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PHÂN TÍCH TÌNH HÌNH HOẠT ĐỘNG VẬN TẢI CỦA VIỆT NAM TRONG BỐI CẢNH NGÀNH LOGISTICS CHUYỂN ĐỔI XANH

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Tóm tắt
Bài viết này tập trung vào việc đánh giá thực trạng của hệ thống vận tải tại Việt Nam, từ đó đưa ra một số định hướng cho chính phủ và các doanh nghiệp logistics tại Việt Nam nhằm thúc đẩy sự phát triển của logistics xanh. Cụ thể, trong quá trình nghiên cứu, chúng tôi nhận thấy đã có những sự tiến bộ đáng kể trong hệ thống cơ sở hạ tầng cho vận chuyển tại Việt Nam, tuy nhiên vẫn còn những vấn đề tồn đọng cần được giải quyết như cơ sở hạ tầng giao thông quá tải hay sự dịch chuyển chậm từ vận tải đường bộ sang đường biển và đường sắt. Thông qua các nghiên cứu thứ cấp từ các nguồn báo chí uy tín trong nước và quốc tế cũng như các trang thông tin chính phủ, bài nghiên cứu này sẽ trình bày những cơ hội cũng như thách thức mà logistics xanh ở Việt Nam đang gặp phải, từ đó đưa ra một số giải pháp cho cả hai phía là chính phủ và doanh nghiệp để phát triển hệ thống vận chuyển tại Việt Nam, qua đó tiến đến gần hơn mục tiêu logistics xanh.

Từ khoá: Logistics xanh, vận tải xanh, Việt Nam, cơ hội và thách thức, khuyến nghị

ANALYSIS OF TRANSPORTATION SYSTEM OPERATION IN THE CONTEXT OF GREEN LOGISTICS IN VIETNAM

Abstract
This paper examines the current situation of green logistics in Vietnam, thereby giving

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recommendations to the Vietnamese government and enterprises to further accelerate green logistics development. Specifically, while electric vehicles and hybrid engines are increasingly prevalent in Vietnam, there still remain numerous problems that hinder significantly the development of green logistics, including an overloaded infrastructure system and public charging system. Incorporating evidence from reputable newspapers, websites of governments and international organizations, this study would demonstrate the opportunities as well as obstacles of green logistics in Vietnam, thereby suggesting solutions to further improve Vietnamese transportation system from both government and enterprise sides in order to achieve green logistics goals.

Key words: Green logistics, green transportation, Vietnam, opportunities and challenges, recommendations

1. Introduction

Net zero transition is the leading trend that has been acquiring attention all around the world, especially in the scenario of rising global warming and climate change in general. Arguably, green logistics is an indispensable component in the efforts of governments globally to achieve net zero emissions.

On the other hand, the implementation of green logistics has been confronting numerous obstacles, which require comprehensive intervention and consideration from a lot of stakeholders, especially the Vietnamese government.

There are innumerable ways to analyze how "green" a logistics system is, yet green transportation is always considered to play a critical part in the criteria as it is one of the main components of a logistics system. On that account, we would like to propose green transportation as the topic for our research paper.

2. Literature Review

2.1. Logistics

Logistics is a collection of all forwarding activities and jobs related to the process of supply, transportation, warehousing, customs procedures and the distribution of goods. Logistics refers to the movement of goods from Point A to Point B, including two functions: transportation and storage.

The logistics sector is a crucial sector for the development of any economy, connecting firms to both domestic and international opportunities (World Bank, 2018) and contributing to the expansion of international business markets. However, logistics industry is among the industries that generates the highest amount of CO_2 emissions and has a dramatically adverse impact on the atmosphere, which is a major concern in the current time.

2.2. Green logistics

Green logistics is defined as supply chain management practices and strategies that reduce the environmental and energy footprint of freight distribution, which focuses on material handling, waste management, packaging and transport.

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. Green logistics development consists of 5 main components:

- Green transportation
- Green warehousing
- Green packaging
- Green information technology
- Reverse logistics development

2.3. Transportation

Transportation is the act or process of moving people or things from one place to another place. The capacity and necessity to move huge amounts of products or large numbers of people across great distances at rapid speeds has been an indicator of civilization, particularly technological advancement.

2.3.1. Roadways

Roadway transport is transportation of goods on roads, which is a lane between the point of departure and destination, with the use of a motor vehicle. This is a significant mode of transportation for various types of commodities all around the world.

In comparison to other types of transport, there are fewer restrictions and an uncomplicated packing, loading process. Thus, it is highly accessible as every country has a road network and this mode can be easy to organize and customize delivery based on the goods. However, road freight takes more time than other types and has limitations of size and weight of the goods. It has the most significant impact on the environment.

