A Review of Environmental Responsibility of Logistics Enterprises

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KEYWORDS	**ABSTRACT**
Logistics Enterprises; Tenvironmental Responsibility; Evaluation indicators	This paper reviews the evaluation of environmental responsibility fulfillment by logistics enterprises and the research on the construction of related index systems. In terms of evaluation, it is closely related to the assessment of corporate social responsibility. After the "triple bottom line" theory was proposed, the importance of environmental responsibility assessment has become increasingly prominent. The construction of the indicator system can be divided into two paths: one is not to rely on existing mature theories, and the other is to depend on mature theories such as the "triple bottom line" and ESG. Among them, the "triple bottom line" theory is widely applied, and some scholars have expanded or screened its dimensions. ESG theory is also applied to related performance evaluations, while the data envelopment rule provides guidance for the construction of input-output indicator systems. Based on the above review, the article puts forward further research ideas.

INTRODUCTION

In recent years, although the policy level has successively issued documents such as the "14th Five-Year Plan for the Development of Modern Logistics" and the "Opinions on Accelerating the Green Development of Modern Logistics", clearly putting forward specific requirements for the green transformation of the logistics industry, and some leading enterprises have also fulfilled their environmental responsibilities by promoting new energy transportation capacity, optimizing transportation routes, and adopting circular packaging, from the perspective of the industry as a whole, There are still problems of imbalance and lack of systematicness in the fulfillment of environmental responsibilities by logistics enterprises[1]. Among them, the non-uniformity of the environmental responsibility indicator system, the blurring of evaluation standards, and the absence of core indicators have become key constraints. In the quantitative assessment of environmental responsibility, logistics enterprises of different regions and scales lack a unified yardstick. Some enterprises only measure their own performance with general expressions such as "reducing fuel consumption" and "lowering the amount of waste". It is difficult to accurately reflect the depth and actual effectiveness of environmental responsibility fulfillment.

This confusion at the indicator level not only makes it difficult to quantitatively assess the effectiveness of enterprises' fulfillment of environmental responsibilities, but also brings many obstacles to policy supervision, industry benchmarking and social supervision. Moreover, it makes it hard for logistics enterprises to clearly identify their own shortcomings and improvement directions during the process of green transformation.

Against this backdrop, systematically sorting out and summarizing the current relevant indicators of environmental responsibility of logistics enterprises, clarifying the core dimensions, theoretical basis and practical application status of the indicator design, can not only accurately identify the common problems and individual differences in the industry's practice of environmental responsibility, but also provide strong support for logistics enterprises to clarify the key points of green transformation and for policymakers to improve the regulatory system This will further promote the coordinated development of environmental and economic benefits in the entire logistics industry, providing a solid guarantee for the implementation of China's green development strategy in the real economy.

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1.Evaluation Of Logistics Enterprises Related To The Fulfillment Of Environmental Responsibilities

1.1.Social Responsibility Evaluation

The relationship between the social responsibility evaluation of logistics enterprises and the fulfillment of their environmental responsibilities is inseparable [2]. Bowen (1953) first proposed the concept of corporate social responsibility, defining it as: the obligation of businesspeople to align with relevant policies, make corresponding decisions, and take ideal concrete actions in accordance with social goals and values [3]. At this point, the importance of enterprises fulfilling their environmental responsibilities has not yet been emphasized. It was not until Elkington (1998) proposed the "triple bottom line" theory composed of economic responsibility, environmental responsibility and social responsibility to construct the evaluation system of corporate social responsibility that people gradually paid attention to the evaluation of enterprises' environmental responsibility [4]. When studying the social responsibility evaluation of logistics enterprises, scholars employ various methods, but the selection of indicators is relatively similar. Luo et al. (2021) adopted the weighted method of mean square error index to analyze the performance of 74 enterprises in China's transportation industry from seven aspects: corporate governance, economic performance, environmental protection, basic human rights, product liability, fair operation, and community development [5]. Liang et al. (2023) evaluated 68 transportation enterprises from seven aspects: corporate responsibility governance, employee human rights, environmental protection, fair operation, product responsibility, community development, and economic contribution, using a combined approach to corporate social responsibility based on differences and similarities. Quan et al. (2022) evaluated the comprehensive efficiency of social responsibility of listed logistics enterprises based on the DEA-Malmquist model, establishing input and output indicators from the perspectives of customers, employees, and society [6].

1.2.Green Performance Evaluation

Green performance evaluation of logistics enterprises refers to the regular and irregular assessment and evaluation of their working capabilities, achievements in green logistics practices, as well as their contributions to the environment and social responsibility [7]. In foreign literature, the data enveloping model is a relatively common tool for evaluating the green performance of logistics enterprises. Data enveloping, as a non-parametric evaluation method, is mainly used to assess the relative efficiency of decision-making units with multiple inputs and multiple outputs. Fathi et al. (2022) evaluated the sustainability performance of transportation enterprises through a novel robust two-stage network data envelope model [8]. Fathi et al. (2024) developed a set of general weight models through a two-stage network data envelope model and Shannon entropy to further deepen the research on the green performance evaluation of logistics enterprises by Fathi et al. (2022) [9]. In addition, the Malmquist index was initially proposed by Malmquist in 1953. Caves, Chris tensen and Diewert began to apply this index to the measurement of changes in production efficiency in 1982 [10]. In the green evaluation of logistics enterprises, Mavi et al. (2019) used the ideal point method to derive the Malmquist productivity index and proposed a new dual-frontier data envelope universal weight model to evaluate the green performance of transportation enterprises [11].

