Research on the Path of Promoting Low-Carbon Consumption in the E-Commerce Industry

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Abstract. As China has included carbon peaking and carbon neutrality in its national development strategy, how to promote low-carbon consumption has become an important social issue. By analyzing the international background and domestic policies of low-carbon consumption, this paper studies the possible paths for China's E-commerce industry to achieve low-carbon development, and focuses on several low-carbon consumption paths, and puts forward several suggestions for the Low-carbon transformation of the E-commerce industry.

Keywords: Low-carbon Consumption · path · E-commerce Industry

1 Introduction

China is an important participant in global climate governance and has incorporated carbon peak and carbon neutrality into the overall national development strategy. In September 2020, at the 75th United Nations General Assembly, General Secretary Xi Jinping proposed that China will strive to achieve the peak of carbon dioxide emissions by 2030, and strive to achieve carbon neutrality by 2060. At present, China accounts for nearly 30% of the world's carbon emissions. The international community has widely praised China's "dual carbon" goal, which demonstrates my country's responsibility as a major country and its contribution to the global realization of the global temperature rise control targets set by the Paris Agreement. Has a major positive impact. After China put forward the carbon neutral target, Japan, South Korea, Canada and other countries have also put forward their own carbon neutral targets one after another [1].

In November 2021, the "Double 11" online shopping festival, which has been held for 13 consecutive times, will be launched. Whether China's e-commerce industry can simultaneously enter the "low-carbon time" has become a major issue.

According to the National Bureau of Statistics, in 2020, the national online retail sales reached 11.8 trillion yuan, an increase of 10.9% year-on-year, and the online retail sales of physical goods reached 9.76 trillion yuan, an increase of 14.8% year-on-year, accounting for nearly a quarter of the total retail sales of consumer goods. With the rapid growth of e-commerce scale and its accelerated integration with the express, manufacturing, and service industries, the carbon emissions and growth rate of the entire

Table 1. Carbon Emissions of E-commerce

Type	Packaging	logistics	data center	warehousing	office
Proportion	18%	29%	23%	4%	26%

Table 2. Carbon Emissions of Offline-commerce

Type	Packaging	customer's transportation	logistics	office
Proportion	4%	36%	13%	47%

business chain cannot be underestimated. According to the estimation of the domestic carbon emission management platform "Carbon Block", in addition to the emissions caused by regular corporate daily office work, nearly 3/4 of the carbon emissions of e-commerce companies originate from four business links with industry characteristics, including data centers, packaging, warehousing, logistics. Among them, the logistics link accounted for the largest proportion of carbon emissions, reaching 29%, the data center and packaging links accounted for 23% and 18% respectively, and the warehousing link accounted for about 4% [2] (Tables 1 and 2).

As China continues to promote carbon peaking and carbon neutrality, all parties in society are paying more and more attention to the carbon emissions of the e-commerce industry. Combining the characteristics of the industry's carbon emissions, many e-commerce companies have begun to actively explore to accelerate low-carbon transformation, setting an example for the e-commerce industry to achieve the "dual carbon" goal.

2   Green Upgrade and Transformation of the Data Center

Electricity from consumption, especially for data centers, usually has to maintain a constant temperature and humidity throughout the year, which consumes a lot of energy. In the past 10 years, the overall electricity consumption of data centers in China has increased at an annual rate of more than 10%. It is estimated that it will account for 4.05% of the total social electricity consumption by 2025, and the annual carbon emissions will be about 100 million tons, of which about 10% Carbon emissions come from the data centers of e-commerce companies. With the rapid growth of e-commerce data processing and the popularization of new technologies such as 5G, the green upgrade of data centers to increase computing power while reducing average energy consumption has become a major concern for e-commerce companies.