2.3.2. Shipping

Shipping is the transportation of heavy or large amounts of loaded goods from departure to destination via sea by ship. Ocean transport accounts for the vast majority of the world's trade. Sea freight is the most suitable way to transport large and heavy goods with affordable cost over long distances. Thus, it has fewer carbon emissions, which is more environmentally friendly. Yet, this mode is time-consuming and can be inaccessible depending on the origin place or end destination.

2.3.3. Inland waterway

Inland waterway is a navigable channel used to transport goods, materials, or other movable objects, which consists of rivers, lakes, canals and backwaters. Inland water transport is the transfer of goods among regions within the territory of a state.

Inland waterways transport is one of the most environmentally friendly modes of transport as the CO2 emission is quite low. The operation costs and energy requirements are lower than other types of transportation. In spite of the high carrying capacity, low cost and less environmental pollution, inland waterway is limited to the areas where rivers are navigable and oceanic routes exist.

2.3.4. Aviation

Aviation refers to all the transportation of goods from one place to another by aircraft . This is a common choice for many in the business of logistics as shipments can be sent from commercial and passenger aviation gateways to anywhere that a plane can fly and land. Air freight is the suitable option for speedy delivery.

Air freight has advantages in speed and security. Still, air freight is expensive due to high fuel costs and additional expenses like security checks. It also has to deal with many restrictions on what can be transported, the size, weight or product types.

2.3.5. Railway

Railway transport is a means of transferring goods on vehicles that run on railroads, known as train transport, which are located on tracks. It can be used for the entire journey or to deliver goods part way along a route where sea or road freight is not possible.

Transporting via land, trains offer more carrying capacity and emit over three-quarters fewer emissions than road freight. However, rail freight lacks accessibility as it is not suitable in all locations and usually requires support transportation at the end of the delivery.

2.4. Green transportation

2.4.1. Definition

Green transportation is the transportation service that has a lesser or reduced negative impact on human health and the natural environment when compared with competing transportation services that serve the same purpose (Björklund, 2011).

2.4.2. Green transportation evaluation indicators

2.4.2.1. Green modes of transport

There are three main types of green modes of transport:

● Green transportation that depends solely on green energy: including all types of electric vehicles like electric cars, electric bikes, electric trains, etc.

● Green transportation that depends partly on green energy: this type of transportation mode encompasses all hybrid vehicles that rely on both electric and traditional combustion engines.

● Green transportation that requires no energy sources: including walking and cycling.

2.4.2.2. Infrastructure facilitating green transportation

● ***The connection in the transportation system conducive to efficient transportation route:*** The use of flexible modes of transport together with the efficient use of multimodal transport has resulted in conventional cost savings, while also leading to environmental benefits in terms of lower fuel consumption per ton-km. Multimodal transport helps expand the transport network and increase economic efficiency by using modes of transport capable of transporting large volumes of goods in one shipment, instead of transporting in multiple shipments, thus reducing the number of deliveries as well as emissions from transporting vehicles.

● **Facilities and equipments at ports:**

Location of ports should be near traffic hubs and industrial parks: arranging ports close to traffic routes, airports, etc. will optimize cost, time and fuel in the process of transportation, hence contributing to greening operations.

Application of information technology in ports management to optimize loading and unloading time at ports: invest and apply science and technology supporting the inspection, arrangement, storage, search and tracking of each batch of goods to the ports or anywhere. The software helps to share and exchange information with partners and customers quickly and transparently so as to

reduce loading and unloading time to avoid congestion of vehicles waiting for queues causing pollution.

● **Technology and management operation:** Analyzing vast amounts of data, identifying patterns, and generating optimal solutions to draw the shortest and most optimal route to avoid long-distance driving in order to emit environmental pollution.

3. Evaluation of Vietnamese enterprises' transportation activities towards green logistics

3.1. Current situation of Vietnamese transportation

3.1.1. Modes of transport

● The total volume of goods transported in the first 9 months in 2022 reached approximately 1,492.7 million tons, an increase 24.4% compared to the same period in 2021.

Table 1. Freight transport by modes of transport by the end of September 2022 in comparison to the same period in 2021

Mode of transport	**Freight transport** *(million tons)*		**Difference**
	2021	**2022**	
Roadway	896,61	1110	23.8%
Shipping	61,03	77,82	27.5%
Inland waterway	236,44	298,62	26.3%
Railway	4,1	4,37	6.6%
Aviation	0,1958	0,2132	8.9%

Source: General Statistics Office

● In 2019, the transportation industry emits about 45 million tons of CO2 and is forecasted to be nearly 90 million tons by 2030. In which, roadway is the highest source of CO2 emissions. This is followed by the emissions from sea transport, inland waterway and aviation. Yet, the emission from railways is insignificant.

