

# Research on the Current Situation of Green Freight Transport in China

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## ABSTRACT

Different from traditional logistics, the type of transport pollution under modern logistics system does not depend on the emissions from a single vehicle, but on the regional transport capacity structure. Therefore, the concern about road transport pollution gives rise to green freight. Due to the low threshold of road transport market, it is difficult for grassroots management, especially in the stage of sustained economic growth in China. However, the academic circle pays little attention to the research on green freight transportation. Therefore, the study of green freight is helpful to reveal the relationship between capacity structure and emission pollution, and has some practical significance to realize the sustainable development of freight transportation. This paper introduces the theoretical and practical achievements of green freight transportation, and gives relevant suggestions based on previous research and the actual situation of freight transportation market, in order to promote the sustainable development of freight transportation.

**Keywords:** Green freight, sustainable development, fuel saving and emission reduction, optimizing transport capacity structure

## 1. INTRODUCTION

The unreasonable allocation of transportation capacity structure in China has a long history, which leads to the increasingly serious emission pollution in transportation, among which the pollution problem of road transportation is the most important. Road transport industry is the lifeblood of the economy in our country, and its many experiences (as shown in Figure 1), more than 70% of the traffic volume in China since the implementation of the "Eleventh Five-Year Plan" to 2018, in response to the industry energy conservation and emissions reduction initiative, diesel oil consumption by 10% compared to the same (as shown in Figure 2, with 96% of the fuel oil consumption for diesel), but because of the continuing growth of freight volume in our country, in the shipping industry consumes diesel 3% lower than only (as shown in Figure 3) at the same time, the transportation vehicle still consumes 30% of the refined oil products in China.

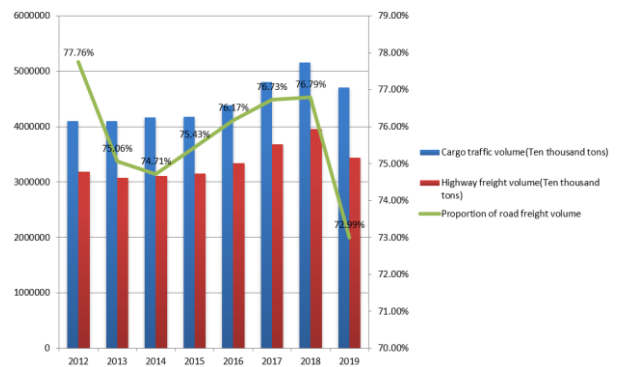


Figure 1 National Road Transport Volume from 2012 to 2019

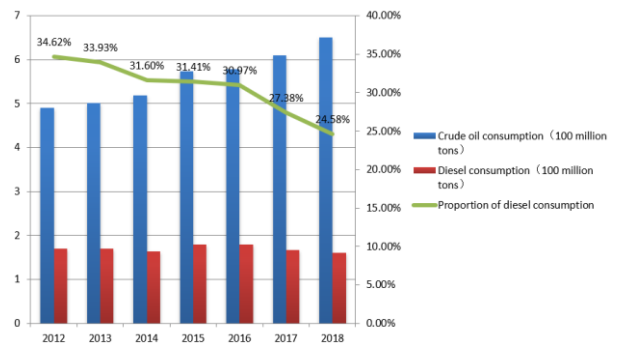
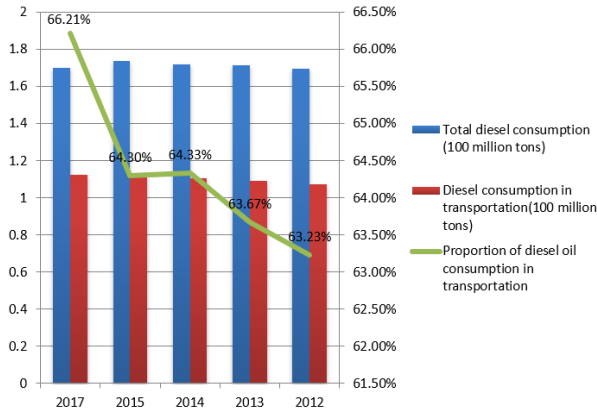


