

China Highway Freight Industry Operation Analysis Report Based on Big Data (2020)

Preface

In 2020, the sudden outbreak of COVID-19 had a huge impact on transport production, and in the most severe period, the demand for highway freight market shrank, only a quarter of the same period last year. Under the overall decision-making and deployment of the Central Committee of the Communist Party of China and the State Council, the domestic COVID-19 pandemic has been well controlled in a short period of time, and the highway freight, with its flexibility and scale, has recovered rapidly in only one month, playing a fundamental and leading role in service guarantee, providing important support for the "six stability" work and the implementation of the "six guarantees" task.

The highway freight continued to play a dominant role in the comprehensive transport system, with the annual freight volume reaching billion tons, accounting for 74% of the total freight volume of various modes of transport, with more than 11 million freight vehicles and more than 18 million truck drivers. Beijing-Tianjin-Hebei, Yangtze River Delta, Guangdong-Hong Kong-Macao and other major urban agglomerations and backbone corridor networks have been continuously improved, and the effect of freight agglomeration has become increasingly prominent. Transport service capacity has been continuously strengthened, the advantages of expressway efficiency have been highlighted, and the advantages of timeliness and convenience of highway freight have been consolidated.

In order to further grasp the operation characteristics of China's highway freight industry, the Logistics Engineering Research Center of the Research Institute of Highway Ministry of Transport, based on the actual operation data of 7 million trucks on the National Freight Vehicle Public Supervision and Service Platform, systematically studies and analyses the operation and development level of

China's highway freight in terms of "safety, scale, efficiency and economy". Through this report, we hope to help industry managers, practitioners and relevant participants better understand and grasp the overall situation of China's highway freight industry, work together to promote the transformation and upgrading of China's highway freight industry, promote high-quality development, and better serve the construction of a country with strong transportation network.

May 2021

Part I Overall Operation

1. Freight demand scale

● Highway freight took the lead in recovery and played a basic role in service guarantee

The sudden COVID-19 pandemic in 2020 had a serious impact on the highway freight industry, the industry demand shrank, and in the most serious period, the highway freight market was only a quarter of the same period last year. Fortunately, the domestic COVID-19 pandemic has been effectively controlled in a short period of time, and the highway freight market has basically recovered to the same period last year in April, taking the lead in the recovery of the secondary and tertiary industries, playing a fundamental and leading role in service security. The annual highway freight volume reached 34.264 billion tons, and the freight turnover volume reached 6017.185 billion ton kilometers showing the characteristics of V-shaped reversal and steady recovery.

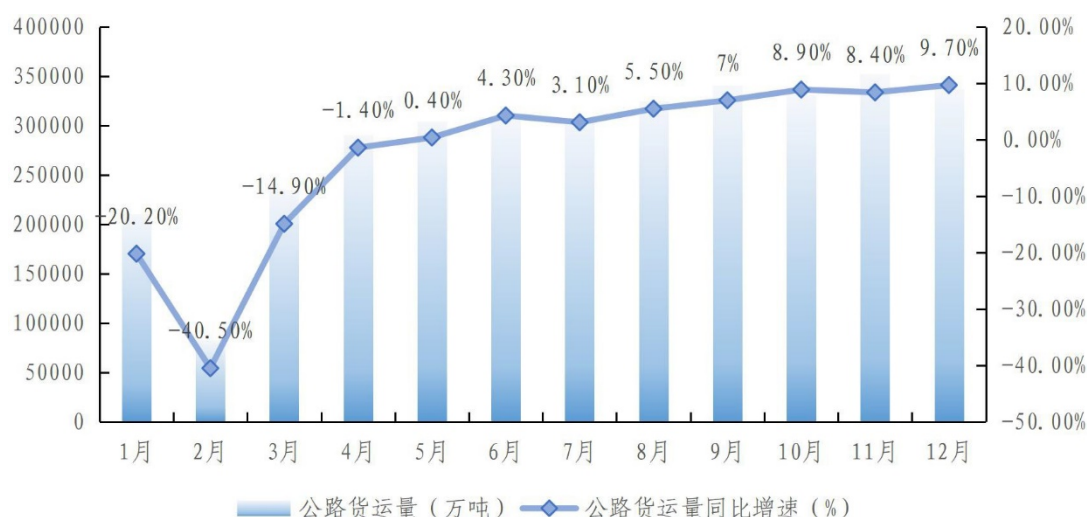


Figure 1 Highway freight volume and year-on-year growth rate in 2020

● The adjustment of transport structure has been effective, and the proportion of highway freight has continued to decline

In 2020, the freight volume completed by highway transportation accounts for 73.8% of the total freight volume of various modes of transportation, and still occupies a dominant position in the comprehensive transportation system. Under the influence of the policy of "Three-year Action Plan for Transport Structure Adjustment", the proportion of highway freight transport has declined for three consecutive years, down by 3 percentage points from 2018. Compared with 2018, the proportion of railways and waterways increased by 2 and 2.8 percentage points respectively.

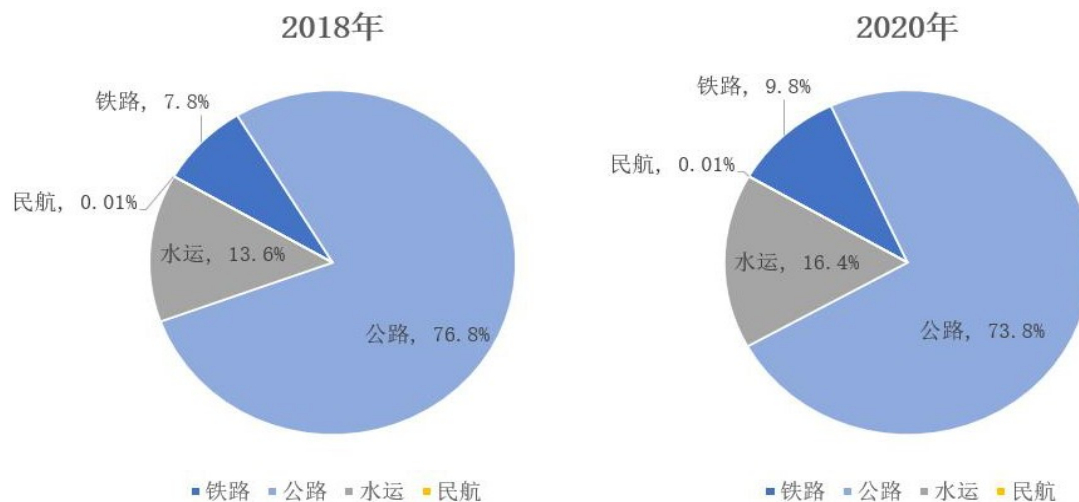


Figure 2 Composition of commercial freight volume of the whole society by transportation mode in 2018 and 2020

● **Freight demand is still concentrated in major areas such as Beijing-Tianjin-Hebei, Yangtze River Delta, Pearl River Delta and Chengdu-Chongqing**

By region, freight demand is still concentrated in the Beijing-Tianjin-Hebei, Yangtze River Delta, Pearl River Delta and the four major urban agglomerations of Chengdu and Chongqing, With the adjustment of industrial structure, the central and western regions undertake industrial transfer in the eastern coastal areas in an orderly manner. The freight volume in Chongqing, Hunan, Shaanxi, Gansu, Anhui, Fujian and other central and western regions has increased by more than 4% compared with last year, with obvious increase and increasingly frequent inter-regional economic activities.

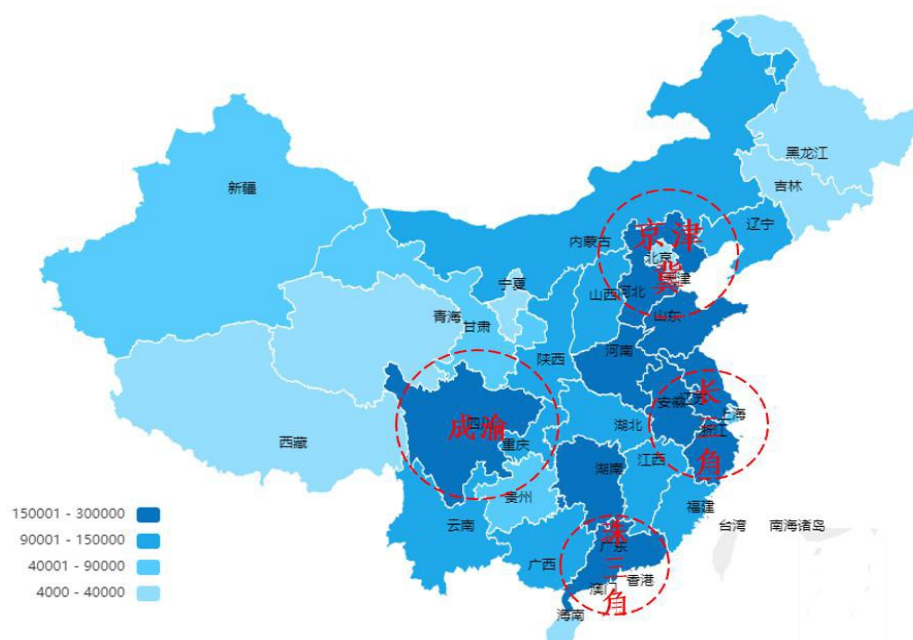


Figure 3 Freight demand is concentrated in four major urban agglomerations

2. Scale of transport capacity supply

● The scale of transport capacity rebounded slightly, and the trend of large-scale vehicles gradually emerged

In 2020, the number of trucks in China was 11.1028 million, an increase of 2.1% compared with last year. The requirements of air pollution prevention and control and overrun and overloaded control accelerated the elimination of old vehicles in the market, which increased the demand for replacement of freight enterprises and individual truck drivers, and the scale of transport capacity increased slightly. In terms of the tonnage of trucks, the tonnage of trucks in 2020 was 157.8417 million tonnages, up 16.2% from last year, showing an upward trend for four consecutive years; the proportion of trucks with a rated load of 38 tons and above was 51%, up 7 percentage points from last year, and the trend of large-scale vehicles gradually emerged.