The main ways to reduce data center energy consumption and carbon emissions include improving the temperature resistance of equipment, reducing cooling energy consumption, increasing resource recovery, using clean electricity, etc., which have achieved good application effects in JD's East China Data Center and Alibaba's Zhangbei Data Center. These two data centers have also been named "National Green Data Centers

in 2020" by six ministries including the Ministry of Industry and Information Technology. In terms of optimizing energy consumption for air-conditioning and refrigeration, both data centers make full use of outdoor natural cooling sources to provide refrigeration, achieving annual natural cooling of 80%–85%. At the same time, with modular design, AI intelligent temperature control, immersion refrigeration, heat recovery technology and other technologies to reduce overall energy consumption, the average annual operating PUE (energy consumption ratio) of the data center is maintained at 1.1–1.2, which is lower than the requirement of "PUE below 1.4" on the national "The Guiding Opinions on Strengthening the Construction of Green Data Centers". The JD East China Data Center can achieve a 30% reduction in infrastructure energy consumption and a 10% reduction in total carbon emissions, and the Ali Zhangbei Data Center can achieve energy savings of more than 70% [3].

In terms of new energy applications, JD East China Data Center currently supplies power to the area through the construction of large-scale distributed photovoltaic power stations. It is expected that by the end of 2021, JD's distributed photovoltaic power generation capacity can be built up to 100 MW; Ali Zhangbei Data Center makes full use of The advantage of the site, through the extensive use of abundant wind and solar energy in Zhangbei area, a green energy utilization rate of over 50% has been achieved. This year's "Double 11", Zhangbei Data Center is expected to use nearly 30 million kilowatt-hours of green power and reduce carbon dioxide emissions by 26,000 t. Compared with last year's "Double 11", the amount of carbon reduction increased by 100%.

3   Reduce the Amount of Packaging and Develop Green Packaging

The second way to reduce emissions is to reduce packaging usage and develop green packaging. China's express delivery business volume has ranked first in the world for 6 consecutive years, and more than 80% of it is e-commerce express delivery. In 2021, China's express delivery business volume exceeded 20 billion pieces in only 83 days, which is equivalent to the total express delivery volume in 2015. The State Post Bureau predicts that in 2021, the annual express delivery business volume will exceed 100 billion pieces. The express delivery monitoring data during the "Double 11" period this year showed that postal and express companies across the country collected 6.8 billion express parcels, a year-on-year increase of 18.2%. At the same time, we cannot ignore the packaging demand generated by the increase in express volume, as well as the environmental impact and carbon emissions brought about by this. According to the relevant data in the Research Report on the Total Greenhouse Gas Emissions of China's E-commerce, in 2019, China's e-commerce industry's carbon emissions due to packaging have reached 9.6 million tons, of which 80% comes from packaging boxes and 15% comes from plastic bags. Therefore, in order to achieve the sustainable development of the e-commerce industry, it is necessary to achieve "green, reduced, and recyclable" express packaging (Table 3).

From the perspective of international experience, the development of green packaging must rely on government policies and guidelines. For example, the Netherlands requires companies to maintain a reusable rate of packaging materials of not less than 65%, and the German Packaging Waste Regulations promote a "dual Recycling system"

Table 3. Carbon Emissions of E-commerce from Packing

Type	Carbon Emission (Units: tCO_{2e})
Woven bag	115,770
Packaging box	7,645,583
Adhesive tape	112,598
Plastic bag	1,397,048
Express waybill	337,809
Total	9,608,808

to ensure that the comprehensive recycling rate of packaging waste in Germany reaches more than 75% [4]. In recent years, China has also continuously issued relevant policies to promote green packaging. For example, on the occasion of Double 11 in 2017, ten major ministries including the State Post Bureau, the National Development and Reform Commission, and the Ministry of Science and Technology jointly issued the "Guiding Opinions" to accelerate the promotion of green and environmental protection of express packaging, and set the first week of November each year as "Green Express Promotion Week"; at the National Two Sessions in 2019, "Promoting Express Green Packaging" was first written in the government work report; From 2019 to 2020, many departments have successively issued "Green Packaging Evaluation Methods and Guidelines" and "Guiding Opinions on Strengthening the Standardization of Express Green Packaging" and other documents to promote the standardization of express green packaging. Under the guidance of policies, many e-commerce and express companies have carried out various explorations to optimize express packaging in three ways: reducing packaging volume, innovating packaging materials, and improving resource recycling.