Figure 2 Crude oil and diesel consumption by industry



**Figure 3** Diesel consumption of transportation industry

In 2019, in order to thoroughly implement the spirit of the national ecological and Environmental Protection Conference and comprehensively implement the “three-year action plan for winning the blue sky defense war”, the “key points of national air pollution prevention and control in 2019” compiled by the Ministry of ecology and environment proposed: comprehensively strengthen the environmental protection supervision of diesel vehicles,

actively promote the adjustment of transportation structure, accelerate the construction of mobile pollution source supervision system, and reduce PM2.5, SO2, NOx, Cox emissions.

Since the China’s Green Freight Initiative was put forward, green freight has been widely concerned by the society and the industry because of its close combination with China's development planning. However, the academic circles pay less attention to the causal relationship between the unreasonable transport capacity structure and the types of transportation pollution, resulting in green freight being only regarded as one of the concepts to realize energy conservation and emission reduction of freight transport, resulting in less relevant research. From 2002 to June 2020, there are 131 domestic green freight journal papers, with only two main titles(CNKI) listed in Table 1. Domestic journals that include green freight papers mainly include transportation manager world, traffic construction and management, etc. (Table 2), and the contents are mainly industry news reports and publicity. However, relevant academic papers focus on the development swap trailer transport and urban development demand, which shows that the role of green freight transport is not limited to energy conservation and emission reduction.

**Table 1** Client–server experimental results

Academic papers on green freight transport in China (131 articles)	
Green Freight	65 articles
Demonstration Project	4 articles

**Table 2** distribution of domestic green freight journals

Green freight Journal	
Transport Business China	31 articles
Traffic Construction and Management	20 articles
Commercial Vehicle News	7 articles
Transportation World (Transport Vehicles)	7 articles
Logistics and Purchasing in China	4 articles

## 2. THE CONCEPT OF GREEN FREIGHT

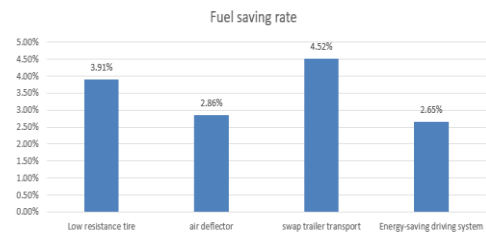
The concept of green freight is inspired from green transportation in green logistics. The core purpose of green freight is to reach structural adjustment of transportation capacity and achieve sustainable development in freight in the end, which is by the means of energy conservation and emission reduction during transportation. Since the 1980s, countries around the world have conducted a multitude of practice in green freight, aiming to solve the environmental problems caused by transportation and implement the principle of sustainable development in transportation business. However, current theoretical research on green freight is mainly from enterprise practice, resulting in partial consensus.

Mei Gang held the idea in 2010 that green freight referred to energy saving as possible, cargo transportation not damaging environment and a freight transportation system which had been reasonably set and improved for the freight. Sun Hui Tai and others held the idea in 2010 that green freight was a kind of modern logistics, which was win-win result in combination of economic growth and social development as well as ecological protection. Under the guidance of sustainable development and by the means of technological and organizational innovation, green freight is a kind of transportation that is committed to improvement of energy utilization rate and transport efficiency, lowering empty-loaded rate, minimization of energy consumption of freight vehicles and reduction of greenhouse gas emission. Asia Clean Air Center defines green freight as a kind of transportation that is committed to improvement of energy utilization rate, reducing dependence on fossil fuel, enhancement of air quality, minimization of carbon dioxide emission, mitigation of climate change and maintenance of competitiveness and economy after a series of measures taken in road, railway, water transport and air transport. In some cases, the definition of green freight transportation is broader, which belongs to the scope of green growth, and also includes the socio-economic impact of freight transportation, such as AIDS prevention and care for drivers, road safety, noise, vibration and working environment, etc.