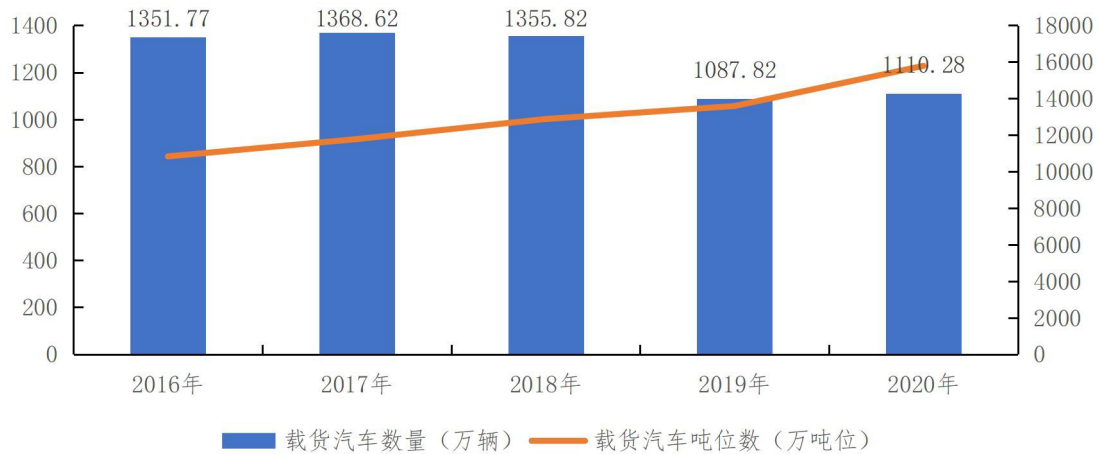


Figure 4 Change trend of truck ownership

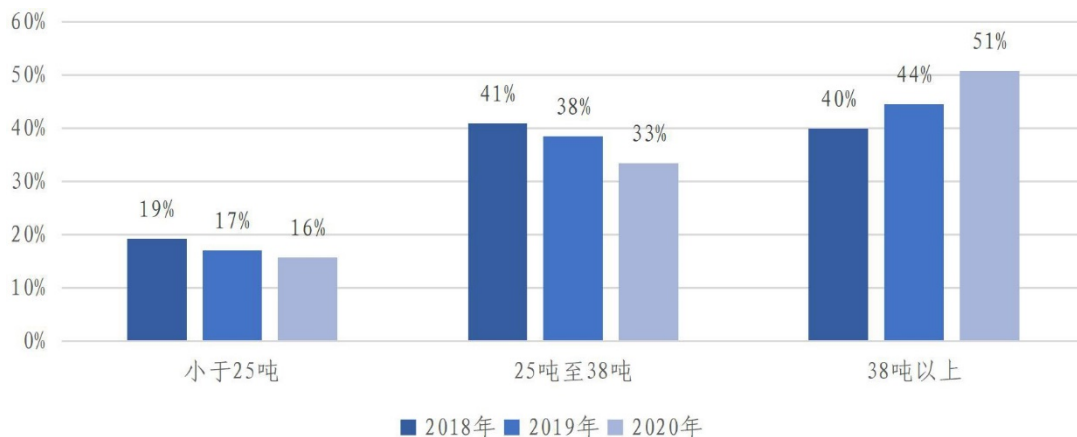


Figure 5 Variation trend of rated dead weight tonnage

● Continuous optimization of transport capacity structure

and increasing proportion of tractors

From the perspective of transport capacity structure, in 2020, tractors accounted for the largest proportion, accounting for 71.3%, stake trucks accounted for 10.9%, van trucks, dump trucks, dropside trucks and special structure vehicles accounted for 15.1%, and other types of trucks accounted for 2.6%. In 2020, the tractor market sales did not decrease but increased, with a year-on-year increase of about 47.8%. On the one hand, due to the policy requirements of comprehensive air pollution control and overrun and overloaded control, the elimination of Tri-national Standards vehicles was accelerated, which increased the demand for tractors. On the other hand, as a barometer of national infrastructure investment, the sales volume of tractors can directly reflect the vitality of the infrastructure market. The construction of 5G base stations, charging piles for new energy vehicles, high-speed railways and other infrastructure projects can activate the domestic market demand.



Figure 6 Proportion of different vehicle types in 2020

- **The transport capacity supply of heavy haul freight cars is stable, and East China is an active area for freight transport**

In 2020, the daily average number of heavy haul freight cars in China was 2.8668 million. Among, the first quarter was more seriously affected by the epidemic, with an average of only 1.6738 million vehicles per day. On March 22, the number of vehicles in operation basically returned to normal and maintained steady growth, ensuring the rapid recovery of production and life in an orderly manner.

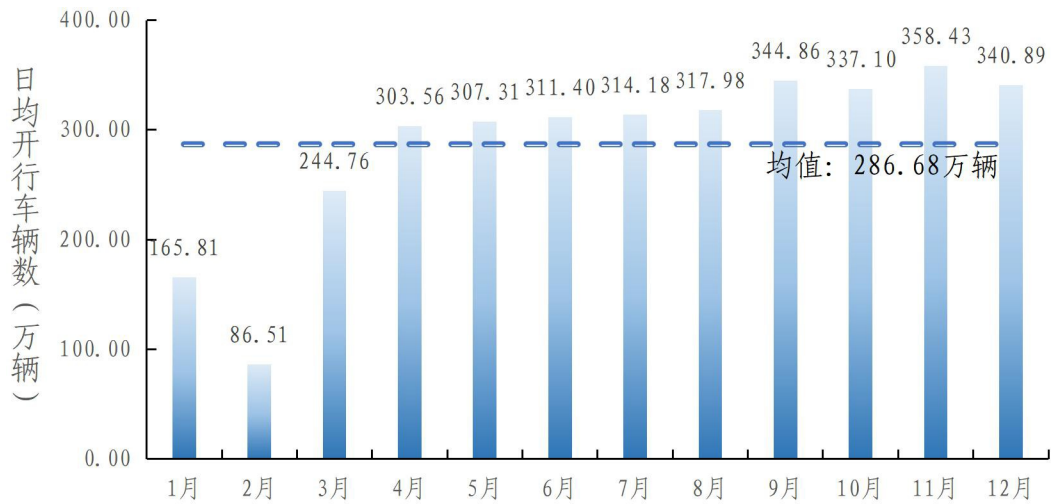


Figure 7 Change trend of average daily number of operating vehicles in 2020

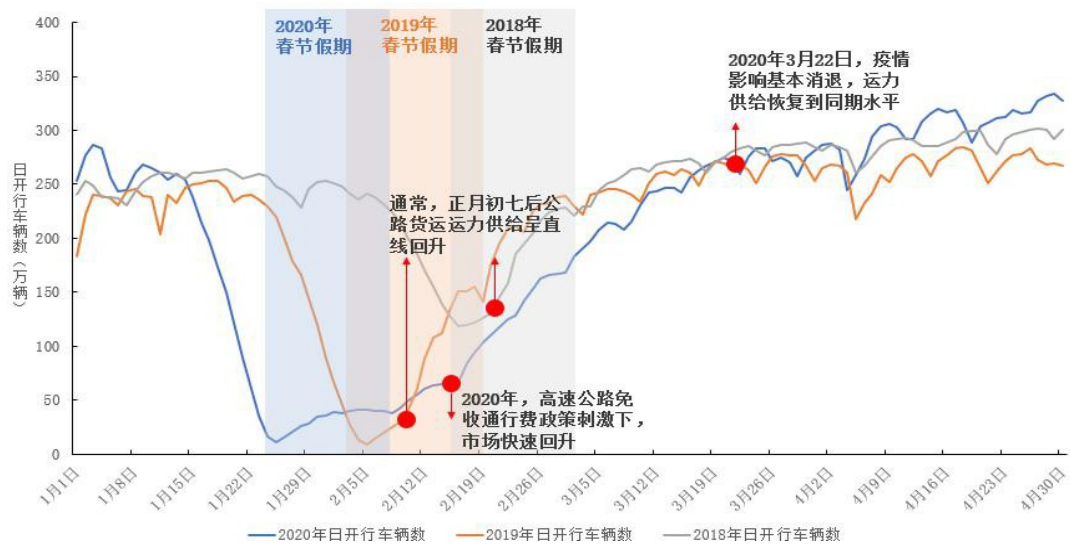


Figure 8 Trend of the impact of the COVID-19 epidemic on the change of the average daily number of vehicles in 2020

3. Scale of transport enterprises

● **The number of highway freight transport operators has been shrinking, and the number of individual transport operators has decreased significantly**

At the end of 2020, the number of highway freight operators was 3.2387 million, down 16.6% from last year, of which 2.7374 million were individual transport operators, down 18.8% from last year, and 15.5% were enterprise operators, up 2.3 percentage points from last year. The main body structure of the market gradually presents the development trend of scale and standardization.

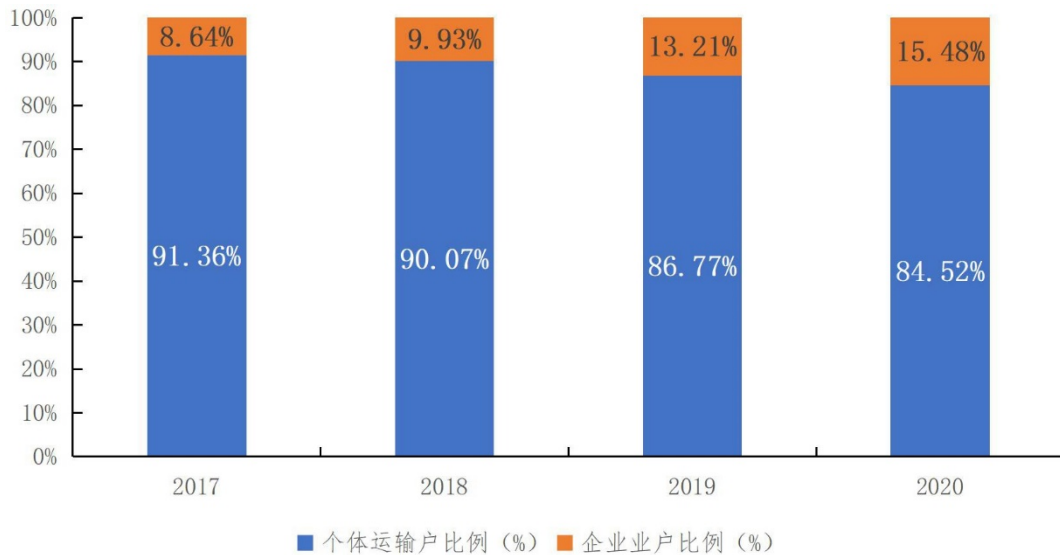


Figure 11 Distribution of registration places of heavy haul freight cars

In 2020, the capacity integration of transport operators will continue to increase, and the number of large and medium-sized enterprises will increase year by year. From the perspective of transport capacity scale, general freight enterprises with more than 50 vehicles accounted for 6.7% of the total number of operators, which increased by 1.3 percentage points compared with last year, and general freight enterprises with less than 10 vehicles accounted for 75.8% of the total number of enterprises, which decreased by 5.9 percentage points compared with last year.