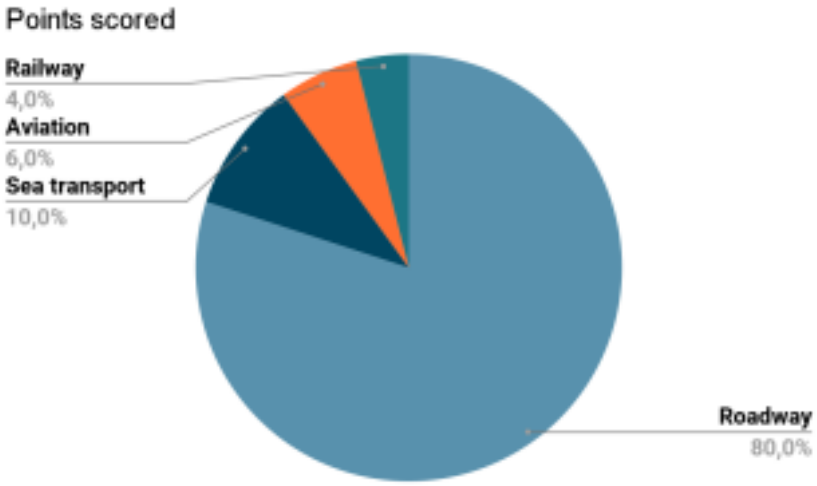

Figure 1. The proportion of CO_2 emissions from different modes of transport
Source: Ministry of Transport

● Roadway is the most popular choice of mode of transportation. Being left far behind, inland waterway and shipping via sea ranked second and third respectively. Lastly, the share of freight by railway and aviation accounted for the least proportion.

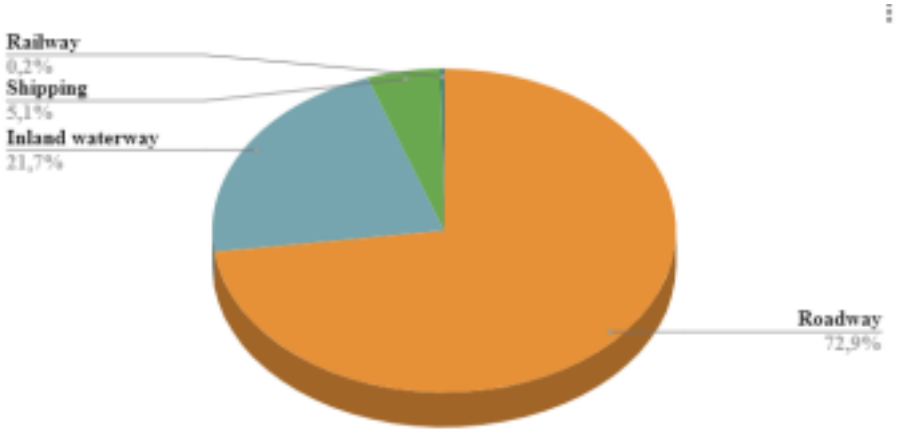

Figure 2. The structure proportion of transportation modes (% volume of goods) in 2022
Source: General Statistics Office

3.1.2. Infrastructure :

According to the 2019 Global Competitiveness Report of the World Economic Forum, Vietnam ranks 66/141 in terms of transport infrastructure.

Table 2: Transport Infrastructure Rank of Vietnam in 2019

Index Component	Score Rank /141
Transportation infrastructure	52.2 66

Road connectivity (0-100)	63.3 104
Quality of road structure (0-7)	3.4 103
Railroad density (km/1,000km2)	7.6 58
Efficiency of train services (1-7)	3.6 54
Airport connectivity (1-100)	86 22
Efficiency of air transport services (1-7)	4.0 103
Liner shipping connectivity (0-100)	68.8 19
Efficiency of seaport services (1-7)	3.8 83

Source: The Global Competitiveness Report 2019

Roadways: Vietnam has an extensive road network. However, more than half of the roadways are communal or rural roads. National highways and expressways, which are critical infrastructure for freight operations, account for only 7% of the entire road network. The density of national roads and expressways in Vietnam (km/km2) is low compared to other countries. The structure of the truck fleet in Vietnam is determined based on the load of the vehicle in use. In Vietnam, trucks with small tonnage account for a higher proportion. As of 2018, there are about 1.1 million officially registered trucks in Vietnam (figure 3). Of which, 68% have a total vehicle weight of less than 5 tons, 11% from 5-10 tons, 14% from 10-20 tons and 7% heavy trucks with a total vehicle weight of over 20 tons.

