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GREEN LOGISTICS STRATEGIES

The strategic importance of green logistics in supply chain management has been proven, leading to a reduction in the negative impact of companies' activities on the environment and ensuring a balance between economic efficiency, environmental safety, and social impact. A hypothesis has been formulated regarding the presence of synergy between green marketing and green logistics for fostering environmental awareness, implementing green initiatives, and ensuring the sustainable development of trade enterprises. The areas for implementing green logistics strategies have been identified, including the optimization of transportation routes, the introduction of energy-efficient technologies, the use of alternative energy sources, waste management, and the reuse of packaging materials. Particular emphasis is placed on fostering environmental awareness among supply chain participants through the synergistic interaction of green communications and green logistics solutions, which contributes to the increasing sustainable consumer preferences, enhancing partner awareness, and encouraging responsible behaviour. The conditions for the effective implementation of green logistics strategies have been considered, including the development of unified assessment standards, the formation of standardized indicators, the monitoring of indirect environmental impacts, and the integration of economic, environmental, social, and technological criteria into the supply chain management system. The proposed approach will enable trading

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СТРАТЕГІЇ ЗЕЛЕНОЇ ЛОГІСТИКИ

Доведено стратегічне значення зеленої логістики в управлінні ланцюгами постачання, що призводить до зменшення негативного впливу діяльності підприємств на довкілля та забезпечує баланс між економічною ефективністю, екологічною безпекою й соціальним ефектом. Сформульовано гіпотезу про наявність синергії між зеленим маркетингом і зеленою логістикою для формування екологічної свідомості, реалізації зелених ініціатив і забезпечення сталого розвитку підприємств торгівлі. Визначено напрями реалізації стратегій зеленої логістики, зокрема оптимізація транспортних маршрутів, впровадження енергоефективних технологій, застосування альтернативних джерел енергії, управління відходами та повторне використання пакувальних матеріалів. Особливо акцентовано на формуванні екологічної свідомості учасників ланцюгів постачання через синергетичну взаємодію зелених комунікацій та логістичних зелених рішень, що сприяє підвищенню стійких споживчих преференцій, посиленню обізнаності партнерів та стимулюванню відповідальної поведінки. Розглянуто умови ефективної реалізації стратегій зеленої логістики, включаючи розроблення єдиних стандартів оцінювання, формування уніфікованих показників, моніторинг непрямих екологічних впливів та інтеграцію економічних, екологічних, соціальних і технологічних критеріїв у систему управління ланцюгами постачання. Запропонований підхід

companies to minimise environmental risks, improve the efficiency of logistics processes, strengthen competitive positions, and create additional value for all participants in the supply chain.

Keywords: strategy, green logistics, supply chains, logistics systems, supply chain adaptation, green distribution, environmental awareness, sustainable development.

дозволить підприємствам торгівлі мінімізувати екологічні ризики, підвищити ефективність логістичних процесів, зміцнити конкурентні позиції та створити додаткову цінність для всіх учасників ланцюга постачання.

Ключові слова: стратегія, зелена логістика, ланцюги постачання, логістичні системи, адаптація ланцюгів постачання, зелена дистрибуція, екологічна свідомість, сталий розвиток.

JEL Classification: D21, D62, L81.

Introduction

In the context of globalization of trade, environmental safety plays a key role in the development and implementation of green logistics strategies in supply chains. These processes are particularly significant within the framework of the European Green Deal, which guides countries and enterprises towards achieving climate neutrality and developing a sustainable economy. The effectiveness of their implementation determines the possibilities for improving the environmental condition through energy consumption, emissions of harmful gases, waste generation, and other environmentally significant aspects. Therefore, green logistics strategies in trade enterprises, aimed at integrating environmental principles into the planning, organization, execution, and control of logistics operations, are highly relevant.

The issues of selecting, unifying, and developing an integrated system of evaluation indicators, as well as ways to increase the efficiency of green logistics, are particularly important for the formation of effective logistics systems, the construction of optimal logistics chains, ensuring the competitiveness of trading enterprises in the long term, and achieving their strategic target goals. In view of the growing global environmental challenges, such areas of green logistics as optimization of transportation flows to reduce emissions, efficient distribution and recycling of waste, environmentally safe disposal of materials, the use of renewable energy sources, and rational consumption of natural resources are gaining significant importance. Moreover, the integration of environmental standards into logistics processes leads not only to a reduction of negative environmental impact but also to an increase in the resilience of logistics systems.

The effectiveness of green logistics encompasses a set of indicators that characterize the level of greenhouse gas emission reductions, the rational use of energy and material resources, the reduction of the negative impact of logistics processes on the environment, as well as the improvement of companies' environmental responsibility. In other words, it is an integral indicator of the performance of logistics systems, combining economic, environmental, and social aspects of the functioning of their elements within supply chains.