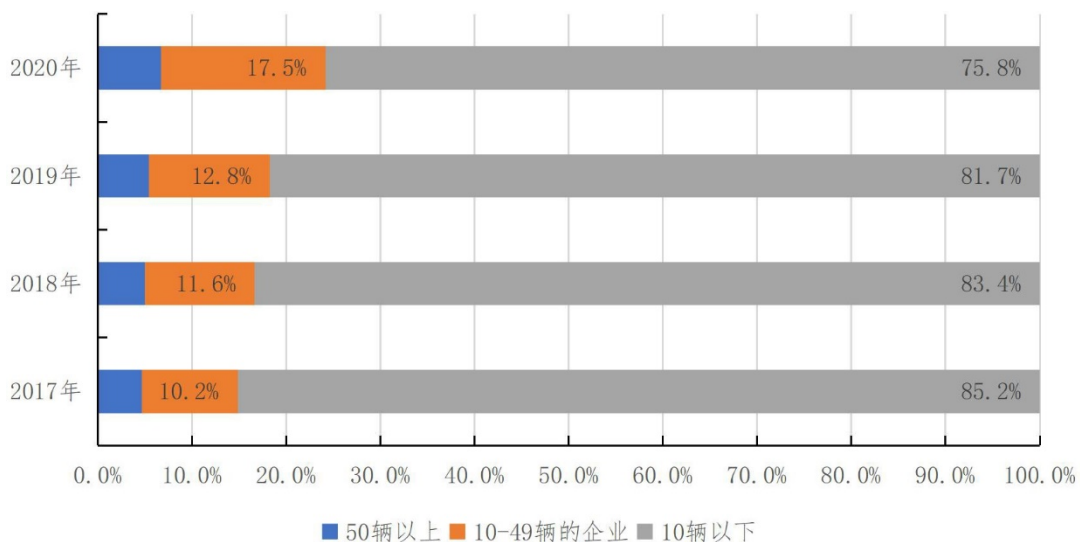


Figure 12 Scale distribution of transport capacity organization (proportion)

● **Strong expansion of specialized markets such as special transportation, large transportation and dangerous goods transportation**

From the perspective of business scope, the market of special

transportation, large transportation and dangerous goods transportation has developed well and maintained a sustained growth trend. By the end of 2020, the number of special transportation (including container transportation) operators reached 127,100, the number of large transportation operators reached 31,400, and the number of dangerous goods transportation operators reached 13,300, with an increase of 28.6%, 42.1% and 4.6% respectively over the previous year.

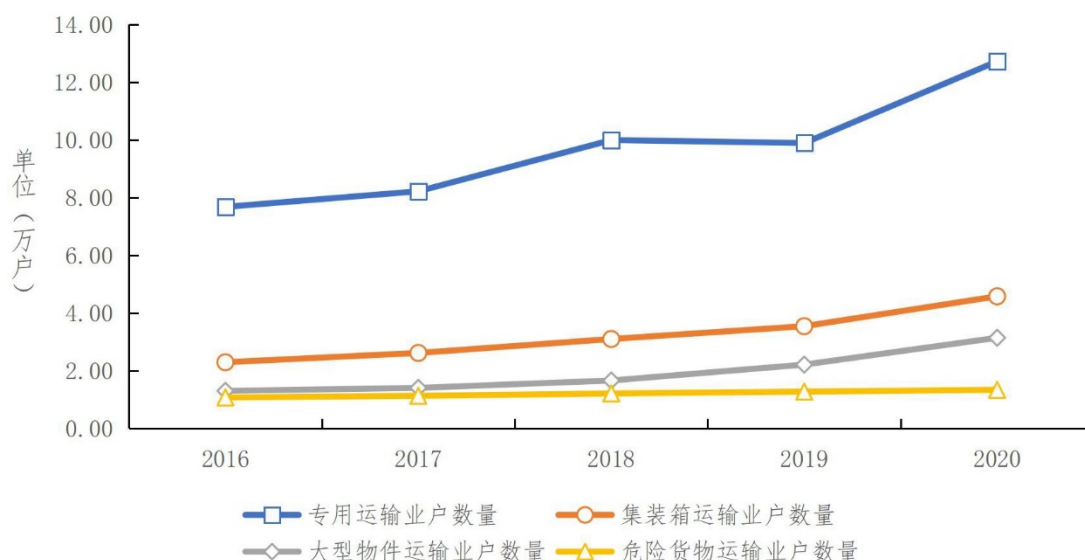


Figure 13 Change trend of the number of operators in specialized transportation market

● **Orderly recovery of business operations, serious decline in revenue and profits**

In 2020, due to the tightening of external environment, the transformation of new and old domestic economic momentum and COVID-19 pandemic, the insufficient demand for freight transport led to a decline in business volume and fierce market competition. 50% of the transport enterprises said that their turnover had continued to decline since June, 30% of them said that their turnover had declined by less than 20%, and their gross profit rate was less than 5%.

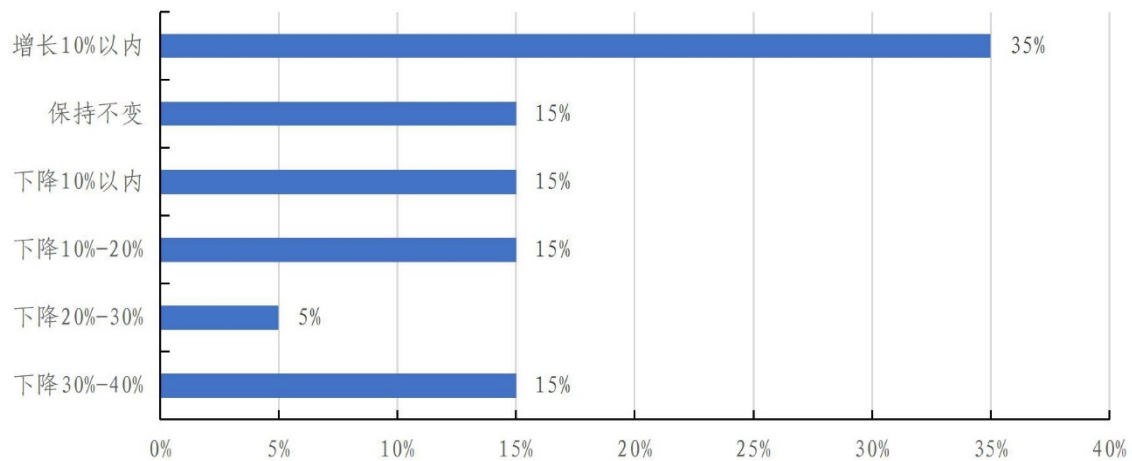


Figure 14 Change trend of turnover of freight transport enterprises

● **New formats support intensive and efficient development of freight logistics**

By the end of 2020, a total of 736 enterprises had obtained the business qualification of network freight, integrated 2.87 million social vehicles, completed a total of 17.83 million waybills, 450 million tons of freight volume, and realized a transaction volume of 57.7 billion yuan, which reduced the transaction cost by 6% -8% compared with traditional freight. The rapid development of the network freight platform drives the intensive and efficient development of the freight logistics industry with the support of new form of industry.

4. Scale of freight drivers

● **The scale of drivers continues to decline, and the problem of "age fault" is constantly emerging.**

In 2020, the number of highway freight transport drivers was 15.0982 million, down 3.2% from last year, which has been declining for four consecutive years. According to a sample survey, 94% of road truck drivers are male, with an average age of 41 years. The factors such as high labor intensity, poor working environment and low social status of truck drivers make the "post-90s" and "post-00s" groups shrink back at the sight of truck drivers, forming an obvious age fault. With the gradual retirement of "post-70s" truck drivers, the problem of age fault will become more prominent.

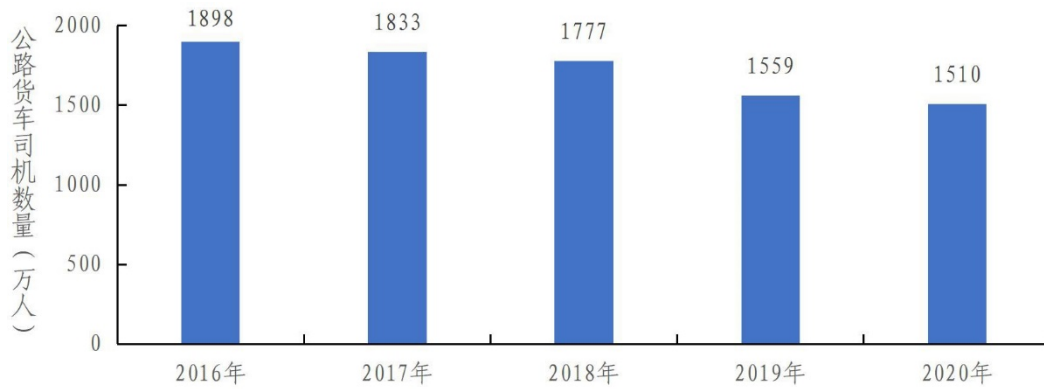


Figure 15 Change trend of number of highway truck drivers from 2016 to 2020



Figure 16 Portrait of highway truck driver

● **The distribution of truck drivers' native places is highly consistent with their vehicle registration places.**

There is a high degree of consistency between the distribution of truck drivers' native places and vehicle registration places. Shandong, Hebei, Henan, Jiangsu, Liaoning, Anhui, Hubei and other provinces are in the forefront of the country in terms of the number of trucks and truck drivers due to their obvious traffic location advantages.

