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The research on green logistics management strategy in the perspective of ecological environment protection

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Abstract: The concept of low-carbon and green logistics has pointed out the direction for the development of China's logistics enterprises. This paper analyses the significance and management strategies of China's logistics industry to develop green logistics based on the specific problems in the ecological environment of the current logistics industry development. In addition, constructs a 'three in one' green logistics management strategy from the three dimensions of logistics enterprises, supply chain system and government, that is, from the enterprise's own carbon reduction. In combination with the low carbon requirements for each participant in the construction of the supply chain system, an electronic archive data system for carbon emissions of each logistics enterprise has been set up to form a bottom-up, inside out green logistics construction system strategy, providing reference for the specific implementation strategy of green logistics development.

Keywords: ecological environment; green logistics; logistics management; strategies.

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1 Introduction

Compound service industry is an important part of national economy, involving a wide range, absorbing more employment, driving production and consumption. The logistics industry is known as the ‘third profit source’, which includes transportation, storage, packaging, loading and unloading, circulation processing, distribution, logistics information and so on. According to relevant statistics, China’s social logistics totalled 298 trillion Yuan in 2019, an increase of 14.9 trillion Yuan over 2018. From January to September 2020, China’s total social logistics volume reached 202.5 trillion Yuan. It can be seen that modern logistics has become an important industry supporting the development of China’s national economy. However, modern logistics industry has also caused many economic and environmental problems. In his speech at the National Environmental Protection Conference, General Secretary stressed that the ecological environment is a major social issue concerning people’s livelihood. Man and nature are a community of life, and humankind must respect, conform to and protect nature. For the logistics industry, which counts for much in national economic income, we must seriously consider how to promote the common development of environment while striving to develop economic construction.

Harnessing green logistics to solve the problem of ecological protection in logistics is the inexorable trend of logistics development. Therefore, in the development of modern logistics, enterprises must actively apply green logistics concept and information technology to provide direction and management strategy for the development of long-term ecological environment protection and solve the contradiction between the economic growth of logistics and the protection of ecological environment, and promote the formation of a new pattern of modern logistics industry construction of harmonious development between man and nature.

2 The concept of green logistics

In Terms of Logistics (GB/T 18354-2001) published in China in 2001, the definition of ‘green logistics’ is: in the process of logistics, the harm caused by logistics to the environment is restrained, and at the same time, the logistics environment is purified, so that logistics resources can be fully utilised. Green logistics with the strategic goal of making full use of logistics resources is to achieve sustainable development of resources and ecology via advanced technology and reasonable management strategies (Jiang et al., 2020). The concept of green logistics affects and implements the whole process of logistics development and management, and the core of the concept is to pay attention to the impact of each section (including all stakeholders of each one) in the whole supply chain on the ecological environment. From the essence of logistics, the ultimate goal of green logistics is to realise the coordination and sustainable development of social economy and ecological environment. From the perspective of logistics subject, green logistics involves all stakeholders in the supply chain, including all supply chain node members; From the perspective of logistics activities, the concept of green logistics covers the whole life cycle of products and services. From a theoretical point of view, green logistics absorbs the essence of sustainable development theory, circular economy theory, ecological economy and many other theories (Gong and Lin, 2017).

To sum up, the main idea of the green logistics is, relying on the implementation of the advanced technology and management strategy, to reduce ecological pollution and resource consumption in each logistics section, to promote the whole process to be more green, finally to realise the balance and a win-win situation between the economic development and the sustainable development of ecological environment.

3 Current ecological environment protection problems in logistics industry

3.1 The large amount of energy consumption of logistics industry

This paper employs volumes of the total energy consumption to measure the input of energy consumption in the logistics industry, that is: raw coal, oil and natural gas energy consumption. For the convenience of unified measurement, all kinds of energy consumption are converted into ten thousand tons of standard coal unit according to the calculation data of electric heat equivalent method to estimate the energy consumption trend of the whole logistics industry. The data source and conversion standard are based on China energy statistical yearbook.