The issues of green logistics, its ecological, economic, and organizational components, as well as the processes of assessing efficiency in all areas of society's functioning, are actively studied by both foreign and Ukrainian researchers. The article (Bondarenko et al., 2024) notes that environmental problems, the socially responsible orientation of the world's population, and the promotion of a healthy lifestyle necessitate the implementation of the concept of "green smart cities", within which green marketing and green logistics play a key role. Indeed, today the interconnection between green marketing and green logistics creates an integrated impact on the strategic development of both cities and enterprises. Scholar Salo (2023) notes that the achievement of logistical activity goals is ensured through the synthesis of economic, social, and environmental components, which form the framework of "green logistics" and provide the unity of interaction of resource-saving technologies. Researchers Reznik and Marynina (2024) also emphasize that the combination of these components contributes to achieving both quantitative and qualitative goals of logistical activity, enhancing the impact of green logistics on sustainable development.

On her part, Kalycheva (2023) focuses on the interrelation between the concept of 'green logistics' and the concept of sustainable development, and also argues that the effective implementation of green logistics principles should be based on technical, organizational, and environmental factors. According to Dorosh (2024), the future of green logistics is directly linked to the automation of the supply chain, while the critical role in achieving its objectives and overcoming barriers to implementing green logistics lies in cooperation between companies, the government, and society. The empirical results of research by Sarkis and Zhu (2024) justify that regulatory pressure (economic, consumer pressure, and government support) is the strongest driver for the adoption of green logistics practices, emphasizing the importance of complying with environmental regulations and standards. Seuring and Müller (2025) analyze the evolution and current state of research in the field of Green Logistics Management (GLM). They pay particular attention to the integration of environmental aspects into supply chains, sustainability measurement, reverse logistics, waste management, and recycling. The research findings indicate that GLM is strategically important for achieving ecological stability and sustainable development in logistics operations.

Research conducted by scientists on the example of about five hundred manufacturing companies in Indonesia (Rizki et al., 2022) allowed them to conclude that green procurement, green marketing, green manufacturing, and green design as key elements of Green Supply Chain Management (GSCM), together with environmental awareness, are decisive in the performance indicators of sustainable enterprise development. At the

same time, eco-design, internal environmental management, environmental education, cooperation with customers, and green information systems do not affect sustainable development indicators. Meanwhile, Fransoo and Winkenbach (2024) reveal the specifics of the impact of digital technologies on the sustainable development of global supply chains through the prism of green logistics management. They analyze how the use of big data, the Internet of Things (IoT), and artificial intelligence contributes to reducing CO_2 emissions, optimizing routes, and improving waste management. The authors also emphasize the importance of integrating environmental criteria into digital platforms to achieve sustainable development in supply chains.

Visualization of scientific connections between publications (*Figure 1*) using Connected Papers (n. d.) allows us to establish that:

• green logistics is rapidly developing as a scientific field (the number of publications has significantly increased in 2023–2025);

• the central research cluster integrates various directions (ecological transport, sustainable supply chains, green technologies, green strategies, green initiatives, environmental awareness);

• the visualized network presents both foreign and domestic authors, indicating the inclusion of national research in the global discourse;

• some articles are devoted to general concepts of logistics, while others focus on specialized issues of supply chains;

• the most cited works are scientific studies related to the integration of ESG approaches into green logistics.

Despite the active development of scientific research in the field of green logistics, for trading enterprises the problem of determining the components for evaluating the effectiveness of implementing "green" practices in supply chains and strategic enterprise development remains unresolved. The efforts of theorists and practitioners are focused on studying conceptual models or mechanisms for implementing green logistics. There is no unified system of indicators for evaluation that would allow for a comprehensive consideration of: environmental outcomes (emission reduction, energy efficiency, waste disposal); economic feasibility (costs and benefits for the business); social impacts (working conditions, community influence); managerial responsibility (compliance with ESG approaches, transparency and strategic decision-making); and the possibilities of digital technologies (to enhance supply chain efficiency). This complicates the development of practical recommendations for integrating green logistics into sustainable supply chain development.

The purpose of the article is to justify the mechanism for implementing a green logistics strategy in supply chains and to reveal its role in ensuring economic efficiency, environmental safety, and the social impact of trade enterprises' operations.

