GREEN LOGISTICS FACTORS AFFECTING OPERATION PERFORMANCE OF ROAD TRANSPORT BUSINESS

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ABSTRACT

Abstract—The article aims to study the impacts of green logistics factors affecting operation performance of road transport business. The population of the study was all 3,010 road transport businesses in Chon Buri province, Thailand. Questionnaires were distributed to a sample of 353 road transport businesses. A statistical software was used to analyze the collected data, using statistics Frequency, Percentage, Average, Standard Deviation. The result showed green logistics factors consisted of green transportation, green warehousing, green reverse logistics, and green packaging. It was found that the overall of factors was at a high level with an average of 3.90 percent. The highest level was green transportation, an average of 4.00, followed by green warehouses was at a high level, an average of 3.94, green reverse logistics was at a high level, an average of 3.92, and green packaging was also at a high level, the average is 3.75. The data suggested that road transport businesses in Chon Buri province should consider and implement green transportation relevant to their business. Moreover, there is a need to move towards environmentally friendly logistics, to sustainably develop the business and improving the operation performance.

Keywords— green logistics, operation performance, road transport business

INTRODUCTION

Thailand will still be affected by significant worldwide trends. The government had thus outlined natural resource development plans, where a focus was shifted from addition of economic values and income towards sustainable economic development. Thus, economic development in the future cannot separate economic and social activities from the environment. Moreover, Thailand's national strategy regarding special economic zone places an emphasis on developing and pushing Thailand towards becoming South-East Asia's distribution hub. Therefore, for Thailand, Chonburi Province is an important economic zone. Especially in the manufacturing sector, logistics is an important business component, and is one of the targets of the government's development plan. Therefore, to drive development in a direction in accordance with the government's plan, rapid supports to buttress the EEC in all dimensions are called for. This is to increase the competitiveness on the national and international level, using modern innovations and environmental consciousness as bases, in a move towards Thailand's sustainable future (Office of the National Economic and Social Development Council, 2021)

The Covid-19 health crisis has greatly contributed to the surge in online sales. All the different lockdowns have pushed consumers who did not use the internet for their daily shopping to take on new habits and are now buying online more frequently, resulting in an increase in deliveries and their polluting emissions. More than ever, it is now essential for manufacturers to make their supply chains greener and reduce their environmental impact. Beyond transportation, every part of the supply chain can be optimized for environmentally friendly logistics, also called Green Logistics. However, current business development strategies must consider a growing list of factors, including environment, society, health and safety, and modernity. Most road transport businesses in Thailand are small and medium-sized organizations, which are not globally competitive in terms of capital, internal management expertise, innovation and technology, or people resources. The problems made some businesses lacking competitiveness have closed or been taken over by foreign corporations. Therefore, the businesses have had to rely on themselves in finding ways to develop and modernize their organizations that

could reduce costs and improve their operation efficiency, to fulfil the needs of customers and improve competitiveness in the international level, sustainably develop and improve their business outputs.

The trend of sustainability and environmental conservation have resulted in new environmentally friendly logistics management strategies, which have led to development of management approaches that focus on multiple dimensions, including service quality, society awareness, and environmental conservation. These business development strategies reflect the businesses' responsibility to the society, improving their brand images, creating opportunities, and improving the service quality towards international standards. By adapting modern innovations to suit their business and to improve their logistics management, a business could reduce cost and increase the capacity for fulfilling customer requirements, both in terms of time and quality, improving the overall business performance. Therefore, this study focuses on the impacts of green logistics factors affecting operation performance of road transport business. This could be a guideline for improving operation performance for transport businesses that accounts for long-term, sustainable social, economic, and environmental development.

OBJECTIVE

1. To study the impacts of green logistics factors affecting operation performance of road transport business

LITERATURE REVIEW

Green Logistics

Eco-logistics or green logistics refers to the set of sustainable policies and measures aimed at reducing the environmental impact caused by the activities of this business area. This logistics concept affects the configuration of processes, structures and systems or equipment in the transport, distribution, and storage of goods. Green logistics includes any business practice that minimizes the environmental impact of the logistics network and delivery. Sustainable logistics or green logistics secure a strong bottom line without sacrificing customer satisfaction, or the well-being of the planet. Intelligent businesses are rushing to understand and embrace sustainable logistics management, supported by powerful technologies such as artificial intelligence, machine learning, and advanced analytics.