Table 1 China's overall energy consumption (2015–2019)

<i>Year</i>	<i>Electric heat equivalent calculation (proportion%)</i>		
	<i>Coal</i>	<i>Oil</i>	<i>Natural gas</i>
2015	68.1	19.7	6.2
2016	66.8	20.1	6.6
2017	65.3	20.4	7.4
2018	63.9	20.4	8.3
2019	62.8	20.7	8.7

It can be seen from Table 1 that China's overall energy consumption has been on the rise from 2015 to 2019. Although coal energy consumption has been shrinking in recent three years, oil and natural gas consumption has continued to increase. According to coal, oil and natural gas, the three main energy consumption of logistics industry, it can be seen that the total energy consumption of China's logistics industry presents a rising trend year by year.

Table 2 Total energy consumption by sector unit: tons of standard coal

<i>Sector</i>	<i>Total energy consumption in 2019</i>
Mining	19,233
Manufacturing	268,426
Transportation, warehousing and postal services	43,909
Construction industry	9,142
Wholesale and retail and accommodation and catering	13,634
Others	27,582
Residential service	61,709

Source: China energy statistical yearbook

The data in Table 2 are classified and summarised according to seven industry categories. According to the data, only transportation, storage and postal industry in logistics ranked the third place in the total energy consumption in 2019, accounting for 10% of the total energy consumption in 2019.

With the continuous refinement and improvement of production, processing and manufacturing technology and the in-depth development of industrialisation and mechanisation, the time of production and manufacturing has been effectively shortened. Some scholars have counted that in the process of modern production, only 5% of the time in the whole production process is spent on processing and manufacturing. 95% of the time is spent in loading, unloading, storage and other logistics processes.

3.2 High carbon emissions in logistics industry

According to the relevant statistics, petrochemical and chemical industries, electric power, iron and steel, building materials, non-ferrous metals, metallurgy and transportation industries are all key industries of carbon emissions. In these industries, production, processing and manufacturing only account for a small part of the whole work flow, and the main tasks are still concentrated in transportation, storage and packaging.

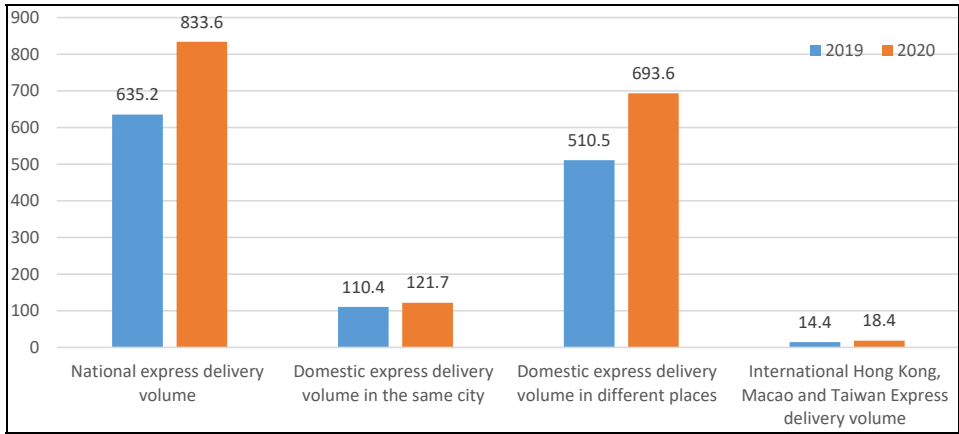
According to statistics, the total carbon emissions of these industries exceed 74% of the total national carbon emissions. China has a heavy and difficult carbon emission reduction task at the present stage, so it is increasingly urgent to strengthen the carbon emission management of enterprises.