From the viewpoints of domestic scholars, it can be seen that, macroscopically, scholars believe that transportation pollution originates from the improvement in the transportation system, and in operation, scholars believe that energy saving and emission reduction by road transportation is the main entry point to realize the sustainable development of freight transportation, so most people hold the view that the government needs to guide the road transportation industry to achieve energy saving and emission reduction, so the current discussion on green freight transportation mainly focuses on energy saving and emission reduction.

## 3. CHINA'S GREEN FREIGHT DEVELOPMENT STATUS

The ultimate goal of developing green freight transportation is to realize the sustainable development of freight transportation. However, the current problem of transportation pollution in China lies in the unreasonable allocation of transportation capacity in the transportation market. Therefore, the first attempt of green freight transportation in China is mainly led by the state, and its core concern is energy conservation and emission reduction by road transportation. At the same time, in order to reduce road transport pollution from the source, practitioners need to change their traditional business ideas. Therefore, through the demonstration action of green freight transport, the country has put forward three initiatives: developing transportation by throwing, applying green technology and driving green freight transport (the results of demonstration activities are shown in Figure 4).



**Figure 4** Results of Demonstration Activities

Although the results of green freight transport demonstration are gratifying, the reasons for the irrational transport capacity structure in China are complex, so we should not only pay attention to the relationship between transport capacity structure and pollution. The problem of transportation capacity structure is not only an objective reflection of China's transportation market format, but also a systematic contradiction that needs to be solved urgently in the development of China's transportation industry. Scholars such as Ding Junfa [1] pointed out that realizing energy saving and emission reduction in road transportation is the main contradiction in realizing green freight transportation in China. However, scholars such as Wang Xiaoyan [2] think that the energy consumption, market composition, freight equipment and industry development mode of road freight make the energy saving and emission reduction of road transport an arduous task. Therefore, in order to solve the problem of transportation pollution from the root, we should not pay attention to "green", but also adjust the transportation capacity structure.

### ***3.1. The Problems Exposed in China's Current Green Freight Demonstration***

For the problems exposed in China's current green freight demonstration, Zhang Shaqing [3] believes that: 1. China's total freight supply is oversupply, effective supply is insufficient, and there is a lack of perfect transportation organization; The concentration of freight market is low, disorder is serious, the main structure of business is unreasonable, and the construction of freight station is imperfect; 2. Swap trailer transport started late, with a weak foundation and slow development; 3. New energy-saving technologies are lagging behind and the reputation of energy-saving products is poor; 4. The structure of the employed vehicles is unreasonable, the grade is low, and the energy-saving awareness of the employees is generally weak; 5. The overall level of informationization in freight industry is low.

Nie Wei [4] thinks that the problem lies in freight transport enterprises: 1. The enthusiasm of enterprises to use energy-saving and emission-reduction technologies is not high. 2. It is difficult to innovate the mode of transportation organization. 3. The enterprise has not carefully managed the operation and management of energy-saving driving training and fuel management.

### ***3.2. How to Realize Green Freight Transportation***

Mei Gang [5], Zhang Shaqing [3] and Lu Huapu [6] respectively gave suggestions on how to realize green freight transportation in China from different perspectives on how to realize energy conservation and emission reduction in China's transportation process and ultimately achieve sustainable development of freight transportation. Mei gang [5] thinks that there are three stages to realize green freight transport: 1. Improve the energy efficiency of railway and ship, strengthen the management and improve the transportation efficiency. 2. Guide and plan freight demand, develop joint distribution and third party logistics. 3. Develop its and use alternative energy. Zhang Shaqing [3] thinks that the Countermeasures for developing green freight in China are government led, market operation and freight demonstration projects. At the same time, the new carrier and new technology are applied, and the transportation mode, information technology and Internet plus are adjusted. Lu Huapu [6] believes that there are three steps to realize green freight transportation in China: 1. Strategies and policies for optimizing the freight structure: building a national green intelligent freight transport channel network system, strengthening the construction of multimodal transport comprehensive transportation hub, promoting the transfer of goods transportation to green freight mode by improving the level of transport organization; improving the sharing rate of railway freight and optimizing the highway and waterway freight transport to improve the level of urban logistics distribution system. 2., strengthen