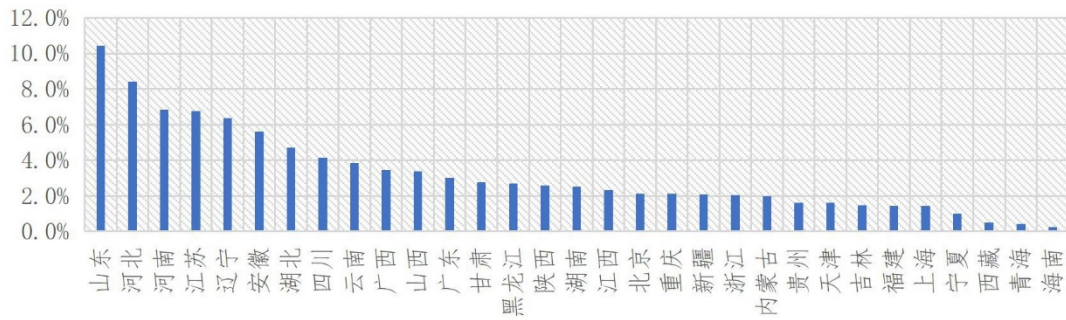


Figure 17 Change trend of the number of truck drivers

● **The driver's income is higher than the average social wage level**

According to the driver interview and questionnaire survey, the income of truck drivers in the whole society is generally in the upper middle level, with an average monthly income of 8,000-20,000 yuan, of which the income of drivers engaged in long-distance transportation is higher than that of short-distance transportation. Compared with the national average wage, the overall income level of truck drivers is higher. However, since the COVID-19 pandemic, the work and life of truck drivers have been particularly affected, with a general decline in income. According to a sample survey, 80% of drivers reported a decline in income in 2020, ranging from 20% to 40%. At the same time, truck drivers purchase vehicles through debt, borrowing and other ways, and the monthly repayment amount is between 10,000 and 15,000, so the repayment pressure is high.

5. **Operation of major logistics channels**

● **The north-south corridor is busier, mainly for Beijing-Hong Kong-Macao, Beijing-Shanghai and the north-south coastal corridor**

From the perspective of freight transport corridor, the freight corridor runs through the east, west, north and south, of which the north-south corridor is busier than the east-west corridor, and the expressway undertakes the main freight volume in China. According to the traffic flow data of national expressway sections, the busiest channels in the north-south direction are Beijing-Hong Kong-Macao, Beijing-Shanghai and Shenyang-Haikou expressways, and the busiest channels in the east-west direction are Lianyungang-Khorgos Expressway, Qingdao-Yinchuan Expressway, Shanghai-Chengdu Expressway and Shanghai-Kunming Expressway. With the further promoting of the "Belt and Road Initiative" strategy, the traffic volume of the land bridge corridor

(Lianyungang-Khorgos Expressway) has increased significantly,

becoming the fourth major road freight corridor, and the traffic volume of Qingdao-Yinchuan Expressway has also increased significantly, increasing by 24.6% over last year.

From the perspective of the average speed of the corridor, the average speed of 11 major logistics corridors is 71km/h, which is slightly higher than the annual average speed of truck expressway, indicating that the traffic efficiency of the main road freight corridor network has been improved.



Figure 18 Traffic flow and speed of 11 logistics corridors

6. Operation index situation

● The seasonal change and holiday effect of road freight industry are obvious

In 2020, the road freight industry generally showed a deep V rebound in the early stage and a steady and positive development trend in the later stage. From January to February 2020, due to the dual impact of the Spring Festival holiday and the epidemic, the freight demand shrank seriously, and the road freight industry was greatly impacted. The road freight industry operation index (TMI) was only 97.94, the lowest in nearly three years; at the end of March, the road freight market basically recovered to the normal level, and the average value of TMI index in the second quarter was 101.85, with a year-on-year increase of 1%; the road freight market in the second half of the year was stable and better, which was generally higher than the same period in 2019. The road freight market shows

obvious seasonal and holiday changes, with the peak transport season in March-May and September-October, and the off-season in January-February and June-August.

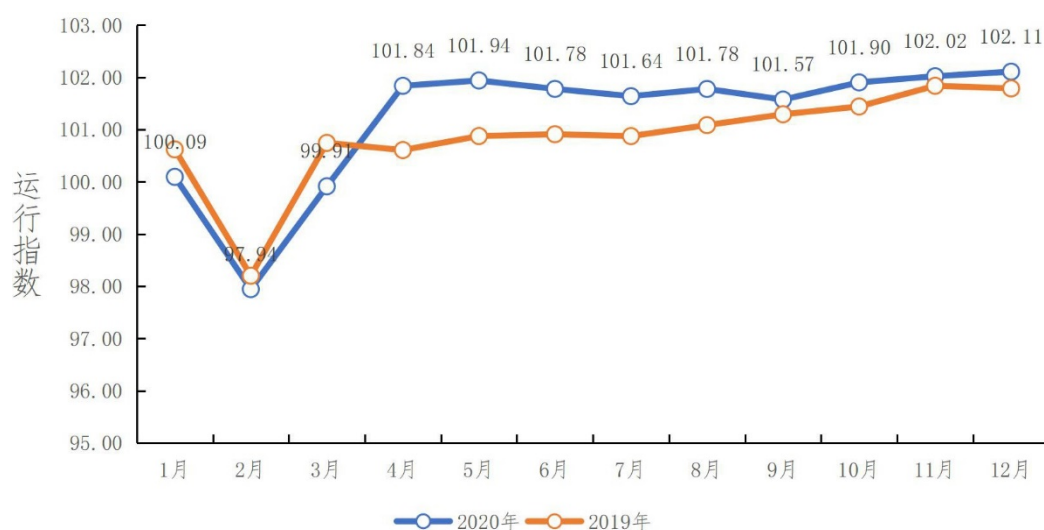


Figure 19 TMI index change trend in 2020

● **The scale of freight transport continued to grow, and the annual supply of transport capacity increased by 2.8% year-on-year**

In 2020, the transport capacity scale index was 102.84, an increase of 0.7% over the same period last year. During the resumption of work and production, the transport capacity scale of the road freight market recovered rapidly, giving full play to the leading and service role of the industry. The scale index was only 98.15 in February, the lowest in nearly three years. After the implementation of the free expressway policy, the market capacity entered the fast recovery channel and returned to normal level by the end of March. By region, the scale of active transport capacity is decreasing from east to west, and the total active transport capacity of the core cities in the Yangtze River Delta, Bohai Rim and Pearl River Delta is more than 45%. At the same time, the scope of truck activities has gradually broken through the "Heihe-Tengchong Line", especially in the central and western regions represented by Sichuan and Gansu, and the strategy of large-scale development of China's western region has achieved remarkable results.

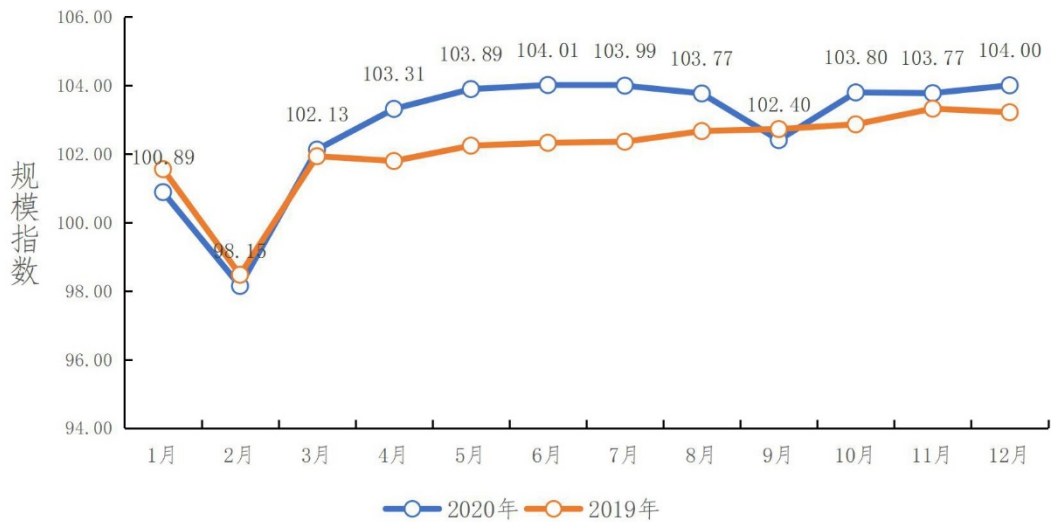


Figure 20 Change trend of scale index in 2020



Figure 21 Starlight map of national heavy haul freight cars activities in 2020

- **The efficiency of vehicle operation has been continuously improved, with the efficiency index increasing by 1.6% year-on-year**

In 2020, the operational efficiency index was 99.98, with a year-on-year growth of 2.8%. During the epidemic period, the toll-free policy for tollway has greatly improved the efficiency of China's highway freight, and the proportion of expressway used by road freight vehicles has increased by about 16.58%. At the same time, thanks to the abolition of provincial toll stations and the promotion and application of ETC, the number of congestion slow-moving stations has been reduced by 65%, and the average speed of trucks at high speed has reached 70.6 km/h, an increase of 4.6% over last year.

With the deep integration of "Internet + freight" and the emergence of online freight platforms, 70% of retail drivers are willing to choose online APPs to find sources of goods. Relying on the ability of resource integration, the network freight platform improves the response time of orders, realizes the matching of vehicles and goods quickly, and improves the efficiency of transportation organization.



Figure 22 Change trend of operation efficiency index in 2020

● **Overall, supply still exceeds demand in the highway freight market, with the price index showing a downward trend**

In 2020, the price index was 95.98, down 2% year on year. In recent years, the road freight market has always been in a situation of oversupply, and the market competition has been further intensified by the rapid development of new form of industry, new modes and the adjustment of transport structure. During the epidemic period, the toll-free policy for tollway was implemented, which promoted the rapid growth of traffic flow in expressway, reduced tolls by 84.88 billion yuan, effectively promoted the reduction of social logistics costs, lightened the burden of enterprises in the real economy, and accelerated the pace of resumption of work and production.

