social and ecological. The third step requires IT submissions that will support in achieving the main goals of adopting the green logistics. Last two steps were focus on the adoption of the strategy itself such as monitoring and evaluation of the achievements (Vasiliauskas *et al.*, 2013).

**Table 6: Mean and standard deviation of barriers implementation green logistics**

	Barriers of implementing green logistics	Mean	Std. Deviation	Interpretation
1	Lack of government regulation and legislation	4.30	0.748	High
2	Lack of government incentives	4.28	0.686	High
3	Lack of long term contract and professional treatment	4.19	0.735	High
4	High implementation cost	4.09	0.709	High
5	Complicated to implement	4.01	0.658	High

## 5. Conclusion

The implementation of green logistics implementation in industries is essential and coordination is expected from entire level of the employees, from bottom-line workforces to top management. Identification of vital drivers and barriers for green logistics implementation is necessary due to its various advantages towards the organizational and environmental performance. The current study has endeavored to present a list of top five drivers that influence the implementation of green logistics to assist managers' determinations towards environmental improvement more efficient. List of top five barriers was also reported in this study in order to identify a major obstacle for green logistics implementation in logistics industries in Malaysia. An analysis literature discloses the presence studies recognizing drivers and barriers for green logistics implementation within industries in Malaysia is still limited. In the current explorative research, this study was able to determine the top five drivers which are essential for green logistics implementation. List of top five barriers were also examined that eradicated the implementation of green logistics. These drivers and barriers are identified through the survey conducted amongst the logistics industries at Selangor, Malaysia.

## Acknowledgement

The authors would like to thank the Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia for its support.

## References

- Abdelkader Sbihi, Richard W. Eglese. Combinatorial Optimization and Green Logistics. *Annals of Operations Research*, Springer Verlag, 2010, 175 (1), pp.159-175.
- Abduaziz, O., Cheng, J. K., Tahar, R. M. & Varma, R. (2015). A hybrid simulation model for green logistics assessment in automotive industry. *Procedia Engineering*. 100, pp. 960-969.
- Abdullah, M., Zailani, S., Iranmanesh, M., & Jayaraman, K. (2015). Barriers to green innovation initiatives among manufacturers: the Malaysian case. *Review of Managerial Science*, 10(4), pp. 683-709.
- Afroz, R., Hasan, M. N., Ibrahim, N. A. (2003). Review of air pollution and health impacts in Malaysia. *Environmental Research*, 92, pp.71-77.
- Aziz, T. N. A. T., Jaafar, H. S., & Tajuddin, R. M. (2016). Green supply chain: Awareness of logistics industry in Malaysia. *Procedia-Social and Behavioral Sciences*, 219, pp. 121-125.
- Bohdan, A. (2018). Green and Reverse logistics as the tools for improving environmental sustainability. Degree programme Logistics engineering. Technology, communication and transport: Bachelor's thesis.
- Choong, C. K., Chew, B. C., Syaiful, M., & Abdul, R. (2015). Implementation of Green Supply Chain Management for Production: a Case Study in Sony (Malaysia) Sdn. *Journal of Technology Management and Business*, 2(1), pp. 1-19.
- Cosimato, S., & Troisi, O. (2015). Green supply chain management. *TQM Journal*, 27(2), pp. 256-276.
- Dhull, S., & Narwal, M. (2016). Drivers and barriers in green supply chain management adaptation: A state-of-art review. *Uncertain Supply Chain Management*, 4(1), pp. 61-76.
- Dube, A., & Gawande, D. R. R. (2014). Barriers for Green Supply Chain Management Implementation. In 3rd International Conference on Recent Trends in Engineering & Technology, SNJB's Late Sau. K. B. Jain College of Engineering, Chandwad. pp. 475-480.
- Gajendrum, N. (2017). Green supply chain management – benefits challenges and other related concepts. *International Journal of Applied Science Engineering & Management*, 3(8), pp. 1-7.
- Gulmez, Y. S., & Tuzun Rad, S. (2017). Green logistics for sustainability. *Uluslararası Yönetim İktisat ve İşletme Dergisi*, 13(3), pp. 603-614.