the strategy and policy of freight management (improve delivery efficiency): develop "Internet plus freight", establish a sound management and guarantee system, optimize highway and waterway freight management, and improve the level of city freight management. 3. Innovative freight technology strategy and policy: formulate series of standards for highway and railway water transport, promote the development and application of energy-saving transportation tools, establish a green intelligent logistics channel network planning and design construction standard system, innovate and apply new railway freight technology, promote the research on energy-saving and emission reduction technology of highway and waterway freight transport, improve the urban freight standard system and innovate the mode of urban freight transport.

### ***3.3. China's Main Measures to Help Green Freight Transport***

#### ***3.3.1. Vehicle Certification and Fuel Standard***

Road freight industry is the economic sector that undertakes the most freight volume in China. At the same time, road transportation is also the mode of transportation with the most pollution. Therefore, the attention to energy conservation and emission reduction in road transportation has given birth to green freight transportation. The healthy development of the freight transport industry can not do without the guidance of the government. During the green freight demonstration action, China's Standards Committee issued "road vehicle outline dimensions, axle load and mass limits (GB 1589-2016)" to improve the standards for trailers, tricycles and other vehicles. At the same time, China abolished the "common diesel (GB 252-2015)" and realized the "three oil combined rail" and prohibited the national six standards for the circulation and production of the following diesel, the "fuel consumption limits for heavy commercial vehicles (GB 30510-2018)" issued by the Ministry of industry and information technology unifies the product standards of commercial vehicles and the assessment standards of road transport license.

#### ***3.3.2. Development of multimodal transport***

The pollution caused by freight transportation is not only a structural problem, but also a development problem. At present, when the freight volume cannot be decoupled from the sustainable economic development (as shown in Figure 4), in order to reduce the pollution caused by road transportation, scholars put forward suggestions to improve China's transportation system and develop multimodal transport. Therefore, after the Ministry of Railways of China was merged into the Ministry of Transport during the "Twelfth Five-Year Plan" period, China National Railway Group Co., Ltd. issued the "2018-

2020 Freight Incremental Action Plan" to help the development of multimodal transport in China; In the same year, the Ministry of Transport, the Ministry of Public Security, and the Ministry of Industry and Information Technology issued a joint notice "Work Plan for Vehicle Transport Vehicle Governance" (Delivery and transportation [2016] No.107) to increase the supervision of road traffic, announcing that non-compliant vehicles will be completely banned from July 1, 2018. Passing, reducing road transport pollution and helping "road to railway", and finally achieved the historical highest growth of 30% in railway freight volume and 7.8% in railway shipment volume by the end of 2019.

3.3.3. Integrate the logistics market and meet the needs of urban development

China's logistics market has a long history of serious fragmentation and low degree of specialization. In 2013, the "Guiding Opinions of the Ministry of Transport on Promoting the Healthy Development of Logistics Industry by Transportation" issued by the Ministry of Transport of China proposed to encourage small and medium-sized transportation enterprises to integrate resources through alliances or joint integration to enhance their competitiveness and anti-risk ability; At the same time, in order to promote China's regional development, meet the development needs of second-and third-tier cities, and realize China's sustained economic growth, the second phase of China's Green Freight Demonstration Action in 2015 announced the combination of "internet plus", focusing on rural logistics and urban distribution. However, until 2017, 98% of the practitioners in China's freight industry are still self-employed, and only 30% of the vehicles in the freight industry are professional freight vehicles. Therefore, in order to optimize China's transportation structure, standardize the transportation market order, develop advanced transportation organizations, and apply green technology; , and at the same time, in order to meet the development needs of the second and third-tier cities, an "intensive, efficient, green and intelligent" urban distribution system is established to solve the problem To solve the problem of urban distribution, by 2020, China has established 46 three-year green freight city distribution demonstration projects.