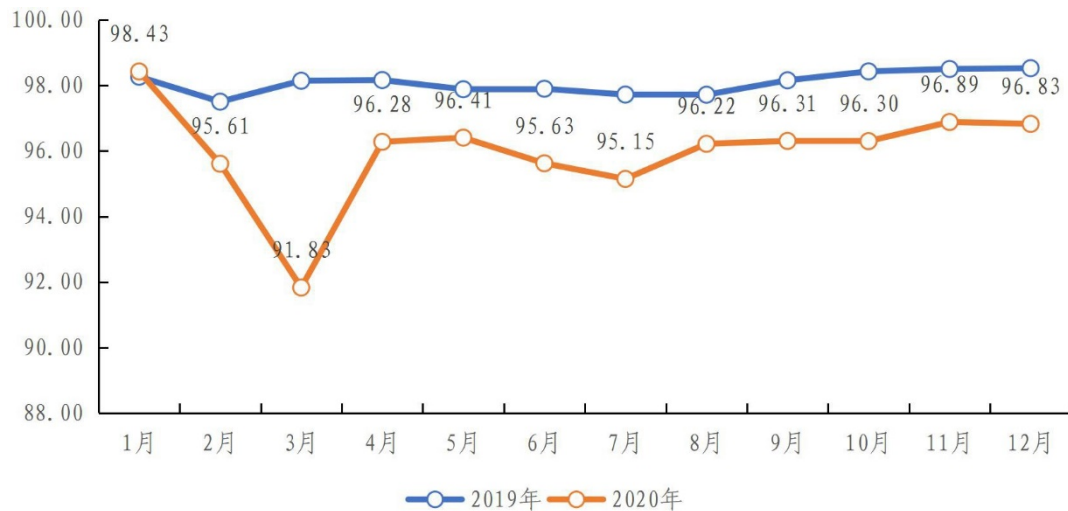


Figure 23 Change trend of price index in 2020

● **The security situation continues to improve, and the incidence of unsafe behavior continues to decline**

In 2020, transportation authorities at all levels actively implemented the requirements for safe production, and the safety situation continued to improve, with the safety index of the highway freight market at 107.16, up 2% year on year. According to the fluctuation law of the whole year, January to March is the month of frequent dangerous behavior of trucks, mainly due to holidays, the overall traffic efficiency of the highway network is higher, and the frequency of speeding and fatigue driving is higher. From the distribution of road network, the incidence of fatigue driving in expressway is significantly higher than that in national roads, provincial roads and county and township roads, accounting for more than 34% of the total number of speeding reminders, while speeding mostly occurs in national and provincial trunk roads. From the regional point of view, truck speeding behavior is concentrated in North China, Northwest China and other sections with good road conditions and wide vision, while fatigue driving mostly occurs in the three eastern provinces and central provinces.

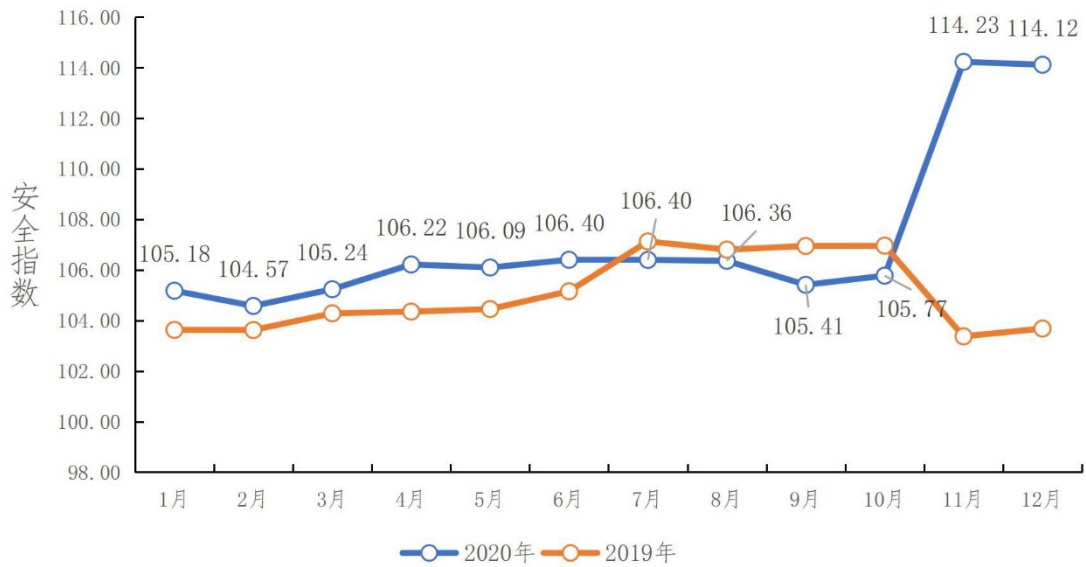


Figure 24 Change trend of safety index in 2020

Part II Safety Behavior Analysis

In 2020, the safety situation of the highway freight market continued to improve, the safety awareness of transport enterprises continued to strengthen, and unsafe driving behaviors such as fatigue driving and speeding driving continued to decrease. With the deep integration of the freight field with the Internet of Things, big data and other new generation of information technology, the installation of disc brakes, tire burst emergency devices, lane departure warning, EBC and other active safety systems for freight vehicles is increasing, and transport safety will gradually tend to fine management.

1. Analysis of fatigue driving behavior

● **The number of fatigue driving of drivers showed a downward trend, and the high incidence months were concentrated in February-April**

In 2020, the average daily number of fatigue driving of single vehicle continued to decrease, which was 6.5% lower than last year, and the high incidence months were concentrated in February-April. In February, industrial and manufacturing production gradually entered a state of recovery, the demand for logistics became more prominent, the short-term highway freight market showed a shortage of supply and demand, drivers in order to "Quick Running", the number of fatigue driving is increasing. From March to April, stimulated by the free expressway policy, the supply of trucks continued to recover, and the proportion of drivers

choosing expressways increased. The average daily driving time of trucks on expressways was more than 4.5 hours, which was 32.4% higher than that of last year. However, the long mileage and good road conditions of expressways could easily lead to monotonous driving movements, single line of sight and fatigue driving.

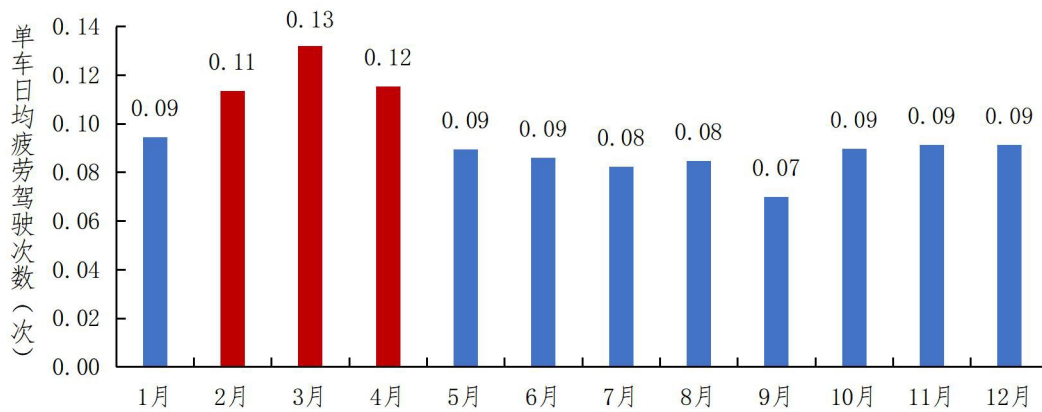
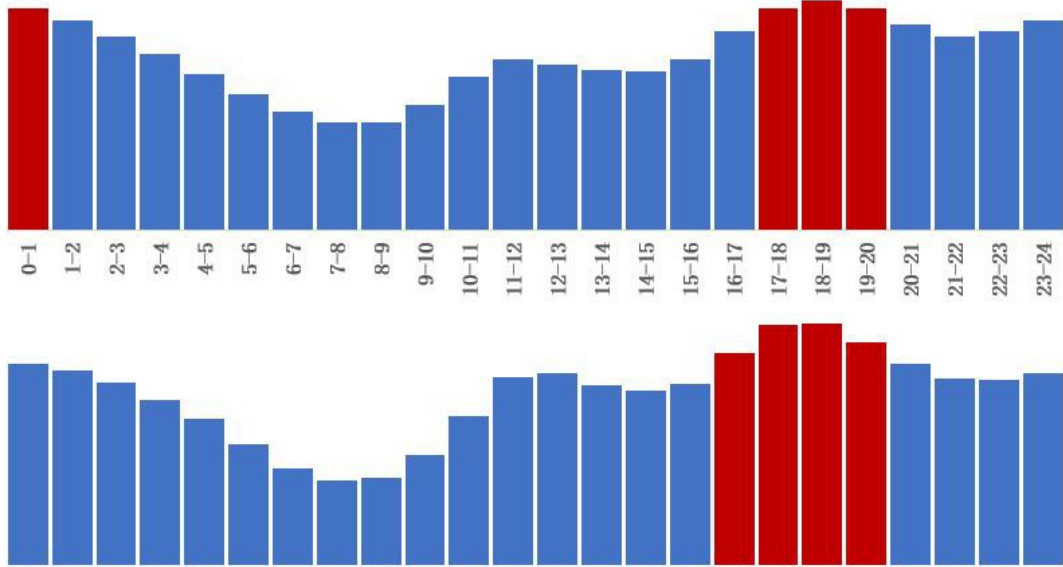


Figure 25 Change of average daily fatigue driving times of single vehicle in 2020

● **The frequent time period of driver fatigue driving is between 0:00-1:00 and 16-20:00**

According to statistics, the occurrence time of fatigue driving alarm is mainly concentrated in the late night (0: 0-1: 00) and the evening (16: 00-20: 00), which are also in line with the physiological characteristics of the human body and prone to fatigue driving. From the point of view of road structure, the expressway is between 0:00-1: 00 and 17: 00-20: 00, and the number of fatigue driving alarms is more, while the national and provincial trunk roads are between 16: 00-20: 00.