As enterprises make the shift toward greener logistics, they realize benefits across the business, including improved profitability and good corporate citizenship. But a primary driver is customer demand. As customers see the real-world results of climate change on newsfeeds and streaming channels daily, they are quickly shifting loyalties to companies that demonstrate significant, permanent steps toward a sustainable future. Customers and shareholders advocate for a circular supply chain that incorporates reverse logistics and are not content with or influenced by "greenwashing."

The objective of green logistics seeks to measure the carbon footprint of logistics operations to establish a starting point for considering sustainability measures and controlling their results. One of the most widespread methodologies for calculating energy consumption and greenhouse gas emissions is the UNE-EN 16258:2013 international standard. Moreover, to reduce air, soil, water, and noise pollution by analyzing the impact of each logistics area, especially those related to transport. In addition, to use supplies rationally by reusing containers and recycling packaging. And to spread sustainability to the supply chain, eco-logistics is also shaped by the design of products and their packaging. Both must be designed to minimize their environmental impact.

Al-Minhas et al. (2020) studied on sustainable logistics management which consists of four components: there were transport, warehousing, packaging, and reverse transport. It related to the study of Kumar, Brint et al. (2019) that mentioned to green logistics management involves transportation and distribution and packaging material. Ceniga and Sukalova (2020) mentioned to element of green logistics which were transportation management and reverse logistics. Aroonsrimorakot et al. (2022) studied the development of environmental-friendly logistics in Thailand including warehouse, transport, storage, and packing. Moreover, Karaman et al. (2020) stated that green logistics consist of green packaging activity using environmentally friendly materials to promote recycling and save energy. Based on the literature review, found that green logistics consisted of green transport, green warehousing, green reverse logistics, and green packaging.

METHODOLOGY

This study presents quantitative research where a questionnaire was used to collect data. For the quantitative method, we distributed questionnaires to collect a large amount of data. The population consisted of all road transport business in Chonburi province, Thailand. totaling 3,010 businesses (Ministry of Commerce, 2022). The respondents were the business owner, managing director, manager, or head of transport of each business. Therefore, 353 samples were required (W.G. Cochran, 1977) to collect the data.

The questionnaire consisted of 34 questions, each using a 5-level rating scale. The questionnaire was assessed by a board of five experts, who evaluated and marked the questions based on the content. The index of item objective congruency (IOC) of the questions were at 0.89 which was between 0.60-1.00, higher than the 0.5 threshold. (Silcharu, 2017) The reliability was assessed using Cronbach's alpha coefficient (Cronbach, 1984). An alpha coefficient of 0.923 (high than a threshold of 0.8) was obtained. So, the questionnaire was reliable and could be used to collect relevant data. The questionnaire was distributed online. A Google Form containing the questions was made and sent to the respondents via e-mail or Line messenger. The follow-up and data collection period lasted one month. The collected data was analyzed using a statistical software, by using descriptive statistics.

RESULTS

The respondents of 353 questionnaires, were analyzed using a statistical software. The results were as follow:

Table 1 The number of frequency and percentage of respondents classified by the operation period of the business.

Operation period of the business	Frequency	Percentage
1. Less than 5 years	76	21.53
2. 5 – 10 years	45	12.75
3. 11 – 15 years	58	16.43
4. more than 15 years	174	49.29
Total	**353**	**100**

From Table 1, it is found that from the sample group 353 respondents: 174 or 49.29 percent of businesses were operated more than 15 years, 76 or 21.53 percent of businesses were operated less than 5 years, 58 or 12.75 percent of businesses were operated 11 - 15 years, and 45 or 12.75 percent of businesses were operated 5 - 10 years.

Table 2 The number of frequency and percentage of respondents classified by the number of employees in the business.