Based on the above, It can be seen that the electric power, cement, steel, the three industry is the key field to carbon reduction, and in the three industries, production and processing can reduce carbon emissions but the limitation is large and the effect is limited. It is essential to expand the perspective of carbon reduction in the upstream and downstream of each node of the supply chain in the three industries to form a green logistics grid and focus more on key nodes such as : transportation, storage, handling, packaging, circulation processing, distribution and etc,. The focus of the grid construction and development of green logistics is to pay attention to the implementation of carbon reduction work at each node of the logistics link, and realise the point-to-point carbon reduction target. Therefore, if we want to control the total carbon emission of the whole country, then controlling the carbon emission of the logistics industry is the key.

3.3 Increasing transport volume in logistics industry

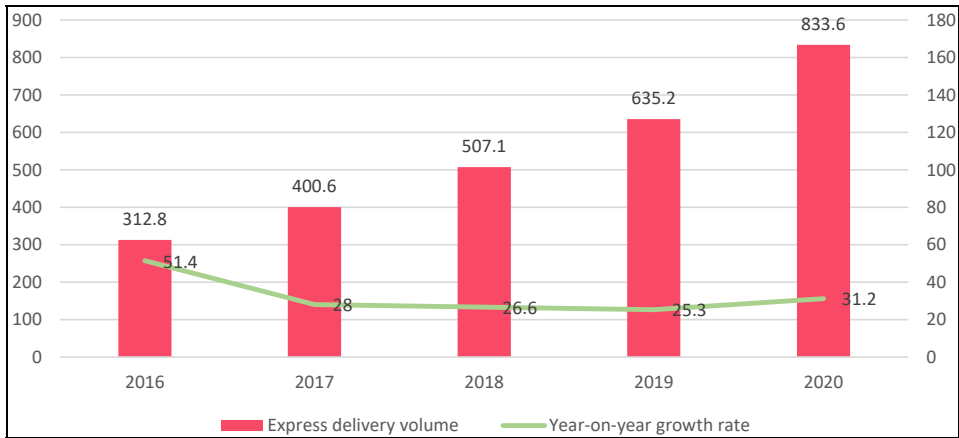
According to the statistical analysis of relevant data in 2020 China logistics yearbook (Volume 1), in 2019, express delivery service companies across the country carried out a total of 63.52 billion pieces of business, up 25.3% year on year; Business process revenue totalled 749.78 billion Yuan, up 24.2% year on year. Among them, the volume of intra-city network business was 11.04 billion, down 3.3% year on year; A total of 51.05 billion pieces of off-site business were completed, up 33.7% year on year. The volume of international/Hong Kong/Taiwan business totalled 1.44 billion, up 29.9% year on year.

Figure 1 Business completion volume of national express service enterprises in 2019–2020 (see online version for colours)



Source: China Business Information Network, www.askci.com

Figure 2 Express business volume and its growth rate from 2016 to 2020 (see online version for colours)



Source: China Business Information Network, www.askci.com

According to internet data analysis, in 2020, express delivery service companies across the country handled a total of 83.36 billion pieces of business, up 31.2% year on year. Operating income totalled 879.54 billion Yuan, up 17.3% year on year. Among them, the total volume of intra-city network business was 12.17 billion, up 10.2% year on year; the volume of off-site business totalled 69.36 billion, up 35.9% year on year. The total volume of international/Hong Kong/Taiwan business was 1.84 billion, up 27.7% year on year.

China's express volume has been the world's largest for many years, accounting for about 55% of the global express volume. It can be seen from Figure 1 that the business volume of express service enterprises in China increased by 19.84 billion pieces in total from 2019 to 2020, with the biggest increase in domestic express business volume. It can be seen from Figure 2 that the growth rate of express business showed a relatively stable

trend from 2016 to 2020. However, the annual growth of express delivery business still shows a stepwise upward growth. Comparing the express delivery business volume in 2020 and 2016, the total express delivery volume in 2020 alone is 2.7 times that in 2016. The rapid development of express delivery industry has brought rapid economic development. Meanwhile, low-carbon environmental protection issues in express transportation should also be taken into account. China's domestic express is mainly by road. Road transportation is characterised by flexible transportation routes, easy loading and strong adaptability. It is an important part of the comprehensive transportation system and an effective tool for material distribution and distribution. However, road transportation has larger carbon emissions, more environmental pollution, but lower energy efficiency, and the impact on the ecological environment can not be underestimated.