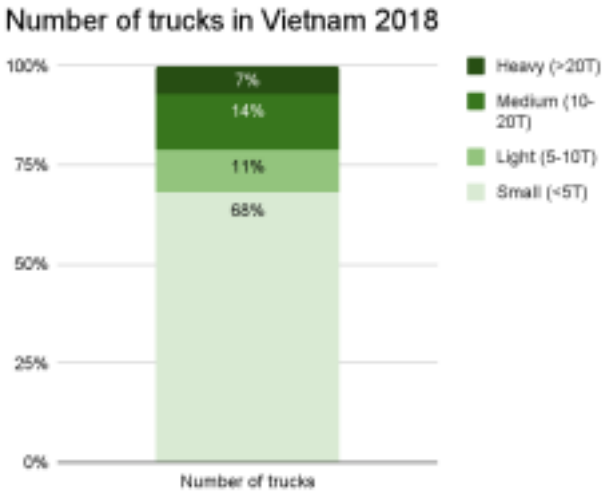

Figure 3. Number of trucks in Vietnam 2018
Source: Vietnam Registry Department

Shipping: As of June 2022, Vietnam's seaport system currently has 286 ports, the total length of the wharf is more than 96 km. Most of the ports attached to the centers and major economic regions of the country have formed large seaports with the role of a focal point serving import and export of goods and creating a driving force for the development of the whole region.

Table 3. Seaports associated with key economic regions.

Key Economic Regions	Seaports
The North	Quang Ninh, Hai Phong
The central region	Thua Thien-Hue, Da Nang, Dung Quat, Quy Nhon
The South	Dong Nai, Ba Ria - Vung Tau, Ho Chi Minh
Mekong River Delta	Can Tho, An Giang

Source: General Statistics Office

Inland waterway: Vietnam has 45 national inland waterway routes with a total length of about 7,075 km (17 routes in the North, 18 in the South, 10 in the Central). According to the Department of Inland Waterways, Vietnam currently has 224 river ports and 8,800 floating docks. However, apart from a number of specialized inland wharfs, dedicated to a specific commodity, with proper equipment and maintenance, most of the inland wharves and piers are of a very basic quality level, only carrying out manual loading and unloading of goods to the riverbank or canal.

Aviation: Vietnam has 22 airports, including 9 international airports and 13 domestic airports. Currently, there are 5 Vietnamese airlines: Vietnam Airlines, Vietjet Air, Pacific Airlines, Bamboo Airways and Vietravel Airlines exploiting combined cargo transportation on passenger flights and no airline specializing in transporting goods by specialized aircraft.

Railways: Largely unchanged over the past decades, Vietnam’s railway network has a route length of 2,609 km, with total trackage of 3,300 km. The century-old railway network, mainly single-track, non-electrified meter-gauge with an axle load of 14 tons, consists of seven principal routes, with the main north–south link joining Hanoi with HCMC. Most countries use standard rail gauge 1,435mm, Vietnam railway mainly maintains narrow gauge of 1,000mm, accounting for 85%, standard gauge of 1,435mm only accounts for 6%, cage gauge of 1,000mm and 1,435mm accounts for 9%. In addition, developed countries use technology of electrification, maglev, and even pipelines, while Vietnam's railways still run single tracks with diesel technology.

Currently, the traffic connection to seaports is a road system, mainly connections through national highways. The quality of road connections is considered to meet the basic standard. However, the reality is that the connection between seaports and highways is still limited. Some

ports have road connections through the urban road system, leading to very limited exploitation capacity, such as Tien Sa wharf (belonging to Da Nang port). According to the draft detailed plan for groups of seaports, ports, wharfs, floating terminals, water areas and water areas in the period of 2021-2030, with a vision to 2050, many large seaports have been connected to railways but later revoked such as Cua Lo port, Song Han port, Quy Nhon port, Saigon port. Currently, there are only 2 seaports with direct rail connections to Hai Phong port (Hoang Dieu wharf area), Cai Lan port (Quang Ninh).

3.1.3. Policies from government and transportation enterprises

According to the Global Infrastructure Hub's outlook data, in the 2016-2040 infrastructure categories, the gap between investment needs and current investment possibilities for infrastructure road is expected to be the largest and will require 70% additional funding. In addition, the cost of infrastructure investment for road projects in Vietnam is quite modest, compared to other countries (Figure 4).