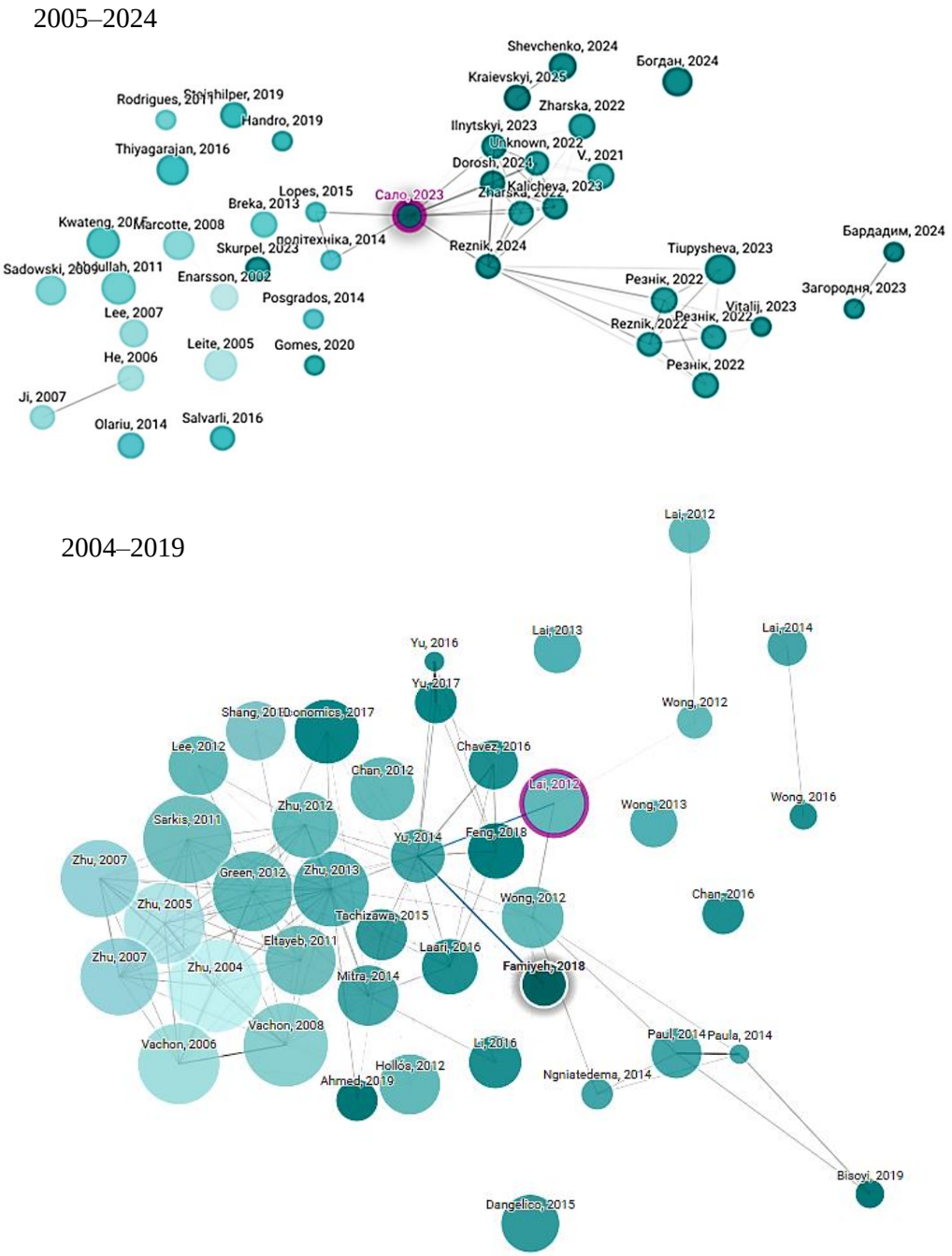

Figure 1. A fragment of the visualization of scientific connections between publications of foreign and domestic researchers

Source: compiled by the authors based on (Connected Papers, n. d.).

A hypothesis has been proposed regarding the presence of synergy between green marketing and green logistics for the formation of environmental awareness, the implementation of green initiatives, and the provision of sustainable development for trade enterprises.

The research methodology is based on the use of systemic and interdisciplinary approaches, which allow for the integration of the principles

of sustainable development, the concept of green marketing, and green logistics. Methods of theoretical generalization, comparative, and structural-logical analysis were also applied for the author's interpretation of the interrelationship between marketing and logistics green solutions.

The three sections of the main part of the article examine the essence and role of green logistics in trade enterprises, outline the key aspects of green logistics, and the environmental initiatives and strategies used by trade enterprises to enhance consumer loyalty. It is proved that green logistics is a concept of strategic development that ensures a balance between economic performance, environmental safety in supply chains, and social impact. The article analyzes the green initiatives of trade enterprises and substantiates the operational and strategic aspects of green logistics. The conditions for the effective implementation of green logistics strategies in supply chains are defined, and their impact on the economic, environmental, and social components of supply chains is studied. Special attention is paid to the methods and directions of forming environmental awareness in supply chains and the synergistic effect ensured by the interaction of green communications and green logistics, which is manifested in the formation of sustainable consumer preferences, increased environmental awareness of partners, and the stimulation of responsible behavior among supply chain participants.

