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Research on the Development Status, Problems and Optimization Paths of Green Logistics in the E-commerce Industry

Dan Li
Southwest Petroleum University, Chengdu 610500, China
Email: dan2322@foxmail.com

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Abstract

Driven by China's dual-carbon goals and booming e-commerce, traditional logistics suffers from packaging pollution, high transport carbon emissions, energy-wasting warehouses and defective reverse logistics. This paper uses literature review, case study and induction-deduction to study e-commerce green logistics based on circular economy and sustainable development theories. It reviews national and local supportive policies, analyzes industrial practices and typical cases of Cainiao and JD Logistics. The study identifies major constraints such as high green material costs, lack of unified standards, underdeveloped intelligent transport and incomplete recycling networks. Corresponding countermeasures are proposed to upgrade packaging, transportation, warehousing and reverse logistics systems. The results show that e-commerce green logistics has made initial progress but still needs coordinated efforts from governments, enterprises and consumers to achieve long-term eco-economic sustainability.

Keywords

E-commerce; Green Logistics; Dual Carbon Target; Circular Economy; Reverse Logistics

1. Introduction

1.1. Research Background

China's online retail volume reached 15.2 trillion yuan in 2024, with 175.08 billion express parcels delivered nationwide. Logistics carbon emissions account for about 9% of national industrial emissions. Under the dual-carbon strategic layout, traditional e-commerce logistics generates huge white pollution from disposable plastic packages, large greenhouse gas emissions from fuel delivery vehicles and massive energy waste in warehousing links. Imperfect reverse logistics further aggravates resource loss. Green logistics, which balances economic, social and environmental benefits, has become an inevitable transformation direction for the

whole e-commerce logistics industry.

1.2. Research Significance

1.2.1. Theoretical Significance

This paper combines circular economy and sustainable development theories with e-commerce logistics scenarios, systematically sorts out industry practical dilemmas and constructs targeted optimization frameworks, expanding the application research boundary of green logistics theories.

1.2.2. Practical Significance

For enterprises, the research provides low-cost green operation schemes to reduce logistics expenditure and improve ESG competitiveness. For governments, it supplies targeted policy suggestions for green logistics supervision and subsidy design. For society, the proposed paths effectively cut logistics carbon emissions and help fulfill national dual-carbon goals.

1.3. Research Content and Methods

1.3.1. Research Content

The paper firstly combbs the theoretical connotation of green logistics; secondly analyzes policy background and industrial green practices, together with two typical enterprise cases; thirdly summarizes core obstacles in four major logistics links; finally puts forward systematic improvement strategies and summarizes research conclusions and future research directions.

1.3.2. Research Methods

Literature research: Sort out domestic and foreign papers, policy documents and industry reports to lay theoretical foundations.
Case analysis: Take Cainiao Network and JD Logistics as samples to summarize replicable green logistics experience.
Inductive-deductive method: Summarize existing industry dilemmas and deduce targeted improvement paths based on relevant theories.

2. Theoretical Foundation of Green Logistics

2.1. Core Concept and Connotation

Defined by China's national standard *Logistics Terminology (GB/T 18354-2001)*, green logistics refers to environmentally friendly logistics activities that save resources and lower pollution through optimized transportation, storage, packaging and distribution. It has four core traits: sustainability, resource conservation, environmental friendliness and systematic coordination among the government, enterprises and consumers.

2.2. Key Supporting Theories

2.2.1. Circular Economy Theory

Centered on 3R principles (Reduce, Reuse, Recycle), the theory advocates full-life-cycle resource recycling. In e-commerce logistics, Reduce refers to simplified packaging and precise inventory control; Reuse means shared circulation boxes and turnover containers; Recycle stands for classified recycling and reprocessing of waste packages and returned goods.

2.2.2. Sustainable Development Theory

The theory requires coordinated development of economy, society and ecology. For e-commerce logistics enterprises, it demands lowering carbon emissions and energy consumption while controlling operating costs, creating green jobs and maintaining ecological balance.

3. Development Status of Green Logistics in the E-commerce Industry

3.1. Policy Environment

National documents including the *14th Five-Year Plan for Modern Logistics Development* and *Carbon Peaking Action Plan by 2030* set clear carbon reduction targets for express packaging and transportation. Provinces like Zhejiang and Guangdong release local subsidy and supervision policies to accelerate green logistics implementation, forming a governance pattern of national guidance and local promotion.