In terms of packaging reduction, JD.com uses preferential policies to encourage upstream brand companies to implement original box delivery, so that thousands of product SKUs (stock-keeping units) can be shipped directly after the original packaging is delivered to the warehouse without disassembly and secondary packaging. This can reduce the use of logistics cartons by more than 150 million, and the effect is quite significant.

In terms of green packaging research and development, in 2018, Suning.com established a green packaging laboratory, through innovative research on packaging structure, packaging form, and packaging methods, such as bio-based material packaging bags, tape-free cartons, etc., to achieve cost reduction, efficiency increase, and green environmental protection. As of November 2021, the innovative packaging product "Shared Express Box Volume" developed by Suning.com has been deployed in the country with a total of over 400,000, and has been used for more than 150 million times, reducing carbon emissions by more than 6,000 t, and reducing carbon emissions by 56 g per package [5].

In terms of resource recycling, in 2019, Cainiao Logistics cooperated with a number of express companies to release the "Box Return Plan", which aims to promote the sorting and recycling of express packaging. According to the sustainability report released by Cainiao, as of 2020, green recycling bins have covered 31 provinces, autonomous regions and municipalities across the country, and the number of recyclable express cartons each year has exceeded 100 million. In this year's "Double 11" event, Cainiao, together with Tmall Supermarket, etc., realized a 30%–40% utilization ratio of single warehouse recycling boxes, and more than 70,000 packages were sent out using recycling boxes in a single warehouse.

4   Reduce Transportation Emissions-Electrification of Transportation

According to a study published by the Future Underground City Research Institute of Shenzhen University and the University of Michigan in Nature Communications, the carbon emissions caused by express logistics and transportation in China have risen from about 300,000 t in 2007 to about 13.7 million tons in 2018. Each package emits about 0.27 kg, of which inter-city express accounts for about 75% of the total express delivery in the country, and carbon emissions account for up to 99%. If left unchecked, the carbon emissions of China's express delivery industry may exceed 70 million tons by 2035.

In terms of long-distance transportation and transshipment, 80% of e-commerce express delivery in China currently uses road transportation, and related logistics companies mainly reduce carbon emissions by reducing the energy consumption of transportation vehicles and improving transportation efficiency. For example, large logistics companies such as Zhongtong are exploring drop-and-pull transportation methods to increase the number of their own high-capacity trailers, thereby increasing the actual load rate and mileage utilization of road freight, reducing energy consumption per unit of transportation turnover, and reducing fuel consumption and road carbon emission. For air transportation with the highest energy consumption, SF Express's "Green Fleet" has introduced large freighters with higher carbon emission efficiency and lower fuel consumption per ton of load per hour, and adopted a series of measures such as bending and straightening and secondary release. Shorten the flight distance and reduce the energy consumption of the aircraft (Table 4).

For urban distribution, new energy vehicles are an effective way to reduce carbon emissions. According to a research report by the World Economic Forum, the electrification of logistics and transportation alone can reduce carbon emissions by 60%, which has become the most common way for many domestic and foreign e-commerce companies to reduce emissions. For example, according to Cainiao's "ACE" future green smart

Table 4. Carbon Emissions of Transportation

Road	Airway	Total (Units: tCO2e)
12,126,961	3,408,177	15,535,139

logistics vehicle plan, 1 million new smart pure electric logistics vehicles are expected to be launched; JD.com's new energy vehicles deployed in more than 50 cities across the country can achieve 120,000 t of carbon emission reduction each year; The proportion of new energy vehicles purchased by China Post in key areas such as the Beijing-Tianjin-Hebei and surrounding areas, the Yangtze River Delta, and the Fenwei Plain has reached 80%. Companies such as "Da" are also planning to fully electrify logistics vehicles.