Number of employees	Frequency	Percentage
1. Less than 25 employees	86	24.36
2. 26 - 50 employees	64	18.13
3. more than 50 employees	203	57.51
Total	**353**	**100**

From Table 2, it is found that from the sample group 353 respondents: 203 or 57.51 percent of businesses had more than 50 employees, 86 or 24.36 percent of businesses had less than 25 employees, and 64 or 18.13 percent of businesses had 26 – 50 employees.

Table 3 The mean and standard deviation of practical level of Green Logistics

Green Logistics	$\bar{X}$	S.D.	Operational Practical level	No.
Green Transport	4.00	0.59	high	1
Green warehouse	3.94	0.59	high	2
Green reverse logistics	3.92	0.65	high	3
Green packaging	3.75	0.55	high	4
Average	**3.90**	**0.54**	high	

From Table 3, it is found that from the sample group 353 respondents: the average of operational practical level of green logistics was high, with the mean at 3.90 and the standard deviation at 0.54. The most operational practical level of green logistics was green transport, the mean was at 4.00, follow by green warehouse, green reverse logistics, and green packaging, were at 3.94, 3.92, and 3.75 of mean respectively.

DISCUSSION AND CONCLUSION

Green logistics affected the efficiency of operational performance of road transport businesses in Chonburi province. Green logistics management in terms of the environment will save energy and reduce costs for maximum efficiency. At present, we can see that the environment is changing rapidly from economic competition. which has a more serious impact on the environment from environmental pollution problems that affect global warming and the deterioration of the environment. This is an important issue that the world pays attention to due to its impact on the environment, such as air pollution caused by transportation Energy consumption in the production process and the use of packaging materials. Analysis of the effects of green logistics on operational performances of road transport businesses in Chonburi showed that the variable with the high impact was green transport, follow by green warehouse, green reverse logistics, and green packaging innovation. The total effect value of green logistics was average at 3.90, in agreement with Yingfei et al. (2022), who studied the relationship between infrastructures and performance of environmentally friendly transportation in the service sector. They found that performance of environmentally friendly logistics had a positive influence on trade and environment. Moreover, Trivellas et al. (2020) showed that information sharing of logistics and transportation networks was the most influential factor for a business' sustainability and a supply chain's performance. They studied the relationship between environmentally friendly supply chain management and performance, similar to a study by Teixeira et al. (2018), which focused on the roles of environmentally friendly transportation and purchasing in environmentally friendly supply chain management, aiming to reduce waste, negative environmental and social impacts, and maximize profit.

In addition, this was related to the uses of innovations that aligned with green logistics' strategy, which led to a reduction of carbon-dioxide emission by using alternative energy sources, reducing operating costs, improving transport processes, investing in training and education, improving internal communications, to increase business competitiveness and sustainability. Sustainability was in fact an important global agenda, where member countries have conferred under the topic of environment and sustainability have issued a consensus regarding the importance of the environment and issued the agenda 21 as a model scheme for sustainable social, economic, and environment development. The United Nations Brundtland Commission defined sustainable development that "meet the needs of the present without compromising the ability of future generations to meet their own needs." In line with this definition, Trivellas et al. (2020); Vidal et al. (2018) elaborated on how green logistics management affected sustainable business development and positively influenced business operations. Sustainability had a significant impact on operational performance when adopted in the long run. From the green logistics factors had affected operational performance of road transport business in the Chonburi. To make a difference and impact on environmental conservation and organizational sustainability, fulfilling consumers' demands while considering these factors is important for operational performance as well. Therefore, green logistics will play bigger roles and become more important in sustainable supply chain operations that considers

the outputs of sustainable business operations that consisted of economy, society, and environment, by integrating the relationship and build an organization's performance for business competitiveness.

RECOMMENDATION

1. Governments should promote environmentally friendly developments in the logistics sector, by introducing tax breaks and grant certain privileges to businesses that move towards a greener operation.
2. Future research direction to study on digital technology, innovation, green logistics, and sustainable organizational development that could affect operational performance in road transport enterprises.
3. Future research direction to study on green logistics, and sustainable organizational development that could affect operational performance in other industrial sectors should be conducted.

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