3.2. Practical Progress of the Industry

3.2.1. Green Packaging

Degradable packaging materials made of corn starch and bamboo fiber are widely promoted, with a national utilization rate of 60% in 2024. Large enterprises adopt tape-free cartons, customized slim packaging and shared courier boxes to cut disposable plastic waste. Nevertheless, non-degradable materials still occupy 80% of annual packaging consumption.

3.2.2. Low-carbon Transportation

China has built 77 green freight demonstration cities with 530,000 new energy delivery vehicles. In Guangdong, new energy vehicles accounted for 94.2% of newly added terminal delivery vehicles in 2024. However, rail and waterway low-carbon transport only account for less than 20% of total logistics volume due to insufficient flexibility and imperfect pricing mechanisms.

3.2.3. Green Warehousing

Leading logistics parks deploy solar power systems and LED energy-saving lamps. Intelligent inventory management lifts inventory turnover by 20%–30%, reducing idle storage and extra energy consumption. Most small and medium-sized warehouses still rely on high-energy traditional equipment without intelligent upgrading.

3.3. Typical Corporate Cases

3.3.1. Cainiao Network

Cainiao launched the Green Initiative Plan in 2016, constructing a full-chain green logistics system covering packaging, warehousing, transportation and recycling. It adopts intelligent combined orders to reduce delivery trips, puts recyclable shared boxes into mass use and builds campus recycling stations. Large-scale recycling campaigns during Double 11 attract tens of millions of consumers to participate in package recovery.

3.3.2. JD Logistics

JD's Green Stream Plan greatly reduces tape and paper waste. It launched nearly one million reusable Green Stream Boxes and built recycling channels in over 1,300 universities. Its new energy delivery fleets cut carbon emissions by 230,000 tons by 2019, forming a closed-loop green logistics model covering packaging, delivery and recycling.

4. Core Problems of E-commerce Green Logistics

4.1. Green Packaging

First, production cost of degradable bags is 30%–50% higher than ordinary plastic products, discouraging enterprise promotion. Second, unified industry standards for packaging size and material performance are absent, causing poor compatibility of circulation packages. Third, recycling networks are incomplete in rural and remote areas, leading to low overall recovery rates.

4.2. Transportation

The industry excessively relies on road transport while intermodal transport of rail and waterway develops slowly. Small and medium logistics enterprises cannot afford intelligent route planning tools, resulting in empty loads and circuitous transportation. New energy delivery vehicles face three major restrictions: short cruising mileage, insufficient charging infrastructure and high purchase costs.

4.3. Warehousing

Traditional warehouses have poor thermal insulation and high energy consumption. Most small and medium-sized enterprises lack funds to deploy solar power, electric forklifts and intelligent inventory systems. Inaccurate market demand forecasting

leads to massive inventory backlogs, further increasing storage energy waste.

4.4. Reverse Logistics

Recycling channels fail to cover remote regions. Unified classification, maintenance and refurbishment standards for returned goods are missing, resulting in low secondary sales rates. High operation costs and unclear profit models make most enterprises regard reverse logistics as a financial burden and reduce investment willingness.

5. Optimization Paths for Green Logistics in the E-commerce Industry

5.1. Improve the Construction of Green Packaging System

Cost reduction: Governments provide financial subsidies for eco-packaging R&D; enterprises adopt shared packaging leasing models to lower single-use cost.

Standard unification: Industry associations formulate unified standards for packaging size, degradable material indicators and environmental labels.

Closed-loop recycling: Expand urban and rural recycling outlets, launch point-reward recycling activities and build professional waste packaging treatment centers.

5.2. Raise the Green Level of Transportation Links

Optimize transport structure by increasing investment in railway and waterway freight infrastructure to develop intermodal transport. Subsidize small enterprises to deploy AI intelligent scheduling systems to cut empty driving rates. Expand new energy vehicle application: complete regional charging networks and offer road priority and tax incentives for electric delivery vehicles.

5.3. Accelerate the Green Transformation of Warehousing Links

Enterprises install solar power generation, LED lighting and electric handling equipment to lower energy consumption. Adopt big data demand forecasting to optimize inventory layout and avoid overstock. Governments offer tax breaks and special funds for enterprises carrying out green warehouse upgrading.

5.4. Perfect the Reverse Logistics System

Build multi-party recycling networks jointly operated by express firms, third-party recyclers and communities. Formulate unified inspection, classification and refurbishment standards for returned goods. Incorporate reverse logistics performance into corporate social responsibility evaluation and grant targeted financial subsidies to reduce operating costs.