Taken together, through the collation and analysis of China's logistics energy consumption, carbon emissions and express industry development data, it can be seen that the logistics industry is an important part as a production and manufacturing in our country. The main industry production, processing, transportation and every node in the process of supply chain involve the participation of logistics. At the same time, With the development of people's economy, the demand for basic and service logistics is increasing. All have an impact on the ecological environment. Therefore, the future development and management of logistics industry must be based on sustainable development of ecological environment, and how to make the current logistics to be more green with developing thinking and management strategy.

4 The significance of developing green logistics

4.1 Green logistics with ecological environmental protection as the development goal

Green logistics is to achieve the sustainable development of logistics activities and ecological environment by making full use of logistics resources and limiting the damage of logistics to the environment. The concept of green logistics is not a negation of traditional logistics, but an intensive and refined model from the perspective of enterprise interests, that is, using new technologies, new tools and new methods to reduce resource consumption and emissions in the entire logistics process, and achieve the win-win goal of harmonious development of economy and environment. First of all, green logistics is based on the maintenance of the earth's environment and sustainable development, emphasising the concept and measures of harmonious coexistence with the environment in the whole process of logistics activities, reducing the harm of logistics activities to the environment, avoiding waste of resources, which is conducive to the sustainable development of social economy. Secondly, while pursuing profits, enterprises should also establish a good corporate image, corporate reputation and fulfill their social responsibilities. The construction of green logistics is conducive to improving the reputation of enterprises, enhancing the brand value and life span of enterprises, extending the life cycle of products, and indirectly enhancing the competitiveness of enterprises.

Green logistics is to take the ecological environment as the core, starting from the problems affecting the ecological environment, is aimed at stepping up the relevant

logistics workflow links using modern information technology and methods to achieve the key goal of reducing environmental pollution and improving resource utilisation. Building the logistics ecological cycle system, including all relevant workflows from production, processing, sales to final recycling in order to achieve ecologically sustainable development of the logistics industry.

4.2 Green logistics can improve the competitiveness of enterprises in the long run

The essence of the function of logistics industry is to provide operational services and turnover connection for the production and operation activities of enterprises, and finally achieve the goal of value-added profitability of enterprises. Driven by this goal, enterprises are more inclined to focus on production and operation based on the traditional production and operation mode, focusing on production input and market area expansion, in order to achieve profitability through large-scale development.

This profit model is not based on the long-term development goals of enterprises, but only through the increase of various production and management activities to achieve enterprise 'value-added', and this 'value-added' model leads to limited revenue-raising effect, high investment costs, high additional costs, and the disadvantage is obvious. In order to develop the enterprise, it is necessary to explore other value-added parts of the enterprise, and the enterprise green logistics relies on the intensive management with the enterprise value-added profit.

It is necessary to adjust the profit target of enterprises that only focus on single production and operation to a win-win development trend that enterprises pay attention to both production and operation value-added and green logistics intensive value-added. Such a transformation mode can not only solve the environmental problems such as resource waste and environmental pollution caused by the economic growth of enterprises, but also effectively improve the sustainable development ability and overall competitiveness of enterprises in the long run.

4.3 Green logistics to achieve an environmentally friendly supply chain model

The value-added effect of the logistics part of the enterprise depends on the overall operation state of the supply chain grid composed of the supply chain and each supply chain node, and each node of the supply chain and the supply chain together constitute the industrialised grid system. At the same time, the grid management of each node is conducive to establishing complementary functional advantages of each node in the supply chain system, avoiding unnecessary waste of resources, realising the construction of environment-friendly logistics system, and improving the competitiveness of the supply chain of industrialised grid system.