5 Work with Stakeholders to Jointly Promote the Green Transformation of the Industry

There are many stakeholders involved in the e-commerce industry, including electronic service providers (such as third-party data center manufacturers), packaging suppliers, commodity manufacturers, e-commerce platforms, platform merchants, logistics companies, investment institutions, certification agencies, and consumers The green and low-carbon transformation of the e-commerce industry is bound to be a systematic project. It is imperative to work with related parties to promote the coordinated carbon reduction of the entire industry chain.

- First, e-commerce companies use their supply chain influence to drive the transformation of upstream and downstream companies. In particular, leading companies should give full play to their own advantages in information, technology, and capital, and promote partners to improve energy conservation and emission reduction awareness and environmental management capabilities by establishing green procurement and investment systems, and conducting product joint research and development. For example, Meituan Waimai launched the Qingshan Project for the recycling and recycling of take-out lunch boxes, and cooperated with related parties to establish plastic lunch box recycling and recycling pilots in many parts of the country, with a recovery rate of 74%; this year's "Double 11", Tmall and Internet Merchants Bank Provide "green zero billing period" service, extend the payment time for certified green products, and promote the supply of green products through the inclination of financial policies.
- Second, e-commerce companies actively participate in the establishment of group standards to promote the industry's green and low-carbon development. Leading companies in the e-commerce industry actively promote the construction and application of industry emission reduction group standards, which not only contribute to the overall emission reduction of the industry, but also effectively promote the research and development of various carbon reduction technologies, and also help promote and integrate national standards or international standards. Standard. For example, in 2017, Ele.me, Meituan Food Delivery and Shanghai local packaging manufacturers jointly formulated and launched the country's first environmental packaging group standard "Shanghai Online Catering Food Delivery Packaging Group Standard". Full implementation began in Shanghai in June 2018.
- Third, e-commerce companies promote the concept of green consumption, and merchants and consumers will walk together. To a considerable extent, consumer behavior affects the operation of the e-commerce industry. In particular, the requirements of

online consumers for packaging and logistics speed may increase the difficulty of e-commerce's low-carbon transformation. The concept of green consumption will be cultivated into the business, and green consumption will be effectively guided by means of increasing green product options, popularizing green product standards, and presenting green consumption benefits. In this regard, e-commerce platforms that connect consumers and platform merchants have inherent advantages. Many e-commerce platforms on Double 11 this year have intensified their promotion of green products. The most typical one is the first launch of Tmall's green venue, covering four major industries including food, home improvement, power consumption, and maternal and child products, with a total of 500,000 products. More than 2,000 merchants participated.

There are many typical cases of cultivating consumers' green living habits. For example, the Ele.me platform associates the "no tableware" option with the "green energy" of Alipay Ant Forest, and encourages users to reduce one time by demonstrating the environmental value of consumption choices. This year, Cainiao launched the activity of swapping recycled packaging for eggs to encourage consumers to participate in resource recycling and form a habit with material prizes. The continuous influence of these guiding green consumer behaviors will extend to the entire industry chain through the transmission of market demand, forcing more e-commerce industry chain participants to follow up the transformation [6].

E-commerce has changed the traditional transaction model. Today, e-commerce has largely become part of the life infrastructure, and satisfying people's yearning for a better life has also made "green" highlights of innovation and development of the e-commerce industry for this year's "Double 11". The process of e-commerce companies promoting their own and industry's low-carbon transformation is also a process of promoting the low-carbon development of the whole society. In the future, it is hoped that more participants in the e-commerce industry can unite with all parties in the society and work together to lead the transformation of more market entities and build a green, low-carbon and sustainable future.

6   Conclusion

Based on the results and discussions presented above, the Path of Promoting Low-carbon Consumption in the E-commerce Industry is below:

(1) Green upgrade and transformation of the data center.
(2) Reduce the amount of packaging and develop green packaging.
(3) Reduce transportation emissions-electrification of transportation.
(4) Work with stakeholders to jointly promote the green transformation of the industry

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