- Ho, Y. H., & Lin, C. Y. (2012). An Empirical Study on Taiwanese Logistics Companies' Attitudes toward Environmental Management Practices. *Advances in Management & Applied Economics*, 2(4), pp. 223–241.
- Islam, S., Karia, N., Fauzi, F. B. A., & Soliman, M. S. M. (2017). A review on green supply chain aspects and practices. *Management and Marketing*, 12(1), pp. 12–36.
- Jonker, D. (2014). Environmental Sustainability in Logistics (Green Logistics). Retrieved on 25 April 2019 from [https://www.academia.edu/15362694/Environmental\\_Sustainability\\_in\\_Logistics\\_](https://www.academia.edu/15362694/Environmental_Sustainability_in_Logistics)
- Kactoglu, S. & Sengul, U. (2010). Erzurum kenti ambalaj atıklarının geri donusumu için tersine lojistik ağı tasarımı ve bir karma tamsayı programlama modeli. *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi*, 24(1).
- Karia, N. (2016). Transforming green logistics practice into benefits: A case of 3PLs. In Proceedings of the International Conference on Industrial Engineering and Operations Management, Kuala Lumpur, Malaysia. pp. 178–179.
- Khairani, N. S., Rajamanoharan, I. D., & Thirumanickam, N. (2012). Green Supply Chain Management Practices: Evidence from Malaysia. *Malaysian Accounting Review*, 11(2), pp. 121–137.
- Krejcie, R.V., & Morgan, D.W. (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement*, 30, pp. 607-610
- Kumar, A. (2015). Green Logistics for sustainable development: an analytical review. *IOSRD International Journal of Business*, 1(1), pp. 7–13.
- Kumar Piaralal, S., Nair, S. R., Yahya, N., & Karim, J. A. (2015). An Integrated Model of themework Likelihood and Extent of Adoption of Green Practices in Small and Medium Sized Logistics Firms. *American Journal of Economics*, 5(2), 251–258.
- Lew, A. F. R., Chew, B. C., & Hamid, S. R. (2018). Green Logistics Implementation Factors: A Study on a Global Logistics Provider. *Journal of Advanced Manufacturing Technology (JAMT)*, 12(1 (1)), pp. 115-128.
- Lin, C. Y., & Ho, Y. H. (2011). Determinants of Green Practice Adoption for Logistics Companies in China. *Journal of Business Ethics*, 98(1), 67–83.
- Loke, S.-P., Khalizani, K., Rohati, S., & Sayaka, A. (2017). Drivers and Barriers for Going Green: Perceptions from the Business Practitioners in Malaysia. *ASEAN Journal on Science and Technology for Development*, 31(2), pp. 49
- Manjunath, G. (2014). Green Logistics: A Learn, Evaluation And Initiatives In Business Organizations. *International Journal of Business Quantitative Economics and Applied Management Research*, 1(7), pp. 36–45.
- Majumdar, A., & Sinha, S. K. (2019). Analyzing the barriers of green textile supply chain management in Southeast Asia using interpretive structural modeling. *Sustainable Production and Consumption*, 17, pp. 176-187.
- Mesjasz-Lech, A. (2011). Efektywność ekonomiczna i sprawność ekologiczna logistyki zwrotnej, (pp. 43-46). Czestochowa: Published by Technical University of Czestochowa.
- Murthy, P. R. A. D., Dean, A., & James, L. (2018). Key drivers for Adoption of Green Logistics by Organized Retail Sector in Bengaluru. *International Journal of Management Studies*, 2(April), 1–7.
- Nadarajah, G. S. (2015). Factors influencing third party logistics performance in Malaysia: The role of trust as a mediator. *Int. J. Supply Chain Manag*, 4, pp. 108-114.
- Ojo, E., Mbowa, C., & Akinlabi, E. T. (2014). Barriers in implementing green supply chain management in construction industry. *International Conference on Industrial Engineering and Operations Management*.
- Patil, G. B., & Dolas, D. R. (2015). Role of third party logistics in supply chain management. *International Research Journal of Engineering and Technology*, 2.