3.4. Efficiency and Energy Saving

The goal of green freight transportation is to achieve sustainable development of freight transportation by realizing energy saving and emission reduction in road transportation. However, some scholars have pointed out that there is a causal relationship between transportation pollution and transportation efficiency after deeply studying the pollution problem of road transportation. Yang Guangxi [7] pointed out that in order to cope with the rising labor cost of the freight industry, green freight

transportation was the first to help the freight industry realize efficient and fuel-saving operation and management. Zhang Shaqing [3] believes that green freight transportation also plays the role of reducing costs and increasing efficiency: ① reducing energy consumption, reducing vacancy rate, reducing operating costs of freight transportation enterprises and improving market competitiveness of enterprises; ②Reduce pollutant emissions, improve air quality and improve ecological environment. Nie Wei [4] believes that the negative externality of transportation restricts the ability of market economy to optimize resource allocation, and the role of green freight transportation is to control the externality of freight transportation activities. Therefore, promoting energy conservation and emission reduction in freight transportation industry can make the market economy system realize its function of optimizing resource allocation.

4. SUMMARY AND SUGGESTIONS

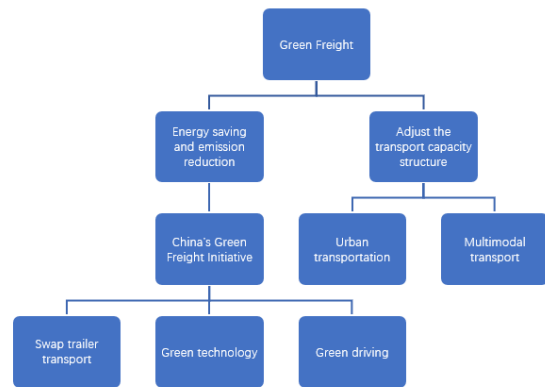


Figure 5 Research Framework of Green Freight Transport

Through reading the related literature of green freight in China, the research framework of green freight in China is summarized in Figure 5.

Green freight transportation conforms to the concern of transportation pollution. Therefore, in order to achieve sustainable economic development, the transportation industry, as an important economic sector, needs to solve the environmental problems caused by transportation and realize energy saving and emission reduction in the transportation process. Every year, China's road transport industry undertakes at least 70% of China's freight volume, however, the road transport industry has a long history of serious pollution, lack of professionalism, and more traditional management methods. In order to achieve energy saving and emission reduction in road transportation, improve transportation efficiency and develop advanced transportation organizations, China has put forward the Green Freight Initiative, which promotes

the cost reduction and efficiency improvement of the transportation industry and improves the management ideas of the transportation industry by encouraging the swap trailer transport, green road transportation technology and green driving. At the same time, in order to put an end to the transportation pollution caused by unreasonable transportation structure, a green transportation system including urban transportation and multimodal transportation was established in the later stage of the demonstration project, to finally realize the sustainable development of the freight industry.

Generally speaking, there are three trends in the development of green freight: 1. From government to enterprise. 2. From enterprise operation to strategic operation. 3. From regional concern to global concern. Taking the United States as an example, the SMAT way certification program, which has been operated by EPA and Freight Association since 2004, is derived from the super truck program.