1. The essence and role of green logistics in trade enterprises

For trading enterprises, green logistics has special strategic significance. Effective green logistics strategies not only enhance the efficiency of supply chain operations but also help shape a positive company image, strengthen consumer trust in the brand, and meet modern sustainable development requirements.

Ukrainian researchers, in particular Zharska (2022), establish a connection between the concept of green logistics and the concept of sustainable development, emphasizing the expediency of implementing green practices in enterprises such as green warehousing, green transporttation, green packaging, and green management. The authors Skupeiko et al. (2022) note that green logistics is a kind of tool for combining the economy and ecology, which ensures increased efficiency of business activities and meeting consumer needs without harming the environment, with the main objects being material, informational, and financial flows. Researcher Salo (2023) identifies three goals of green logistics: reducing traffic, limiting pollutant gas emissions, and minimizing waste. The authors Dorosh et al. (2024) reveal the advantages of green logistics for the company, its suppliers and partners, clients, and society.

Foreign researchers Nagy and Szentesi (2024) note that companies prioritizing green logistics can significantly enhance brand reputation and meet consumer expectations. At the same time, the regular support of the government and environmental organizations in implementing green logistics is important.

The results of Khayyat's (2024) research have demonstrated that environmental awareness, organizational culture, technological readiness, government regulation, and financial support significantly influence the implementation of green logistics practices in enterprises. In turn, Kim (2024), using mathematical modeling methods, proves that the implementation of green logistics strategies ensures a combination of environmental principles and profitability, as well as coordination between the private and public sectors.

Research by scientists allows for the identification of the following common features in the implementation of green logistics tasks: minimizing the negative impact of logistics operations on the environment (reducing greenhouse gas emissions, energy efficiency, use of alternative energy sources, and waste management); optimizing supply chains (aimed at improving the efficiency of all stages of the supply chain (from raw material procurement to delivery to the end consumer), route optimization, warehousing, and packaging in accordance with environmental standards); integrating economic and social aspects (green logistics simultaneously performs economic, environmental, and social functions); forming a positive company image and consumer trust; and having a connection with the concept of sustainable development and ESG.

The distinctive features in the works of researchers on the implementation of green logistics strategy are: emphasis on different levels of application (focusing on the entrepreneurial and national levels, paying attention to global and systemic approaches; concentrating on the integration of green logistics into international supply chains and the use of innovative technologies); detailing of tools and technologies (describing specific technologies in detail, such as carbon-free transport, electric vehicles, AI logistics optimization models, or focusing on general principles, standards, and management approaches, not always resorting to specific technological solutions); different levels of emphasis on the social component (highlighting social responsibility, image, and consumer trust, or focusing on economic and environmental efficiency, with the social aspect mentioned less in detail, except for the general principles of ESG); defining the role of the circular economy and closed loops (closing resource and circular economy cycles or limiting it to waste management and material reuse, without a broad analysis of the circular economy).

The analysis results prove that green logistics in supply chains is a comprehensive concept of flow process management that ensures the integration of economic, environmental, and social principles at all stages of the movement of goods and services, starting from procurement planning and transportation and ending with the disposal or reuse of products and packaging. For trading enterprises, green logistics acquires specific characteristics dictated by the particular nature of their activities. First of all, this involves the use of environmentally safe packaging materials and the minimization of packaging waste; optimization of transport routes and implementation

of energy-efficient types of transport; application of "green" technologies in warehouses and retail spaces; introduction of energy-saving measures and reduction of carbon emissions; development of reverse logistics, which includes collection, return, reuse, and recycling of products and containers; the need to combine economic benefits, environmental responsibility, and social priorities, which allows achieving long-term competitive advantages. Operational and strategic levels of green logistics are presented in *Table 1*.

Table 1

Operational and strategic levels of green logistics

Analysis criterion	Green logistics as:	
	operational approach	strategic development concept
Purpose of implementation	Reduction of operational costs and optimization of current logistics processes	Formation of long-term resilience of logistics systems and competitive advantages
Planning level	Short-term and medium-term planning	Long-term planning
Focus	Transport, storage, packaging, energy saving	Integration of economic, environmental, and social goals into business strategies
Tools and technologies	Energy-saving technologies, route optimization, waste reduction	Eco-supply strategies, investments in renewable energy, "green" partnerships, socially responsible policy
Function for enterprises	Performs an auxiliary function in daily processes	Is a key element of strategic development and positioning
Implementation results	Resource savings and improved operational efficiency	Improving corporate reputation, attracting investors and loyal consumers, sustainable development of logistics systems

Source: developed by the authors.