The organic combination of enterprise production and management capacity, industrial development, meeting consumer demand, environmental protection and resource conservation, taking resource conservation and pollution reduction as important goals in all aspects of logistics activities, developing a green logistics economy and tapping the 'third source of profit' is an inevitable trend in the development of the logistics industry, as well as the sustainable development of society and the environment. The inevitable choice of sustainable development of society and the environment.

5 Green logistics management strategies promote win-win economic and environmental benefits

The development of green logistics is a major event for the benefit of the country and the people. Both logistics enterprises themselves and government departments need to work together in the development process of energy saving and emission reduction, green logistics, with parallel regulation and cooperation, parallel incentives and penalties, parallel systems and regulations, a common operating system with multiple parallelism and multiple nesting.

Based on the three dimensions of logistics enterprise, supply chain system and government, this study coordinates and constructs mutually, integrates the basic layer, middle layer and macro level of logistics development, and establishes a 'three in one' green logistics management strategy; Enterprises start from their own carbon emission reduction; In the construction of the supply chain system, choose to combine the low carbon needs of the participants; Cooperate with the local government to control the carbon emission electronic document data of logistics enterprises. And incentives. Establish a bottom-up, inside out green logistics construction system strategy. Start from the enterprise's own carbon emission reduction; select according to the low carbon requirements of the participants in the supply chain system construction; cooperate with the local government to control and reward the carbon emission electronic archive data of logistics enterprises. Establish a bottom-up, inside out green logistics construction system strategy.

5.1 Establishing an electronic file system for carbon emissions of logistics enterprises – the basic layer

Logistics enterprises should establish the development goal of low carbon and carbon reduction from their own will, which is the basis for the sustainable and stable development of green logistics. Local government departments of logistics enterprises shall formulate corresponding electronic archives of enterprise carbon emission standards according to the logistics scale and transportation volume of enterprises. Carbon emission electronic document data can be used together with enterprises to obtain support from local governments. For example, honorary awards, corporate loans, tax incentives, etc. In order to obtain more government support, the enterprise combines the carbon emission standard electronic document data with the enterprise development characteristics to carry out carbon control and low-carbon operations. Its carbon emission standard electronic document mechanism will be managed by multiple local government management agencies, forming a continuous and complete electronic document system. Combined with existing blockchain technology, timestamp technology, digital signature and other new technologies, it effectively guaranteed the security of carbon emission standard electronic documents. Establish the concept of sustainable green logistics development from the enterprise itself by establishing the electronic carbon emission archive system of logistics enterprises.

5.2 Establishing a low carbon emission cooperation system within the supply chain system – the middle tier

The supply chain system jointly constituted by each enterprise and upstream and downstream node enterprises is an inevitable trend and choice for future enterprises to seek industrial development and deep development direction. Therefore, the relationship between the supply chain system and each node enterprise is a symbiotic development mode of mutual integration and mutual promotion. The logistics function is essential in each supply chain system, and the selection and system construction of each node in the supply chain will certainly be a comprehensive assessment of the competitiveness of each node in the chain, low carbon, carbon reduction and the electronic file system of carbon emission of logistics enterprises as the criteria and basis for the selection of logistics node enterprises in the supply chain.

The gradual establishment of industrialised, grid-based and modernised supply chain system requires complementary production and operation of each node in the chain, sustainable development, etc. It is conducive to the construction of a supply chain system that meets the development requirements of the ecological environment at the present stage of China and to the improvement of the competitiveness of the supply chain system of industrialised grid system.