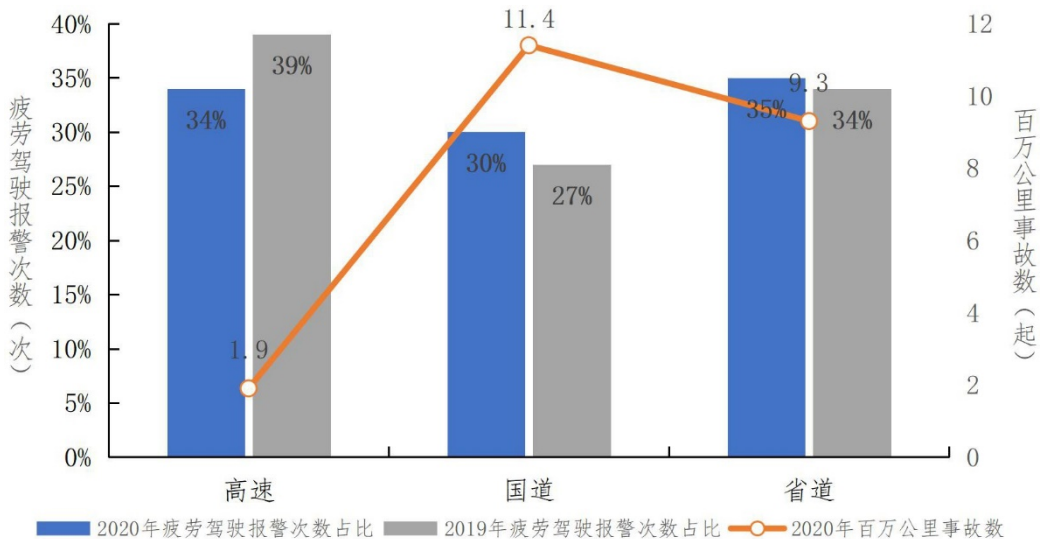
高速公路



国省干道

Figure 27 The relationship between the incidence of fatigue driving behavior and time

In 2020, the number of fatigue driving alarms on expressways decreased significantly, which was 5 percentage points lower than that in 2019, while the proportion of national highways increased by 3 percentage points compared with last year. Although the overall number of alarms is reduced, the degree of accidents on highway sections is more serious, so it is still necessary to strengthen the long-term driving behavior of drivers on highway sections.



Information source: The number of accidents per million kilometers comes from the *White Paper on Smart Safety of China's Road Freight Industry*.

Figure 28 Relationship between fatigue driving times and accidents on expressway and other roads

2. Analysis of speeding behavior

● Speeding behavior also showed a downward trend, with high incidence in September-October

In 2020, the average number of daily speeding reminders for single vehicle was 73.57, down 5.8% from last year.

The high incidence months are concentrated in September-October. Influenced by the promotion of e-commerce and traditional holidays, September-November is the traditional peak season for transportation. This year's "Double Eleven" e-commerce promotion campaign was advanced, which lasted from November 1 to November 11, and the factory adjusted the warehouse in advance to stock up. After September 22, the number of speeding for single vehicle increased significantly and lasted until October 25. In order to ensure the timeliness of shipment, the frequency of speeding vehicles increased.

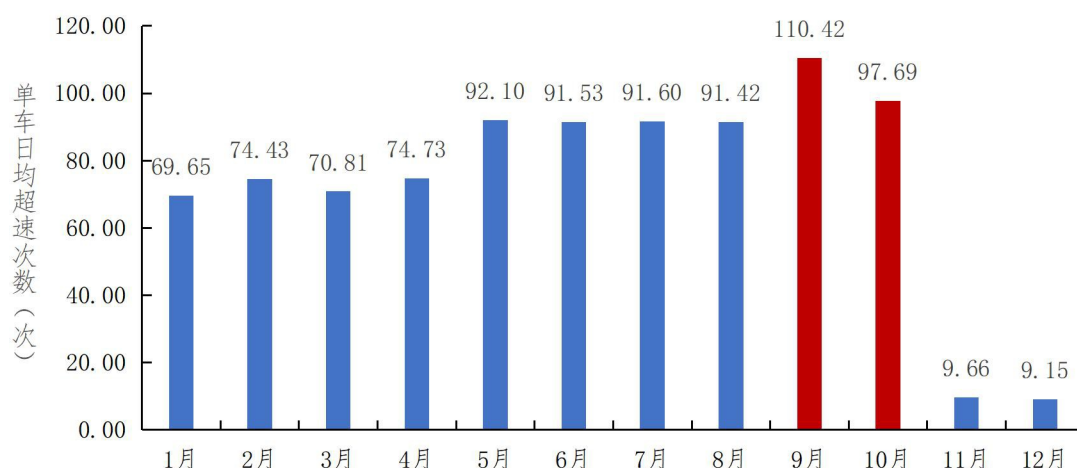


Figure 29 Incidence change of speeding in each month in 2020

● The number of speeding alarms on expressways decreased, while the number of speeding alarms on national and provincial highways increased.

In 2020, the number of speeding alarms on expressway decreased significantly, and the number of speeding alarms on national highways increased slightly. The proportion of speeding times on expressways is 23%, down 1 percentage point from last year, while the proportion of speeding times on national highways was up 2 percentage points from last year.

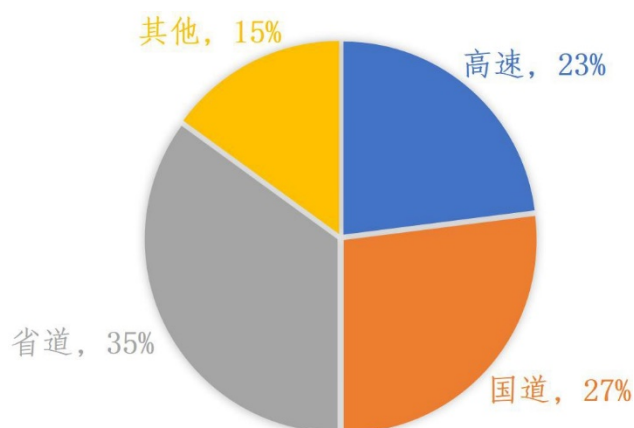


Figure 31 The relationship between the number of speeding driving behaviors on different road structures

Part III Analysis of Operation Efficiency

In 2020, the efficiency of vehicle operation will continue to improve, road freight transport will be smoother and more efficient,

and the efficiency index will increase year by year, from 98.52 in 2018 to 99.98 in 2020. Benefiting from the withdrawal of expressway stations and the promotion and application of ETC, the number of congestion slow-moving stations will be reduced by 65%. The average speed of trucks at high speed reached 70.6 km/h, which was 11% higher than that in 2018, and the efficiency of vehicle operation was continuously improved.

1. Vehicle mileage efficiency

● The efficiency of single vehicle operation has increased steadily, and the advantages of expressway are prominent

In 2020, the average daily mileage of single vehicle was between 257 and 356 kilometers, with an annual average of 305 kilometers, an increase of 4.5% over last year. Expressway is an important symbol of the modernization of transportation. By the end of the “13th Five-Year Plan period”, the traffic mileage of expressway reached 161,000 kilometers, which has outstanding advantages in terms of transport capacity and efficiency. During the period of toll reduction and exemption during the epidemic period, truck drivers were greatly stimulated to choose expressway. From February to April, the average daily mileage of single vehicle increased month by month, with an average increase of 10.2% compared with last year, and the driving efficiency of vehicles increased significantly.

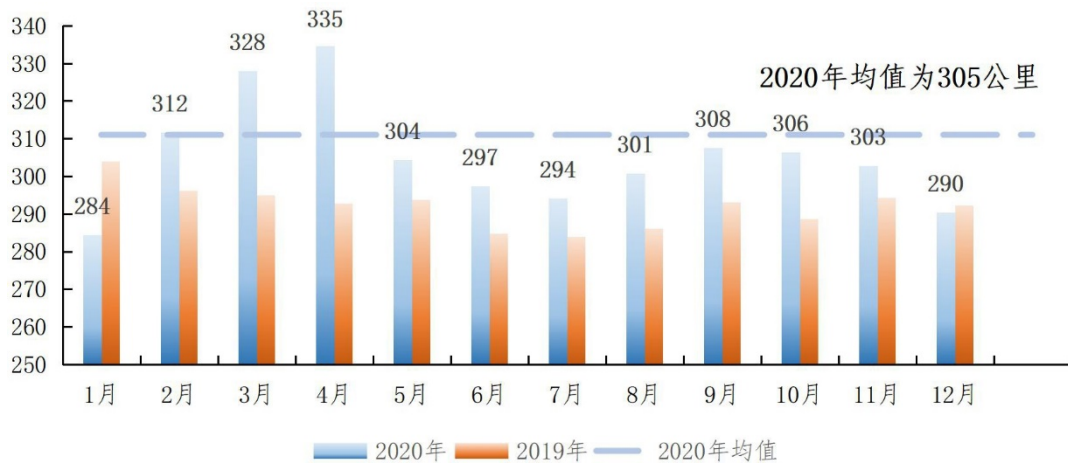


Figure 32 Change of average daily mileage of single vehicle in 2020

● **The monthly mileage of vehicles showed obvious fluctuations in the off-season and peak season.**

According to the monthly data, the average monthly mileage of single vehicle in 2020 was 5430 kilometers, an increase of 7.3% over last year. Among them, the average monthly mileage of single vehicle in April-May and September-November is more than 6000 kilometers, and the monthly mileage of vehicles shows a clear fluctuation law in the off-season and peak season.



Figure 33 Average monthly mileage of single vehicle in 2019-2020

From the perspective of road structure, the proportion of expressways in the average daily mileage of single vehicle has been increasing for three consecutive years. Thanks to the improvement of the expressway network and the impact of the toll-free policy during the epidemic period, the proportion of expressways has reached 47%, an increase of 4 percentage points over last year. The proportion of national and provincial trunk road mileage also increased to 31% compared with last year.

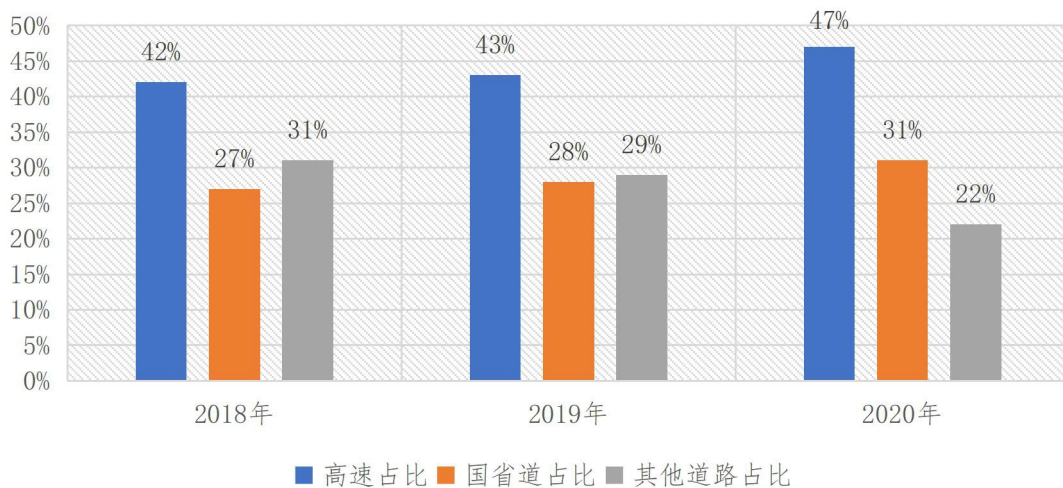


Figure 34 Proportion of freight vehicle mileage by road structure

2. Vehicle running speed efficiency

- **The average speed of road freight vehicles is 49km/h, which is 3% higher than last year**

In 2020, the average annual speed of freight vehicles in China was 49km/h, which was 3% higher than last year. The average speed of expressway is 70.6km/h, the average speed of national highway is 46.1km/h, and the average speed of provincial highway is 45km/h. The driving speed of vehicles with different road structures has increased slightly, of which the average speed of the highway is 4.6% higher than last year, but compared with the United States (the average speed of 88.5 km/h in 2015), it still needs to be improved.