- Pannirselvan, M. D., Bin Rahamaddulla, S. R., Muuhamad, P. F., Maarof, M. G., & Sorooshian, S. (2016). Innovative solution for barriers of green logistics in food manufacturing industries. *International Journal of Applied Engineering Research*, 11(18), pp. 9478–9487.
- Piecyk, M. I., & Björklund, M. (2015). Logistics service providers and corporate social responsibility: sustainability reporting in the logistics industry. *International Journal of Physical Distribution & Logistics Management*, 45(5), pp. 459-485.
- Rahman, A. A., Ho, J. A. & Rusli, K. A. (2014). Pressures, Green Supply Chain Management Practices and Performance of ISO 14001 Certified Manufacturers in Malaysia. *International Journal of Economics and Management*, 8, pp.1–24.
- Raju, K. H. H., & James, G. H. (2017). Green Logistics – Development and Paradoxes. *International Journal of Latest Engineering and Management Research (IJLEMR)*, 2(12), pp. 59–65.
- Rhman M. A. A. & Shrivastava, R. L. (2011). An innovative approach to evaluate green supply chain management (GSCM) drivers by using interpretive structural modeling (ISM). *International Journal of Innovation and Technology Management*, 8, pp. 315-336, 2011
- Rose, L. A. F., Chew, B. C., & Hamid, M. S. R. B. A. (2018). Green Logistics Implementation in Malaysian Logistics Industry. *Advanced Science Letters*, 24(6), pp. 4214–4217.
- Rui. O.E (2017). The Barriers Of Adopting Green Supply Chain Management In Small Medium Enterprises: An Empirical Study On Food And Beverage Manufacturing Firms In Selangor, Malaysia. Universiti Tunku Abdul Rahman: Master Theses
- Sakundarini, N., Olugu, E. U., Ayub, N. S., Musa, S. N., Ghazilla, R. A. R., & Abdul-Rashid, S. H. (2015). Drivers and Barriers Analysis for Green Manufacturing Practices in Malaysian SMEs: A Preliminary Findings. *Procedia CIRP*. 26, pp. 658–663.
- Saroha, R. (2014). Green Logistics & its Significance in Modern Day Systems. *International Review of Applied Engineering Research*, 4(1), pp. 2248–9967.
- Seroka-stolka, O. (2014). The development of green logistics for implementation sustainable development strategy in companies. *Procedia - Social and Behavioral Sciences*. 151, pp. 302–309.
- Seyal, A. H., & Rahman, M. N. A. (2003). A preliminary investigation of e-commerce adoption in small & medium enterprises in Brunei. *Journal of Global Information Technology Management*, 6(2), pp. 6-26.
- Vasiliauskas, A. V., Zinkevičiūtė, V., & Šimonytė, E. (2013). Implementation of the concept of green logistics referring to it applications for road freight transport enterprises. *Business: theory and practice*, 14(1), pp. 43-50.
- Van Rensburg, S. L. J. (2015). A framework in green logistics for companies in South Africa. University of South Africa: Master Theses.
- Villanueva, R., & García, J. L. (2013). Green Supply Chain Management ; a competitive advantage. In *International Congress on Logistics & Supply Chain*, Sanfandila, Queretaro, Mexico, pp. 1–5.
- World Bank Official Portal (2019). LPI index 2012- 2018. Retrived on 5 November 2019 from <https://lpi.worldbank.org/>.
- Zhang, Y., Thompson, R. G., Bao, X., & Jiang, Y. (2014). Analyzing the promoting factors for adopting green logistics practices: a case study of road freight industry in Nanjing, China. *Procedia-Social and Behavioral Sciences*, 125, pp. 432-444.
- Zheng, L., & Zhang, J. (2010). Research on green logistics system based on circular economy. *Asian Social Science*, 6(11), pp. 116.
- Zhu, Q., Sarkis, J., & Lai K. (2007). Initiatives and outcomes of green supply chain management implement by Chinese manufacturers. *Journal of Environmental Management*, 85, pp. 179-189.