5.3 Establishing government macro regulatory system – macro layer

Sound legal system and good external legal environment are the basis for the development of green logistics. A sound legal system and a good legal environment are inseparable from the government's supervision of the implementation of rules and regulations. The government departments regulate the behaviour of logistics enterprises and maintain the normal market order of the logistics industry by formulating green logistics laws and regulations. Through specific reward and punishment system and means, effectively curb the carbon emissions of logistics enterprises. For example, the establishment of emission charging system or carbon emission electronic archives will regulate the carbon emissions of logistics enterprises through technical and economic means, implement the principle of 'whoever pollutes will govern', increase the marginal cost of environmental pollution of enterprises themselves, and accelerate the deepening development of green logistics. The content of the 'system opinions' emphasises the promotion of green development of the service industry, including in the specific tasks of national production and manufacturing. Clearly put forward the improvement of green logistics related policies, focusing on accelerating the establishment and improvement of green laws, regulations, norms and system management systems for express companies, e-commerce logistics, takeout distribution and other industries.

On March 17, 2020, the Ministry of Justice of the National Development and Reform commission issued the opinions on accelerating the establishment of a policy system for regulating green production and consumption, emphasising that the promotion of green development in the service industry will be included in the specific tasks of the national production and manufacturing industry. Specifically put forward the improvement of green logistics related policies, focusing on accelerating the establishment and improvement of green environmental protection laws, regulations, norms and system management systems in express companies, e-commerce logistics, takeout distribution and other industries, reducing the application of excessive packaging and one-time goods,

promoting the application of degradable and recyclable packaging products and storage equipment, and improving the management methods and technical standards for the classification and recycling of renewable energy. The opinions put forward suggestions on packaging, warehousing, transportation and other aspects of logistics enterprises, aiming to accelerate the process of green logistics construction of logistics enterprises in China.

5.4 Strengthen the research and development of green logistics technology – technical layer

In the development process of China's logistics enterprises to green logistics, logistics enterprises should strengthen the use of green logistics technology and research and development, promote the change of the internal working mode of logistics enterprises, and enhance the effectiveness of the use of modern technology in logistics enterprises. On the one hand, China's logistics enterprises should be supported by internet technology, build logistics enterprise information platform, optimise the work process of logistics enterprises. The use of big data, artificial intelligence technology and other advanced technical means for logistics to provide environmental protection, safety, reliability, speed of green logistics management services, while relying on the support of modern technology to achieve energy saving, environmental protection of the whole process of logistics. On the other hand, China's logistics enterprises in the process of green logistics development, not only should pay attention to the use of advanced logistics technology, but also pay attention to the research and development of technology, to promote the use of logistics technology and research and development level 'two-pronged', to provide services for modern green logistics logistics. For example: the use of logistics enterprises recycling packaging technology, the logistics recycling packaging technology used in the logistics industry, not only can improve the internal logistics enterprises, resource utilisation, but also effectively promote the development process of logistics enterprises to green logistics

6 Conclusions

In conclusion, under the new normal of China's economic development, the future direction of logistics development should adhere to the national strategy of green development, and be guided by the policy demand of transformation and upgrading of modern logistics industry to green logistics industry development. Research on the green logistics strategy based on the perspective of ecological environmental protection.

First, at the level of policy research, perfect and sound legal system and good external legal environment to lay a solid policy foundation for the development of green logistics;

Secondly, the implementation of green logistics cannot be implemented without the specific logistics enterprises, and it is not enough to strengthen green logistics from the ideology and awareness alone. The 'trinity' of green logistics management strategy.

Third, through the deepening of the development of logistics technology, to further strengthen the research and development of low-carbon technology from packaging, warehousing, transportation and other high energy-consuming aspects of logistics.

This study starts from the carbon reduction of enterprises themselves, combines the choice of low carbon requirements for participants in the construction of supply chain

system, and cooperates with the local government to control and reward the carbon emission electronic file data of each logistics enterprise, and establishes the strategy of green logistics construction system from the bottom up and from the inside out.

Logistics enterprises, supply chain system and the government to establish a ‘three – body’ green logistics management strategy. It can integrate low-carbon economy into the whole process of logistics enterprise development, effectively realise the transformation and upgrading of modern logistics enterprises to green logistics industry development, and finally realise the trend of China’s logistics enterprises and the ecological environment to develop together.

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