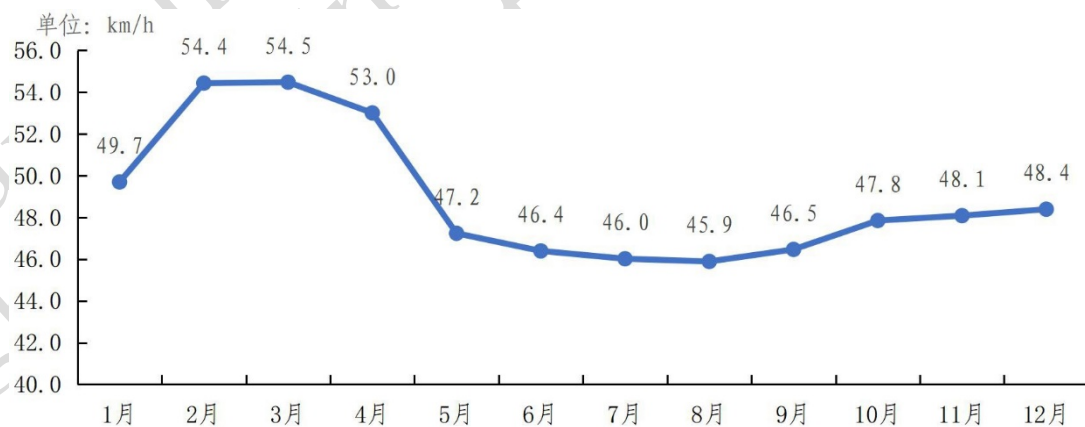




Figure 35 Average speed distribution of freight vehicles

3. Vehicle running time efficiency

- **The average daily running time has increased slightly, and the labor intensity of drivers is relatively high**

In 2020, the average daily driving time of single vehicle was 7 hours, up 1.4% compared with last year. Truck drivers in China belong to the “sweaty” profession, with long working hours, poor working environment, irregular working hours, high mental tension and high-risk factor. According to the survey, the average working hours of truck drivers in China are about 49 hours per week, which is higher than the average working hours of labor force in China, and much higher than the working hours of American transportation workers.

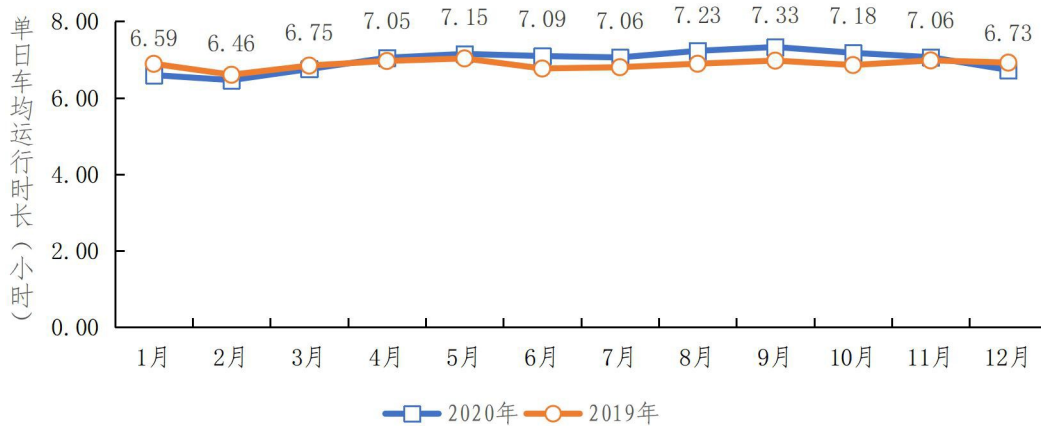


Figure 37 Change of daily average running time of single vehicle in 2020

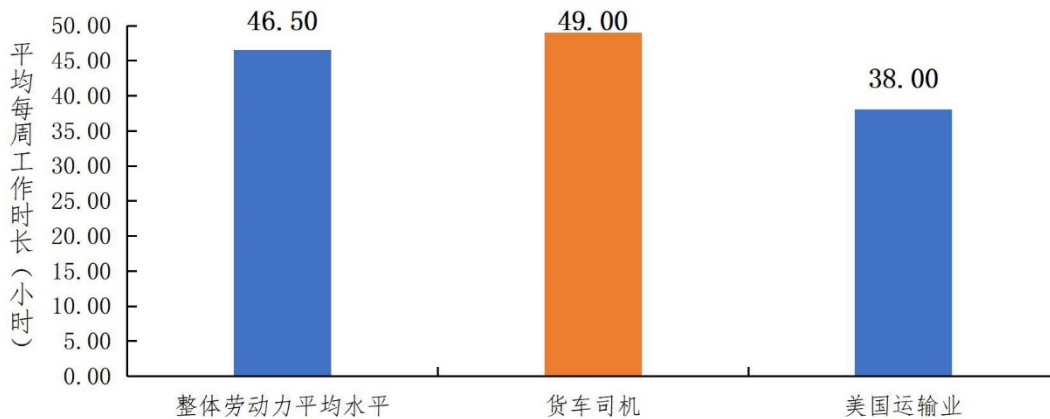


Figure 38 Comparison of weekly working hours of truck drivers at home and abroad

Part IV Analysis of Green Energy Saving

In September 2020, President Xi Jinping solemnly announced to the world at the United Nations General Assembly that China will strive to achieve carbon peak by 2030 and carbon neutrality by 2060. At present, China's transportation sector accounts for about 15% of the country's terminal emissions. To achieve the goal of "carbon dioxide emission and carbon neutrality", the transportation industry undertakes an important task. Internationally, developed countries such as the United States, Japan and Europe also regard transportation as a key area of national carbon emission reduction. Highway transportation occupies a dominant position in the comprehensive transportation system, further reducing the fuel consumption of traditional diesel vehicles and vigorously developing new energy vehicles are also the most fundamental guarantee for the implementation of traffic emission reduction.

1. Influence of highway freight on fuel consumption

● Heavy goods vehicles are the main mobile sources of fine particulate matter and nitrogen oxides

In recent years, the public demand for a living environment has been increasing, especially the demand for clean air. Under the strong impetus of resolutely winning the fight to defend the blue of our skies, the "13th Five-Year Plan" air pollution and air quality has improved significantly. According to the *China Ecological Environment Status Bullet in 2020*, 202 of the 337 cities at prefecture level and above in China met the air quality standards, accounting for 59.9%. However, the improvement effect is not stable, among which PM2.5 and ozone are the two major air

problems that plague cities. *China Mobile Source Environmental Management Annual Report (2020)* shows that the emissions of fine particulate matter and nitrogen oxides from trucks are higher than those from passenger cars, among which heavy goods vehicles are the main contributors, so the exhaust control of diesel trucks has become the focus of air pollution control. In July 2020, the opening of the China VI Era accelerated the elimination of vehicles China III and China IV, and promoted the research and development of energy-saving and emission reduction technologies for vehicles.

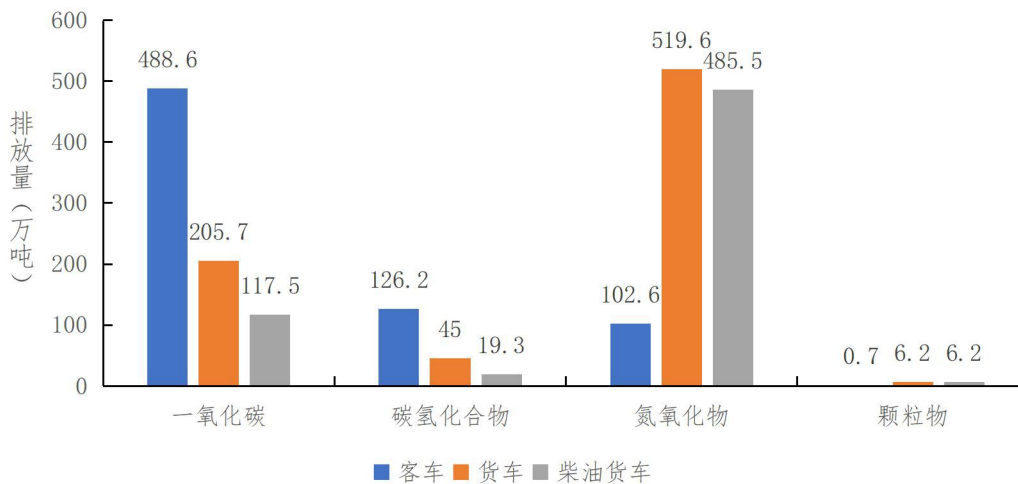


Figure 40 Pollutant Emission of Passenger and Freight Cars

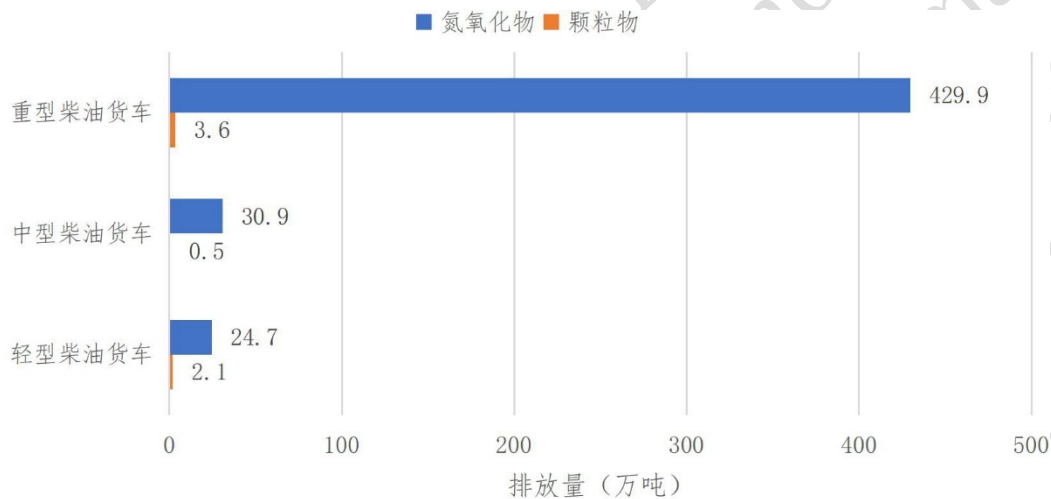


Figure 41 Emission of fine particulate matter and nitrogen oxides from diesel trucks by vehicle type

● **There are many factors affecting fuel consumption, and the truck load is positively related to fuel consumption**

There are many factors affecting the fuel consumption of trucks, including vehicle condition, performance, vehicle load, driver's driving habits, road conditions, weather, oil and so on. Among them, with the increasing weight of trucks, the fuel consumption of 100 kilometers of trucks is also increasing, showing a positive correlation

of both. The continuous research and development of lightweight and energy-saving technologies for commercial vehicles will further improve the fuel consumption level of trucks.