Thus, green logistics in trade enterprises serves not only as a direction of operational management but also as a strategic development concept that ensures a balance between economic efficiency, environmental safety in supply chains, and social impact, which is manifested in improving consumers' quality of life, promoting responsible consumption, and strengthening reputation. It involves a set of measures and actions aimed at minimizing negative environmental impact. It encompasses logistics solutions in the areas of reducing CO_2 emissions through the use of environmentally friendly transportation, optimizing delivery routes to reduce mileage and fuel costs, implementing energy-efficient warehouse solutions, transition to biodegradable and recyclable packaging, and digitalizing processes to enhance transparency and control at all stages of the supply chain.

Rational use of natural resources and the preservation of biodiversity in supply chains are key guidelines of green logistics strategy. This involves using environmentally safe materials, optimizing packaging, minimizing energy consumption, and implementing sustainable sourcing principles, which contribute to maintaining ecological balance and long-term environmental sustainability of commercial activities. These areas have found

practical implementation in the green initiatives of retail networks, which include measures for energy efficiency, resource reuse, waste recycling, and the development of environmentally responsible supply chains (*Figure 2*).

LLC "EPICENTER K"

- Use of energy-saving technologies (installation of solar power plants and providing up to 30% of shopping centers' needs with "green" energy).
- Implementation of charging stations for electric vehicles (development of its own network of EV charging hubs).
- Recycling of waste paper (collection and sending of cardboard and paper packaging for recycling).
- Recycling of used batteries (installation of battery collection containers).
- Reduction of plastic packaging and containers consumption (implementation of large-scale projects (#BagForYou and #BreakingUpWithPlastic))

LLC "SILPO-FOOD"

- Operation of the "ReCycling" supermarket (equipped with solar panels, heat pumps for heating and cooling, refrigeration equipment running on CO_2).
- Implementation of the Silpo Recycling project "Silpo" (includes a network of collection stations for recyclables, where consumers receive eco-points on their loyalty card for returning paper, plastic, metal, glass).
- Eco-friendly delivery (order delivery using electric scooters, eco-packaging for orders).
- Organic product support program (joining the international initiative Organic September).
- Reusable packaging programs

LLC "ATB-Market"

- Implementation of a comprehensive eco-strategy aimed at reducing plastic use and promoting a culture of responsible consumption.
- Encouraging consumers to use biodegradable bags and offering plastic bags for sale.
- Collection and recycling of used batteries.
- Greening and forest restoration (within the framework of social and environmental projects, 30 hectares of forest were donated to six regions of the country and over 180,000 seedlings were planted).
- Use of reusable eco-boxes (introduction of eco-packaging technologies and the appearance of "shopping boxes" made of durable cardboard).

LLC "NOVUS Ukraine"

- Launch of its own "green" logistics center in Kyiv (the logistics center built according to BREEAM eco-building principles)
- Use of biodegradable bags (made from corn and potato starch and decomposing within three years).
- Installation of solar panels and solar stations.
- Sorting and recycling of waste (installation of sorting locations in the network, special containers for glass, paper, plastic, and other waste, recycling of waste and expansion of the range of recyclable items)

Figure 2. Green initiatives of trade enterprises

Source: developed by the authors.

For domestic trade enterprises, green logistics is becoming increasingly important. Its tools reduce the negative impact on the environment while also serving as factors that enhance the efficiency of logistics processes. Its implementation in trade enterprises is based on the principles of efficient resource use, waste minimization, transition to renewable energy sources, and the application of innovative technologies. In particular, green transportation logistics ensures a reduction in energy consumption and operational costs through route optimization, improved quality of transportation, and decreased losses during the transportation and storage of products. Green warehouse logistics involves energy-efficient lighting and heating of warehouses, the use of automated inventory management systems to minimize losses and optimize space; environmentally responsible packaging using biodegradable and recyclable materials, as well as minimizing packaging to reduce waste; a sustainable supply chain that includes selecting suppliers with environmental certifications, reducing transportation, and prioritizing local producers to lower the carbon footprint; as well as green information logistics, which includes the digitization of processes, electronic document management, and tracking environmental indicators in supply chains to increase transparency and control of environmental impact.