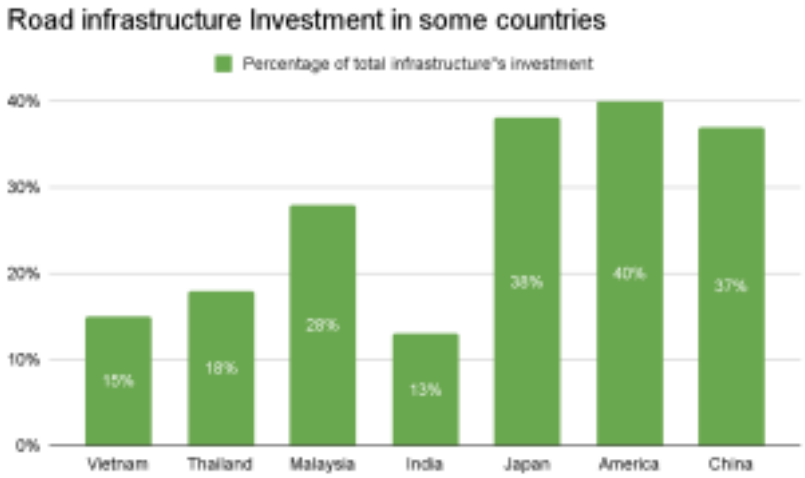

Figure 4. Road infrastructure Investment in some countries

Source: Global Infrastructure Hub data

The Prime Minister of Vietnam at COP 26 has made commitments to the international community in economical and efficient use of energy and emission reduction. The Prime Minister signed Decision No. 2157/QD-TTg on December 21 2021 to establish a National Steering Committee to implement Vietnam's commitments at COP26. Currently, in the frame system green growth legislation in traffic activities, the Government has promulgated policies and documents, such as: National action plan to implement the 2030 Agenda for Sustainable Development with 17 general goals and 115 specific goals, and establishes a system to monitor and evaluate the implementation of sustainable development, National strategy on green growth 2021-2030, vision 2050 towards green development, etc. Specially for the transportation in logistics, the Ministry of Transport has issued Circular No. 16/2010/TT BGTVT dated June 30, 2010 stipulating the management and operation of airports; and the Vietnam Maritime Administration has issued the "Plan for the implementation of the Green Port Development Scheme in Vietnam" to research and propose a mechanism to support enterprises in implementing green port development and

technology transfer.

On July 22, 2022, the Prime Minister issued Decision No. 876/QD-TTg approving the Action Program on green energy transformation, reducing carbon and methane emissions of the transport sector with the overarching goal of developing a green transport system towards the goal of net zero greenhouse gas emissions by 2050.

3.2. Evaluation of Vietnamese transportation system towards green logistics

3.2.1. Achievements

a. In the structure of transportation system

Sea and inland waterway transport marked the largest increases in shares

The Action Plan of the Ministry of Transport stresses the importance of reducing the market share of road transportation while increasing those of eco-friendly modes like sea and railroad. All transportation modes enjoyed increases in their shares, with sea and inland waterway registering the highest growth rate.

b. In infrastructure

Recent improvements in the road infrastructure

Key routes such as the North - South highway, Belt Road No.3 Ho Chi Minh City and Belt Road No.4 Hanoi have been listed as priority projects by the Ministry of Transport. The construction of these routes helps reduce traffic congestion and shorten shipping time, making the transportation process more efficient and reducing the industry's environmental impact.

Some ports have been upgraded to foster sustainable sea freight.

Ports of Hai Phong and Ho Chi Minh City have been named in the top 50 biggest container ports in the world. Increasing the ports' capacity not only allows them to meet the growing demand for sea transportation, but also takes advantage of economies of scale to attain higher efficiency. Up-to-date technologies such as digital border gate, e-ports, and itinerary monitoring systems have also been increasingly employed in busy locations such as Hai Phong and Lang Son. Another significant achievement is Tan Cang - Cat Lai port of Ho Chi Minh City being recognised as a “Green port" by APEC. Numerous practical actions have been taken to reduce the carbon footprint: substituting diesel-fueled with electric equipment, adopting electronic documents to reduce the waiting time of vehicles, on-site waste treatment, etc.

c. In government and enterprises policies

Government investments, incentives and green transportation policies

The Vietnamese government has set out clear goals and dedicated substantial amounts of capital to carry out numerous large-scale investments to upgrade the transportation infrastructure serving all modes of transport. The Government has paid special attention to environmental protection and climate change response by promulgating specific policies and documents.

With the aim of providing support to firms amidst the COVID-19 pandemic and fuel price fluctuations, the government has offered reductions in fees for the transportation business. Regulatory bodies have also formulated action plans and policies for green transportation development, demonstrating their commitment to promoting green transportation and at the same time serving as guidelines for local authorities and firms.

Eco-friendly transportation projects actively embraced by firms in the industry Recently, Vinfast and Ahamove have jointly introduced AhaFast, a delivery service operating on the basis of electric motorbikes. Delivery networks have been established in 17 cities and provinces with more than 2.5 million users. Another notable initiative is the eco-friendly cars training project for drivers carried out by Delta International Co., Ltd and GIZ. These projects help reduce the road system's dependence on fossil fuels and promote the use of alternative resources.