Although China's green freight transport has made achievements in energy conservation and emission reduction, it is undeniable that the sustainable development of the freight transport industry is a long-term systematic project. Especially when the new infrastructure is proposed, effective energy-saving and emission reduction measures must be taken according to the characteristics of contemporary logistics and local freight demand. Therefore, in order to consolidate the achievements of green freight development in China and promote the further development of road energy conservation and emission reduction, according to the freight market reality and the opinions of scholars, combined with the existing policies and regulations and other related green freight announcements The paper has the following suggestions:

1. Strengthen policy support for new energy vehicle application enterprises.

Taking Guangdong as an example, Guangdong's new energy vehicle industry is in the forefront of the country, and it is also the only province designated by the green freight demonstration action. However, LNG drivers often complain that there is no filling station on expressways, which affects the transportation efficiency. The development plan of new energy vehicles in Guangdong Province (2013-2020) points out that in order to drive the industry new energy vehicles should be applied in the field of urban public services. Due to the disadvantages of new energy vehicles compared with diesel vehicles, the purchase intention of freight transport enterprises is not that strong, which makes so some support needed. Besides, we should strengthen the construction of transportation organization guarantee and logistics industry credit system as well;

2. Green technology promotion and vehicle certification should be combined with green freight.

Clean Air Asia believes that the willingness of energy conservation and emission reduction in transportation should be based on local vehicles. Therefore, to make the achievement of green freight demonstration further, it should be shifted to urban and rural distribution. Green

technology certification (promotion catalogue of key energy-saving and low-carbon technologies in transportation industry) and vehicle certification should follow the demand; However, the transport capacity of the third and fourth tier cities and towns is generally underdeveloped, the transportation operation is relatively nonstandard, and the qualification, salary and information level of transportation practitioners are relatively low. Therefore, in order to standardize the business format, establish the awareness of green freight transport, and ensure the interests of practitioners, technology is extremely important. So the orientation of technical collection and vehicle certification may need to be adjusted accordingly.

3. Continue to promote logistics informatization (Combining "Internet plus" with freight).

The logistics industry informatization mainly includes two ways: establishing public freight information platform and carrying out all day dynamic monitoring of vehicles and facilities. The combination of "Internet plus" and freight transportation is to build green intelligent transportation network, improve transport organization efficiency, and ultimately push transportation to a cleaner way. Combined with China's transportation environment, the realization of logistics informatization also encourages small and medium-sized freight transport enterprises to regulate and develop the third-party logistics in China, so as to further implement the purpose of energy-saving and emission reduction in the transportation process. At present, the energy saving and emission reduction of freight transportation being pushed forward by the government policy mainly. Therefore, in order to consolidate the achievements of energy conservation and emission reduction of freight transportation, it is necessary to continue to promote logistics informatization and implement cost reduction but also efficiency improvement.

4. Promote container transport and improve the level of multimodal transport.

Compared with the international advanced level, there is still a gap in the level of multimodal transport in China. In order to establish an efficient multimodal transport system, improve the connection with the "last mile" distribution, and realize the distribution and channel transportation, container transportation needs to be developed. Therefore, we should consider multi-modal transport as the starting point to achieve reasonable distribution of transport capacity, optimize the structure of transport capacity, reduce transport pollution and realize green freight transport.

5. Strengthen the interaction with academic circles and reduce the threshold of green experience exchanging.

The green freight enterprise standard (CrTa / cgfi001-2015) mainly focuses on the demonstration effect and brand value brought by local enterprises. It pays more attention to drop and pull transportation, which results in less efforts to implement green freight in daily operation, and which greatly reduces the demonstration effect of green freight in the industry. The main audience of green freight action communication is business people, less the academic community is. Although some scholars have given

relevant opinions and suggestions on the development of green freight transport, most of them are based on the realization of green freight in the macro view, and speak less on the daily operation.

6. Improve laws and regulations to speed up the cost of pollution.

Different from the developed countries, the economic gap between regions in China perhaps to be larger, so the reports of savage operation and savage development of transportation enterprises are also common. Therefore, in order to standardize the business form and urge the green operation of relevant enterprises, it is necessary to cost the negative externality of transportation by law. Take noise as an example. It has been 50 years since the noise pollution of trucks was first complained by British urban residents in the 1970s. However, noise pollution sources other than manufacturing industry are still not taxed in the regulations on the collection and use of pollution charges (State Council Order No. 369). Therefore, we should pay more attention to the externality and cost of transportation during the green freight demonstration transferring into cities and towns.

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