2. Conditions for ensuring the effective implementation of a green logistics strategy in supply chains

The implementation of green logistics strategies in trade enterprises is an important task that will create a solid foundation for the development of environmentally conscious brands, support consumer trust, and sustain ecological reputation. The strategic objectives of green logistics are aimed at ensuring sustainable development by integrating environmental initiatives into all stages of logistics processes. One of the priority areas is the reduction of greenhouse gas emissions (CO_2, CH_4, N_2O), which is achieved through the optimization of transportation routes, the implementation of energy-efficient technologies, and the transition to the use of alternative energy sources. Decarbonization of logistics operations helps reduce the impact on global warming, which is a key factor in maintaining climate stability. In addition to reducing the carbon footprint, green logistics aims to decrease environmental pollution, particularly of the air, water resources, and soil. This is achieved through the implementation of cleaner technologies, emission control, and efficient management of harmful waste generated during the storage, packaging, and transportation of goods.

The goal of developing and implementing a green logistics strategy is to ensure the development of logistics systems by harmoniously combining economic feasibility, environmental sustainability, and social responsibility. While traditional logistics often prioritizes cost and speed, green logistics pays significant attention to environmental preservation and social responsibility. An important component of green logistics in the trade sector is also reducing waste through recycling and reuse systems for packaging materials, which helps minimize waste generation, reduce the need for primary resources, and lessen the environmental impact on landfills. This is achieved through phased planning based on the selection of environmentally responsible suppliers and procurement optimization, the implementation of energy-saving and "green" technologies in transportation and warehouses, the organization of reverse logistics and product recycling, the development of environmental awareness among employees and consumers, as well as monitoring and evaluating the effectiveness of strategy implementation.

Despite the fact that each trade enterprise chooses its own approach to implementing green logistics strategies, a number of directions can be highlighted that define its unique opportunities, including: the use of electric and hybrid vehicles; optimization of delivery routes based on modern logistics software and real-time traffic data, taking into account road conditions, weather, and customer time windows; lean inventory management; creation of energy-efficient warehouses and heating and cooling methods; use of biodegradable, compostable, or recyclable packaging materials; development of waste reduction policies and responsible waste management practices; implementation of ethical standards and building environmentally responsible

supply chains with the harmonious functioning of all participants; and the use of reverse logistics technologies.

Let's consider the main conditions that contribute to the effective implementation of green logistics strategies in the supply chains of trade enterprises.

Taking into account the requirements of international certification standards (Bondarenko & Siazin, 2024). The application of internationally recognized certification standards (ISO 14001, Fair Trade Certified, Rainforest Alliance, GOTS and PEFC) ensures the credibility of companies' environmental statements and their adherence to greening principles. The use of these standards provides a systematic approach to controlling the environmental aspects of operations, optimizing resources, reducing negative environmental impact, and increasing corporate environmental responsibility. ISO 14001 certification promotes the formalization of environmental management systems, allowing companies to integrate sustainable development principles into logistics processes, including optimization of delivery routes, warehouse energy efficiency, and management of transport flows to reduce emissions and resource consumption. The Fair Trade Certified standard provides support for corporate social responsibility and ethical trade, enabling commercial enterprises to build responsible supply chains and reduce social risks. Rainforest Alliance certification focuses on biodiversity conservation and the implementation of sustainable agricultural practices, allowing companies to choose environmentally certified suppliers and minimize the negative impact of logistics operations on natural ecosystems. The GOTS standard ensures the use of organic materials and compliance with social standards in textile production, enabling the integration of environmentally friendly products into a company's logistics flows, supporting the concept of a closed loop and waste minimization. PEFC certification ensures the legality and sustainability of forest management, allowing responsible use of timber and packaging materials, optimizing resource conservation, and maintaining environmental standards in supply chains. Thus, the implementation of these standards not only increases the level of environmental responsibility of trading enterprises but also provides practical realization of the key components of green logistics: resource optimization, emission reduction, waste management, and the creation of sustainable supply chains.

Transparency of environmental processes in supply chains. Ensuring the transparency of environmental reporting involves systematic and regular informing of supply chain participants, partners, and end consumers about the company's environmental performance indicators and environmental initiatives. The information in the reports should reflect key environmental indicators, including: rational use of water, energy, and fuel; waste volumes and greenhouse gas emissions and their dynamics; expenditures on environmental protection measures and the results of their implementation; payment of environmental taxes and rent for subsoil use; renewal of fixed assets

considering their impact on energy efficiency and reduction of environmental load; and expenses for implementing environmental initiatives. This approach allows for increasing the transparency of logistics processes, strengthening the brand's reputation as a socially and environmentally responsible business entity, and also encourages partners and suppliers to adhere to the principles of green logistics.

Access to independent sources of control and audit. Ensuring access to independent sources of control and auditing is an important tool for implementing green logistics strategies in supply chains. This approach involves the introduction of external and internal systems for checking environmental practices, which allows for the assessment of the compliance of a company's actual activities with established standards and certification requirements. This area includes external audits, internal control and monitoring, transparency of audit results, and analytical use of audit report data.