3.2.2. Limitations

a. In the structure of transportation system

Current transportation system is heavily relied on road

Road transport, which has the highest amount of emissions and largest negative impact on the environment, still accounts for the largest amount of goods transported, far overwhelming the amount for sea and rail. Switching from road to railway and sea may reduce the flow of traffic and optimize the transportation process as a whole.

b. In infrastructure

Despite having been upgraded throughout the years, the road infrastructure of Vietnam still remains inefficient

Although the most popular mode of transportation in Vietnam is by road, the road quality is relatively low. Not only are the roads narrow with few road lanes, but they are also poorly maintained and non-durable, subjecting them to frequent damages such as potholes and cracks. This may cause considerable disruptions and reduce the productivity of the transportation process. Besides, the network of highways being in the early stages of development, plus the uneven distribution of highways across regions of the country has made it difficult to meet transportation demand.

Vietnam's sea transportation system is inefficient and insufficient

The current capacity of most seaports as well as of the roads linked to these ports is unable to accommodate the demand of cargo transportation. Additionally, many of the ships in use are already obsolete, thus having low energy efficiency and higher toxic emissions.

The railway and air systems require substantial upgrades to carry out shipping services in a more efficient way

Regarding railway transportation, most of the trains in use are already outdated, thus having low technical standards. This is associated with significant limitations in train speed and capacity. The utilization of outdated train engines also produces a larger amount of emissions and consumes more energy.

Likewise, air transportation infrastructure has a lot of room for improvement. Instead of employing specialized cargo aircraft, Vietnamese airlines tend to integrate freight with passenger transport. Therefore, the infrastructure at airports is designed for the primary purpose of serving passenger transport, thus the facilities and equipment may be unsuitable for freight transportation activities, especially loading and discharging goods.

Low quality infrastructure has also exacerbated traffic congestion, making the transportation process more consuming in terms of time and energy

Congestions force vehicles to spend more time on the road, which both extends the shipping time and burns more fuel. This consequently reduces transportation efficiency and increases the amount of chemicals emitted by vehicles. As for the truck fleet, the majority of trucks being utilized are old and have low load capacity. This inefficient fleet means that a larger number of trucks is needed for the same amount of goods. This may worsen traffic congestion, result in higher emissions and drive transportation costs higher.

The staggering percentage of empty trucks on return journeys is another problem that needs addressing to improve the system's productivity

Trucks running empty means that the same load of cargo is transported with double the amount of fuel and exhaust fumes, which is undoubtedly wasteful.

c. In government and enterprises policies

Slow pace of infrastructure projects

The cost of infrastructure investment for road projects in Vietnam is quite modest, compared to other countries (Figure 4). The pace of implementing infrastructure development projects is relatively slow. Only few projects with direct investment in capital have succeeded, hence, there exists a large gap between the number of projects approved and actually carried out.

Lack of a standard management system

Vietnamese firms have become highly aware and adopted several strategies to foster green transportation. However, most firms lack a systematic approach and a standard management system, which may lead to inefficiencies in carrying out green transportation strategies.

Barriers to implement regulations and policies

There is a lack of detailed procedures and clear routes to implement regulations and policies. The promulgated regulations and rules have not been amended and supplemented to be suitable with the realistic situation, hence, there still exists a gap between expectation and reality of green transportation

The number of enterprises adopting green transportation is not significant 90% of logistics enterprises have capital of less than 10 billion VND, 5% have capital of 10 - 20 billion VND while the estimated cost of green transformation is up to hundreds of billions VND, which is a burden for transportation enterprises. Hence, the large proportion of transportation enterprises have barriers in converting into a greener operation.

4. Opportunities and Challenges of Vietnamese transportation system towards green logistics

4.1. Opportunities

Enterprises have initially approached and applied science and technology to logistics activities

Vietnamese businesses have taken the first steps towards green and sustainable logistics.

According to the Vietnam Logistics Report 2022, among surveyed businesses, 73.2% said that green logistics was in their business strategy, nearly 65% said that they have implemented environmental control at their enterprises.

Consumers perceive the consumption of green logistics services

Vietnamese consumers have begun to be conscious of consuming green logistics services (37.24% of consumers surveyed in a 2022 study are willing to pay more for green logistics); This is a signal for businesses to accelerate the implementation of green transport solutions.

Enterprises can easily access modern, fast and convenient administering system

With e-commerce growth continuing at double digits, Vietnam has the advantage of developing green transport thanks to the approach and application of digital transformation as well as modern, fast and automatic administering systems. This simplifies paperwork, minimizes errors, and saves time and costs. Currently, Vietnamese transport enterprises complete customs declaration services almost 100% electronically, tax payment with 100% of electronic invoices.