6. Conclusion and Prospect

6.1. Research Conclusions

First, circular economy and sustainable development theories provide solid theoretical support for e-commerce green logistics transformation[10]. Second, supported by national policies, leading logistics enterprises have achieved preliminary results in green packaging, low-carbon delivery and energy-saving warehousing[13]. Third, the whole industry faces prominent bottlenecks including high packaging costs, unreasonable transportation structure, backward warehousing energy conservation and incomplete reverse logistics, together with restrictions of consumer awareness and talent shortages. Fourth, systematic solutions covering packaging, transportation, warehousing and reverse logistics are required to realize comprehensive green upgrading of e-commerce logistics.

6.2. Research Prospect

Future research can carry out quantitative empirical surveys to verify the actual emission reduction effect of green logistics optimization measures. Comparative research on foreign green logistics policies and technologies can provide more practical references for China's industry. In addition, the carbon reduction value of digital technologies such as big data and blockchain in full-link logistics will become a key research direction.

E-commerce green logistics is a systematic project requiring joint efforts from governments, enterprises and consumers. With continuous policy improvement and technological innovation, the industry will steadily advance toward low-carbon sustainable development and make important contributions to China's dual-carbon strategic goals.

References

[1] Department of E-commerce and Informatization, Ministry of Commerce. China E-commerce Report (2024)[R]. Beijing: Ministry of Commerce, October 22, 2025.

[2] Wang Zhili. Analysis on the Development of E-commerce Logistics Under Green Mode[J]. China.Storage&.Transport,2023(07):100. DOI:10.16301/j.cnki.cn12-1204/f.2023.07.098.

[3] Liu Xiaohui, Tu Zaiyou, Liu Yating, et al. Research on Problems of Green Logistics Development — A Case Study of JD Logistics[J]. Inner Mongolia Science Technology & Economy, 2025(09):35-38.

[4] Logistics Terminology[S]. Beijing: China Standards Press, 2001.

[5] Mao Dandan, Gu Ping. Research on Innovative Development Path of China's Logistics Industrial Clusters From the Perspective of Green Supply Chain[J]. Logistics Engineering and Management, 2021,43(11):66-68.

[6] Liu Chang. Research on Cultivation Path of Agricultural Enterprises' Core Competitiveness Based on Circular Economy Theory[J]. Agricultural Economy, 2018(4):23-25.

[7] Huang Xiaoyi, Yang Yongzhong, Zhong Lin. Research on Integrated Model of Manufacturing and Cultural Creative Industries in China From the Perspective of Circular Economy Theory[J]. Science & Technology Progress and Policy, 2016,33(6):71-75.

[8] Lu Mingxiang. Application of Circular Economy Theory in China's Construction Industry[J]. Chinese Township Enterprises Accounting, 2007(09):46-47.

[9] Wang Junhong. Research on Sustainable Development Problems of Low-Carbon Logistics Parks Based on SWOT Analysis[J]. National Circulation Economy, 2020(05):21-22. DOI:10.16834/j.cnki.issn1009-5292.2020.05.009.

[10] Mebratu D. Sustainability and sustainable development: historical and conceptual review. Environmental Impact Assessment Review, 1998, 18(6): 493-520.

[11] Spangenberg J H. Sustainability science: a review, an analysis and some empirical lessons[J]. Environmental Conservation, 2011, 38(3): 275-287.

[12] Xing Yu Xingyao. Green Packaging Design Strategies and Practices Under the Concept of Sustainable Development[J]. Green Packaging, 2025(02):93-96. DOI:10.19362/j.cnki.10-1400/tb.2025.02.019.

[13] You Meihong, Yan Mengling, He Meizhang. Analysis on the Expansion Mode of Green Logistics Capacity Driven by 5G Application — A Case Study of Cainiao and JD Logistics[J]. Commercial Economic Research, 2020(19):103-106.

[14] Wang Zhiguo. Mechanism and Path of Two-Way Interaction Between New Productive Forces and Green Logistics[J]. Logistics Sci-Tech, 2025,48(21):38-40+48. DOI:10.13714/j.cnki.1002-3100.2025.21.008.

[15] Tu Wenjing. Research on Low-Carbon Transformation and Green Development Path of Logistics Industry Driven by Zero-Carbon Island Construction in Ningde City[J]. High-Tech & Industrialization, 2025,31(11):72-77. DOI:10.26927/j.cnki.hitech.2025.11.032.

[16] Liu Lili. Research on Development Strategies of Highway Transportation Economy Under the Concept of Sustainable Development[J]. China Logistics & Purchasing, 2025(18):50-51. DOI:10.16079/j.cnki.issn1671-6663.2025.18.007.