The activation of the use of digital technologies by enterprises. This concerns the following areas:

• optimization of transportation routes: the use of Big Data and Artificial Intelligence (AI) allows for demand forecasting and selecting optimal delivery routes. This reduces vehicle mileage, lowers fuel costs, and cuts CO_2 emissions;

• ensuring intelligent warehouse and inventory management (warehouse management systems (WMS) with analytics help to plan inventory volumes more accurately and avoid excessive transportation. This will reduce the frequency of transportation and unnecessary cargo movements, which will lower energy consumption and greenhouse gas emissions;

• the integration of IoT (Internet of Things) and sensors allows real-time tracking of vehicle conditions, loading, and cargo temperature. As a result, it ensures more accurate planning, reduces losses and product returns, which decreases additional transportation and emissions;

• promoting "green" solutions in supply: digital platforms enable consideration of environmental criteria when selecting suppliers and transport operators. For example, by choosing a supplier with a lower carbon footprint or vehicles with low emissions, companies directly reduce the overall emissions of the supply chain.

• reverse logistics and recycling: digital technologies enable the efficient organization of reverse flows of goods and waste. This increases recycling rates, reduces the need for new materials, and lowers emissions associated with production and disposal.

Resource optimization and waste management. The rational use of materials, energy, and water resources, along with the implementation of policies for waste reduction, reuse, and recycling, ensures the minimization of environmental impact based on the creation of energy-efficient warehouses, optimization of packaging, sorting, and reuse of materials.

Partnership with environmentally responsible supply chain participants. Cooperation with participants who adhere to principles of sustainable development and ethical standards allows for the formation of a more

resilient supply chain. Assessing environmental practices and integrating environmental criteria into operations ensures that all stages of the logistics process are aligned with the principles of green logistics.

Increasing the environmental awareness of participants in supply chains. In this aspect, the participants include not only the enterprise's external contractors but also the employees of the enterprise, since their actions and decisions directly affect the effectiveness of implementing green logistics strategies. Regular training of personnel on the principles of green logistics, environmental standards, and ethical resource management practices contributes to the formation of a socially responsible corporate culture. This ensures the effective implementation of environmental initiatives in daily operational activities and supports the enterprise's strategic goals in the field of green logistics.

Thus, the effectiveness of green logistics strategies in commercial enterprises lies in their ability to integrate economic benefits, environmental feasibility, and social priorities, forming the foundation for long-term sustainable development.

3. Environmental awareness in supply chains

Environmental awareness in supply chains encompasses a range of aspects. In particular, it involves assessing environmental indicators, applying international certification standards to optimization of transportation flows, enhancing warehouse energy efficiency, managing waste, and implementing digital technologies for controlling and monitoring logistics processes. It ensures not only compliance with environmental regulations but also enhances brand reputation, strengthens consumer and partner trust, and creates preconditions for the economic, environmental, and social sustainnability of the enterprise.

According to the Deloitte report (2025), environmental issues continue to shape the behavior of Generation Z and Millennials. The environment is a constant source of concern for these generations: about two-thirds of Generation Z (65%) and Millennials (63%) reported feeling worried or anxious about environmental issues over the past month. These concerns directly influence their consumer choices: for instance, nearly two-thirds of respondents indicate a willingness to pay more for environmentally sustainnable products and services. Environmental considerations also affect career decisions – around 23% of Generation Z and 22% of Millennials report that they research a company's environmental impact or policies before accepting a job offer.

An important role in this process is played by green marketing, which encourages consumers to choose environmentally friendly products and services, as well as raises business partners' awareness of the need to comply with environmental standards. On the other hand, green logistics ensures the effective management of material and product flows taking into account environmental criteria, such as minimizing CO_2 emissions, optimizing transportation routes, and reducing waste. The integration of green supply

chain management (*GSCM*) practices and environmental consciousness significantly improves the sustainable performance of enterprises, particularly through the influence of green marketing and environmentally oriented processes (Rizki et al., 2022). At the same time, green logistics practices positively affect the operational and financial efficiency of companies while promoting the development of corporate environmental awareness (Sarkis & Zhu, 2024).

Therefore, the main areas for implementing effective green logistics strategies in supply chains are:

Organization of environmental activities. Organizing training sessions and seminars for employees and partners on green logistics practices, including energy-efficient transportation, route optimization, and waste and resource management. This will help align green logistics strategies with consumer expectations and the capabilities of companies to meet them.

Sponsorship and participation in environmental initiatives. This area concerns the support of environmental programs and partner projects. It promotes the development of sustainable environmental practices throughout the supply chain and is ensured through participation in environmental initiatives and the exchange of best green practices. The success of its implementation affects the enhancement of brand reputation by demonstrating its environmental responsibility.