Many government policies support green and sustainable logistics

The determination of the Government and authorities to direct businesses towards sustainable development through the promulgation of many relevant legal documents and policies has created a favorable legal corridor for green logistics development.

Government has issued many regulations and general policies related to sustainable economic development, green economy, circular economy in general. At the 26th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP26), Vietnam committed to develop and implement measures to reduce emissions. Strong greenhouse gas emissions with domestic resources and international community support and cooperation to achieve net zero emissions by 2050, while committing to a 30% reduction in methane emissions in 2030.

In addition, the state promulgates regulations and policies directly related to the development of green and sustainable logistics, such as Decision No. 876/QD-TTg approving the Action Program on energy transformation, green energy, reducing carbon and methane emissions of the transport sector for each mode of transport.

Investment from financial package

Developing the green logistics service industry will create a premise for attracting foreign investment. According to Mrs. Vu Thi Quynh Hoa - Oxfam in Vietnam's National Director, raising the commitment to reduce greenhouse gas emissions will benefit Vietnam in attracting green finance from the financial package promised by countries with 100 billion USD per year for green economy development, circular economy and renewable energy. In addition, at the dialogue session of the COP26 Conference, Standard Chartered Bank committed to provide credit agreements for projects for sustainable development in Vietnam up to 8 billion USD from now to 2030.

Lessons from experiences of countries that are developing green logistics

Currently, green logistics, specifically green transportation, is an inevitable trend that countries around the world are aiming for, typically developed countries such as Singapore, Japan and Germany. Therefore, Vietnamese businesses can learn and inherit from the policies and plans applied to be able to compensate for the CO2 emissions from the transportation process and move

towards green logistics in a favorable way.

4.2. Challenges

Legal institutions on logistics are incomplete and lack connectivity

There is a lack of policies to create substantive connections between regions to share opportunities and take advantage of each area's resources, which results in local competition and unequal development in the transportation system among provinces, being obstacles to move towards green operation. The current regulations of the government mainly focus on road transport, which would lead other modes of transport to suffer difficulties. Moreover, there are not yet preferential policies for green transportation development.

The high costs for green transportation and long payback period discourage enterprises To transform into green logistics, enterprises need to invest in various categories: infrastructure, equipment, technology, etc. Nevertheless, these categories require massive funds and capital investment. For instance, modern green equipment using clean fuel is up to tens of millions of USD, which is significantly more costly than conventional equipment running on oil. Moreover, these devices need complementary infrastructures, which add extra cost.

With the characteristics of equipment and infrastructure investment, green transportation will take a long time for capital recovery. To compensate for high investment costs, many enterprises impose a surcharge on the customer, which affects the business relationship between parties. Therefore, they are not willing to invest and voluntarily deploy green transportation.

Logistics labor force experiences shortage in number and lack of skills

Logistics industry requires high-quality human resources with skills and knowledge of technology and logistics to achieve green transportation. Nevertheless, there is no clear connectivity between training institutions and logistics enterprises is not close, which leads to the output not satisfying demand of the industry in practice. The current labor force is not adequate in both quantity and quality for the industry to reach green objectives.

Poor transport infrastructure

The current transport infrastructure system has not been facilitated for adequate maintenance and upgrade, which limits the exploitation capacity and affects the planning of transport networks towards green development goals. The capacity of the transport infrastructure system is weak: the roads in the city are narrow with many intersections and limited load while the number of vehicles is large. This leads to congestion and increasing emissions into the environment. With railway transport, the technical standard is low and there are limitations in tonnage, which make it less widely used compared to other modes of transport while railway is more optimal in terms of environmental aspects.

Lack of connectivity among means of transportation

The transportation system with the connection among different vehicles can enhance the management capability of the transport infrastructure in general, allowing competent authorities to flexibly use multimodal transport to lower fuel consumption, which is more environmental-friendly; also, this can reduce traffic congestion, hence reducing emissions to the environment.

However, the transportation system in Vietnam still lacks that connectivity. Although the characteristics of some modes of transport are closely related to each other, the procedures and regulations of these modes are developed separately. This prevents Vietnam from effectively combining multimodal transport to reduce the negative impact on the environment.

The limited ability to apply technology and digital transformation in logistics industry The application of appropriate technology can optimize logistics activities, reduce the number of vehicles needed to deliver goods, hence reducing carbon emissions. Enterprises can control the green logistics operations through telematics devices that track metrics such as vehicle time on the road, level of fuel and emissions. The application of information technology in Vietnamese logistics enterprises is still far from international standard.

The reasons for this delay and inefficiency of applying digital transformation in transportation activities vary: limited funds, limited human resources; concerns about the safety and ability of information security of online platforms, etc.