2.The Construction Of An Indicator System For Logistics Enterprises Related To The Fulfillment Of Environmental Responsibilities

When building an indicator system related to the fulfillment of environmental responsibilities for logistics enterprises, the construction paths can be divided into two major categories: One is the method of independent design and construction based on specific scenarios or actual needs, rather than directly relying on existing mature theoretical frameworks; Another category is to fully utilize and integrate mature theories (such as the triple bottom line theory, ESG theory, etc.) as guiding principles and theoretical foundations, and construct an evaluation index system through systematic methods. This classification method aims to emphasize whether a time-tested and widely recognized theoretical system has been adopted as support and guidance during the construction process. In foreign literature, some have not constructed an index system based on existing theories. For instance, Kumar (2020) evaluated logistics suppliers from aspects such as internal and external

management practices, freight distribution and fleet operation practices, and green knowledge management practices [12], and did not use mature theories to assist in building an evaluation index system. It is quite common in foreign literature to construct an index system based on existing theoretical frameworks. When evaluating the green development level of logistics enterprises, the triple bottom line principle is widely adopted as a framework. This principle emphasizes that when measuring the performance of enterprises, a comprehensive consideration of the economy, society and environment should be emphasized. It is necessary to comprehensively evaluate the performance of the three dimensions of economy, society and environment, so as to comprehensively assess the sustainable development capacity of logistics enterprises and the effectiveness of their green transformation. Scholars such as Fulzele (2023) and Prabodhika (2022) have used economic, social and environmental indicators to evaluate the green development of logistics enterprises [13, 14]. Some scholars have expanded the dimensions of the triple bottom line principle on its basis. As Zhang and Mohammad (2024) introduced the dimension of "sustainable development innovation" on the basis of the triple bottom line principle [15]; Mohammadkhani and Mousavi (2023) introduced the "risk" dimension; Daimi (2023) introduced the "institutional" dimension [16]. Some scholars, such as Prabodhika (2022), have excluded the "economic" dimension indicators from the triple bottom line principle to reflect that the constructed indicator system deeply focuses on the fulfillment of enterprises' social and environmental responsibilities [17]. During the continuous development of the triple bottom line principle, some scholars have proposed the ESG theory (environment, Society and Governance) based on the triple bottom line principle [18]. As Zhang (2024) employed the data enveloping model to assess the sustainable development performance of China's international trade ports based on environmental, social and governance factors [19]. In addition to the guiding role of ESG theory in building an indicator system, when using the data envelopment method, as input-output indicators need to be constructed, it also plays a guiding role in the construction of the indicator system.

3.Review of Literature Research

3.1.Overall Research Status

In terms of the content of index evaluation, current research at home and abroad mainly focuses on the social responsibility evaluation of logistics enterprises, green performance evaluation, and the selection evaluation of green logistics suppliers, etc. In the evaluation of social responsibility, early attention was focused on enterprises' response obligations to social goals and values. Subsequently, with the proposal of the "triple bottom line" theory, the consideration of environmental responsibility was gradually strengthened. Green performance evaluation focuses on the comprehensive performance of logistics enterprises in green logistics practices, covering their contributions to the environment and social responsibility. The selection and evaluation of green logistics suppliers emphasize the balance between economic and environmental responsibility benefits, screening out potential suppliers that not only meet business needs but also align with the concept of green development.

In terms of the construction methods of the indicator system, they can be divided into two types. One type does not rely on mature theoretical frameworks, but independently designs indicators based on specific scenarios or actual needs, and combines the operational practices of logistics enterprises to extract evaluation dimensions. Another category relies on mature theories (such as the triple bottom line theory, ESG theory, and stakeholder theory) as guidance to systematically construct an indicator system. Among them, the triple bottom line theory is widely applied, and some studies have further expanded on its basis, such as introducing new dimensions like "innovation", "risk", and "institution". ESG theory integrates environmental, social and governance elements, providing a framework for the design of indicator systems. The stakeholder theory starts from the needs of the subjects, such as shareholders, employees, communities, etc. In addition, the data envelope model can only be used by constructing a system dimension with "input", "output" and "environmental factors" as variables, and thus also plays a guiding role in the construction of the indicator system.

3.2.Research Gap

Based on the above discussion, there are two possible areas

for optimization in the current construction of the environmental responsibility index system for logistics enterprises. On the one hand, at the level of indicator design, due to the differences in method selection and evaluation objectives, existing literature, especially domestic literature, mostly focuses on easily quantifiable dimensions such as equipment investment and operation processes, while paying insufficient attention to the core element of environmental management level. This leads to a structural imbalance in evaluation dimensions and makes it difficult to comprehensively reflect the level of enterprises' fulfillment of environmental responsibilities. On the other hand, at the level of research methods, the literature review stage generally lacks systematic literature analysis and retrieval strategies, such as not clearly defining the retrieval scope and not adopting scientific screening criteria. This may lead to limitations in the theoretical basis and literature support of some studies, which could affect the rigor and innovation of the conclusions.

Conclusion

This paper first classifies and sorts out the existing environmental responsibility indicators of logistics enterprises, and analyzes in detail the construction paths of the indicator systems in various types of literature, providing strong support for subsequent researchers to deepen related explorations. By further analyzing the gaps in current research, a brand-new direction is provided for the innovative construction of the environmental responsibility evaluation system of logistics enterprises, thereby better promoting the sustainable and healthy development of green logistics.

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