Green distribution and transport. This area involves planning optimal delivery routes taking into account environmental criteria to reduce CO_2 emissions and fuel costs, using energy-efficient or alternative transport (electric vehicles, hybrid trucks, biofuels), using appropriate transport management systems to monitor and control the environmental performance of transportations; implementing reverse logistics and packaging management for recycling and reuse of resources.

Green procurement and production. Key actions include the rational selection of suppliers with certified environmental standards and low emissions, the use of materials with minimal environmental impact and energy-efficient equipment in production, and the implementation of Lean Green Logistics policies to reduce waste and optimize the resource use.

Digital monitoring and analytics. To track emissions, optimize logistics flows, and control energy consumption, it is reasonable to use IoT, big data, and analytical platforms. Monitoring the environmental indicators of supply chain participants is the foundation for ensuring compliance with corporate sustainability standards and supporting transparent communication.

Green marketing and communications. They foresee systematic informing of supply chain participants and end consumers about the environmental characteristics and benefits of products, including components of green logistics such as "green delivery", carbon footprint reduction, and rational use of resources. Effective implementation of green marketing strategies is aimed at stimulating demand for environmentally safe products, increasing consumer environmental awareness, and forming a positive perception of the brand as socially responsible and environmentally oriented.

For this, it is necessary to use comprehensive marketing measures, including green campaigns, educational programs, digital and social communication platforms, as well as transparent messages about the environmental initiateves of enterprises. In particular, green marketing initiatives and communication strategies that emphasize the environmental characteristics of products and the transparency of company actions motivate businesses to implement more efficient and environmentally safe logistics processes. This approach not only helps to enhance consumer loyalty but also strengthens brand reputation, ensuring its competitiveness in a market where environmental responsibility is becoming an important factor in consumer choice.

Green branding is becoming particularly significant as a key factor in ensuring sustainable business development and achieving leadership positions in the trade sector. In the context of growing consumer expectations and strengthened regulatory requirements for environmental processes, companies that integrate the principles of green branding into their activities are competitive. Brands that implement ecological values not only in their communication messages but also in their corporate culture are capable of ensuring high competitiveness and achieving successful development.

Clear formulation of a brand's green communications involves presenting the environmental characteristics of products and logistics practices in a straightforward and accessible manner in marketing messages, which helps build trust among consumers and partners and strengthens the image of a responsible brand. Green marketing communications convey the values of sustainable development to consumers and promote the practical implementtation of eco-friendly logistics solutions in supply chains, while increasing environmental awareness among all participants in these processes becomes the foundation for their effective and responsible interaction.

Thus, under conditions of long-term strategic development, it is environmental awareness that will determine the level of competitiveness of enterprises, as consumers increasingly prefer brands with transparent and sustainable logistical practices. Furthermore, eco-consciousness contributes to the harmonization of economic, social, and environmental interests, ensuring balanced business development and the preservation of the environment.

Conclusions

The implementation of green logistics strategies in supply chains is an important task for trade enterprises that aim to build long-term relationships with consumers, create a positive customer experience, and ensure sustainnable development. Applying the principles of green logistics and optimizing logistics operations will help reduce the negative impact of trade activities on the environment and decrease pollution of air, water, and soil. Effective waste management systems at the stages of storage, packaging, and transportation of goods allow for the reduction of harmful waste and ensure the efficient use of resources. Implementing practices for recycling and reusing packaging

materials reduces the need for primary resources and lessens the environmental burden on landfills.

Green logistics strategies should provide for the integration of environmental initiatives at all stages of the supply chain. One of the priority areas is the reduction of greenhouse gas emissions (CO_2, CH_4, N_2O), which can be achieved through the optimization of transportation routes, the implementation of energy-efficient technologies, and the transition to the use of alternative energy sources.

The formation of ecological awareness among participants in supply chains requires the coordination of green marketing initiatives with logistical solutions. The hypothesis of a synergistic effect from the interaction of green communications and green logistical solutions has been proven, manifesting in the development of sustainable consumer preferences, increased ecological awareness among partners, and the stimulation of responsible behavior among supply chain participants.

The implementation of green logistics strategies in trading enterprises requires the development of unified standards and methods for evaluating environmental indicators; the formation of a standardized system of indicators for an objective comparison of results between enterprises and types of economic activity; the assessment of indirect environmental impacts and the contribution of individual stages of the logistics chain to overall environmental performance; ensuring reliable information, systematic accumulation, monitoring, and reporting; and the integration of economic, environmental, social, and technological criteria into the overall supply chain management system.

The implementation of these measures will enable trading enterprises to reduce environmental risks, increase the efficiency of logistics processes, strengthen competitive positions, and create additional value for each participant in the supply chain.

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