5. Recommendations

5.1. For governments and competent authorities

Encourage logistics enterprises to buy carbon credits and regularly conduct monitoring and evaluation activities

Government implements carbon trading mechanisms to limit the emissions from logistics businesses. Carbon credits should be complemented with regular monitoring and evaluation of the green logistics-oriented activities of enterprises and the regions as a whole. From periodic assessments, the competent authorities can have a comprehensive view on the difficulties in the process of green transformation and promptly give policies to tackle outstanding problems.

Promulgate preferential mechanisms for tax and interest rates

With the features of high cost and long payback period from investment in equipment, green transportation has not been invested much. Therefore, incentive policies can reduce the financial burden for enterprises, thus encouraging them to mobilize resources to invest in green logistics and green transportation. Government can exempt taxes or offer preferential tax rates for transport businesses using clean energy vehicles or adopting technology to transform towards green operation.

Accelerate the digital transformation process and create the favorable environment for enterprises to adopt information technology

Government needs to complete a legal framework for logistics services and digital transformation, tackling concerns preventing enterprises from adopting technology, in particular security and financial issues. Government should facilitate the connectivity between logistics enterprises and information technology corporations, and mobilize information technology corporations to transfer logistics software at preferential prices to reduce financial burden.

Planning and building infrastructure towards modernity to facilitate green transportation

Encourage multimodal transportation: Government issues and clarifies regulations and guidelines on multimodal transport. Develop infrastructure focusing on the linkage between modes of

transport.

Repair and upgrade the existing transport infrastructure: Encourage the replacement of fuel and petroleum by alternative sustainable energy. Have financial programs to facilitate renovation and upgrade of the outdated railway system to meet current technical standards, thereby increasing the use of trains.

Promote and optimize logistics centers: Reduce the intensity of cargo circulation in the inner city through multimodal transport schedules and environmentally-friendly distribution systems.

Develop an indicator with a set of criteria to measure the level of green logistics development

It is of great necessity to develop an indicator to assess the performance of green logistics, in which there need to be criteria to evaluate the situation of green transportation. A Green Logistics Performance Index can be beneficial in controlling green logistics activities, assessing green logistics capacity on a regular basis, thereby, building appropriate and effective solutions when necessary.

Focusing on human resources training

Support companies with short-term training to solve urgent needs of labor in the logistics industry. In the long run, the government needs to promote undergraduate and postgraduate, as well as vocational training in the logistics and transportation sector, and build curricula suitable for practice. Authorities coordinate with businesses and localities to implement the "School - State - Enterprise" model; strengthen international cooperation in training and research.

5.2. For logistics and transportation enterprises

Develop clear and practical strategies towards green transportation

Implement the strategy that promotes green transportation subject to the enterprise's objectives and financial resources. The strategy needs to be practical, specific, measurable and time-bound so the company can work under the strategy effectively. Regularly review and evaluate the implementation of green logistics activities towards the strategy to have timely appropriate adjustments.

Transform enterprise's vehicles system and structure towards green transportation

Improve the quality of means of transport, upgrade the substandard vehicles, especially the train system with low technical standards and backward infrastructure. Prioritize the use of environmentally friendly means of transport and sustainable alternative energy replacing fuel.

Apply technology in transportation

Enterprises need to take advantage of incentives from the government to apply the appropriate technology optimizing the transportation process. GPS and route tracking technology are recommendable as companies can set the most efficient route to reduce the use of fuel, hence decreasing the emissions to the environment and avoid empty round trips.

Raise awareness about the importance of green logistics

It is essential that logistics service providers and logistics service users raise awareness about the inevitability and importance of implementing green transportation. Once users are aware of the importance, their demand will increase, which motivates the green transformation process in

logistics providers.

Coordinate with the state and other institutions to tackle outstanding issues Propose sponsorship from the state or other corporations and take advantage of the preferential programs offered by the government to reduce the financial burden in terms of green transformation. In terms of human resources problems, logistics businesses need to collaborate with associations and universities to provide a knowledge foundation for a higher quality labor force of the industry.

6. Conclusion

In order to achieve green logistics, it is important for both the government and enterprises to take action to improve the transportation system in Vietnam. From evaluating the current transportation system of Vietnam, we conclude that besides significant achievements in road infrastructure, there still remain tremendous obstacles to overcome. Accordingly, we continue analyzing the opportunities and challenges of the current transportation system, thereby achieving information to further propose recommendations for both government and logistics enterprise sides. Specifically, it is vital for the government to take comprehensive methods to promote preferential regulations of tax and interest favorable to logistics enterprises. From the enterprises' side, there are some noteworthy suggestions that enterprises should take into consideration, including transforming the enterprise's vehicle system and structure towards green transportation and applying technology in transportation. In conclusion, a collaborative effort from both government and enterprises is required to advance the transportation system towards green logistics.

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