In terms of vehicle types, the actual fuel consumption of light trucks is between 15.9L/100km and 17.4L/100km, and the fuel consumption distribution is highly consistent. The actual fuel consumption distribution of ordinary trucks is quite different, the highest is 37.4L/100km, and the lowest is only 22.2L/100km, mainly due to the different deadweight and load weight of trucks. Due to the high load capacity, the actual fuel consumption of the tractor is relatively high, and the fuel consumption per 100 km is between 43.1L/100km and 47.2L/100km.

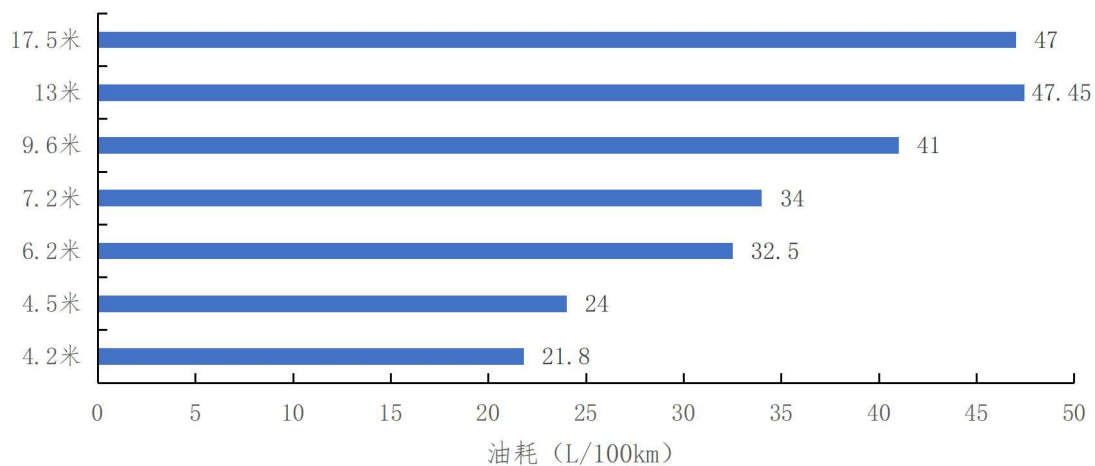


Figure 43 Fuel consumption of vehicle types

● **Promote ecological driving behavior and urge the reduction of bad driving such as excessive idling and excessive deceleration**

Previous studies have found that the driving behavior of drivers accounts for 25% of the factors affecting fuel consumption, and car owners have also realized the importance of differences in driving behavior leading to differences in fuel consumption. "Eco-Driving" refers to the way of driving that avoids uneconomical and environmentally friendly driving behaviors such as rapid acceleration, rapid deceleration, empty pedal and long-term idling. The governments of the United States, Europe, Japan and other countries have promoted Eco-Driving projects, and some domestic researchers have assessed the impact of five bad driving behaviors on fuel consumption, namely, ultra-long idling, rapid acceleration, over-acceleration, rapid deceleration and over-acceleration deceleration, with an average fuel-saving potential of 2.6% for reducing ultra-long idle speed and 3.8% for reducing rapid

deceleration. By promoting Eco-Driving behavior, the environmental benefits of vehicle emissions can be reduced, and the cost of vehicle use can be effectively avoided.

2. Development of new energy logistics vehicles

On the one hand, energy conservation and emission reduction of highway freight should reduce the fuel consumption of traditional fuel vehicles, on the other hand, new energy vehicles should be vigorously developed. Over the past five years, the sales of new energy logistics vehicles have fluctuated from rising to falling. With the gradual decline of the subsidy policy, the market has gradually changed from "fixed sales by compensation" to "fixed sales by technology". The gradual liberalization of road rights policies around the country has increased the real demand of the market. Logistics enterprises also put forward higher requirements for the selection of new energy logistics vehicles, EIC system, endurance mileage, cargo weight, after-sales and other aspects.

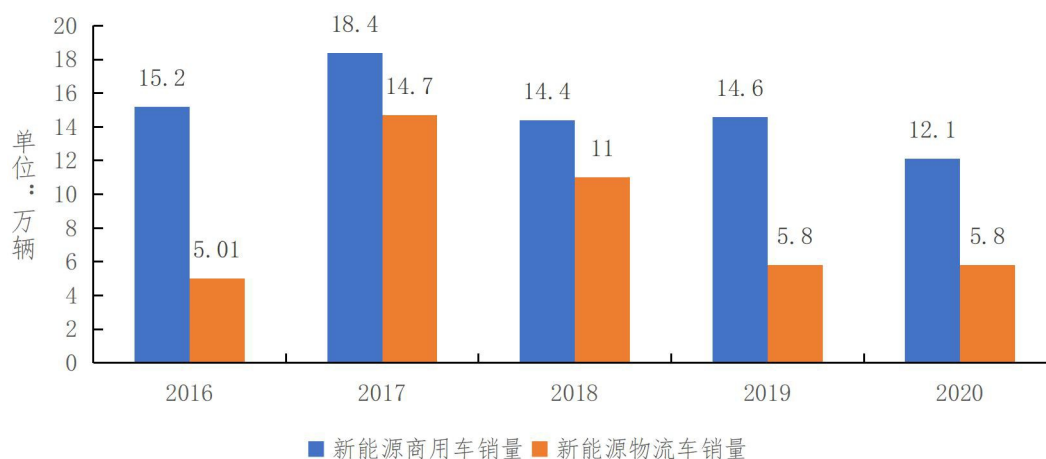


Figure 44 Sales volume of new energy commercial vehicles and logistics vehicles

● The urban green freight distribution demonstration project accelerates the promotion and application of new energy logistics vehicles

According to the statistics of tram resources, in 2020, 273 cities in China have sales of new energy logistics vehicles, of which the TOP20 market accounts for 81%, and the hot-selling cities are concentrated in Shenzhen, Chengdu, Guangzhou, Nanjing and other first-tier cities. Since 2017, the Ministry of Transport, together with the Ministry of Public Security and the Ministry of Commerce, has been implementing pilot urban green freight distribution work across the country to also accelerate the promotion and application of new energy logistics vehicles in cities. Up to now, a total of 63000

new energy logistics distribution vehicles have been added in 46 demonstration projects, with a total of more than 166,000 vehicles, and the average daily mileage of single vehicle increased by 10%, which has effectively promoted energy saving, emission reduction, cost reduction and efficiency enhancement in the freight industry.

Part V Price Cost Analysis

In 2020, road freight prices were generally stable, and the price index continued to decline, down 4.02% from 2018. On the whole, the freight market has a low degree of intensification, and the market capacity has been in oversupply for a long time. Especially under the background of continuous optimization of transport structure and accelerated adjustment of industrial structure, the problem of excess capacity will be further highlighted, and the market competition will be further intensified.

1. Transport price of highway freight

● Prices in the highway freight market fluctuated sharply, showing a downward trend as a whole

In 2020, the price of highway vehicle transportation fluctuated sharply, with an average price of 0.35 yuan / ton kilometer, down 2.44% from the same period last year. From February to April, due to the implementation of the policy of free expressway, cargo owners took the opportunity to force down the price, small and medium-sized enterprises and individual drivers reflected that the rate of decline was as high as 30% -40%, and freight enterprises did not enjoy the bonus policy. After the resumption of charges, the freight rate rebounded slightly, but due to the production and manufacturing, commercial circulation and other related real economy has not yet fully recovered, the overall freight market shows insufficient demand and excess capacity, which is still lower than the same period last year. After September, the highway freight rate showed a trend of stabilization and recovery.

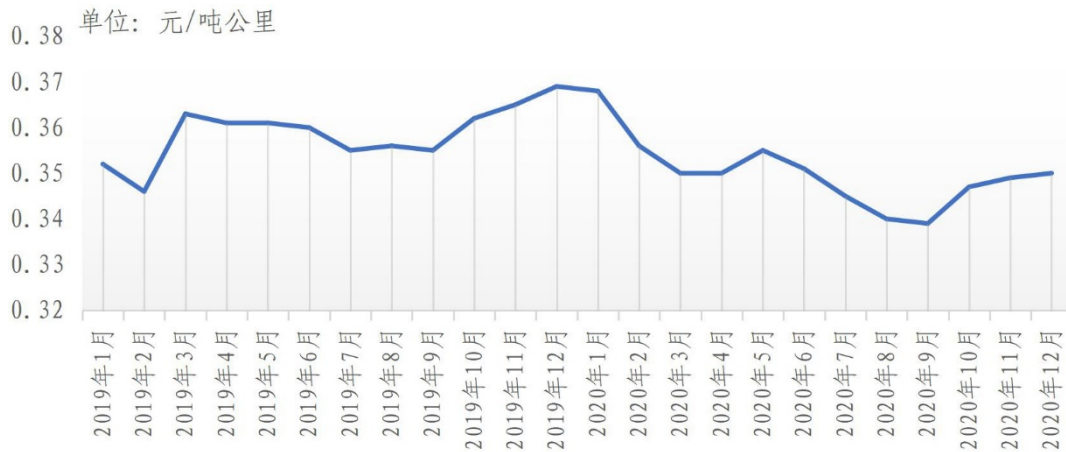


Figure 45 Change trend of freight index in road freight market

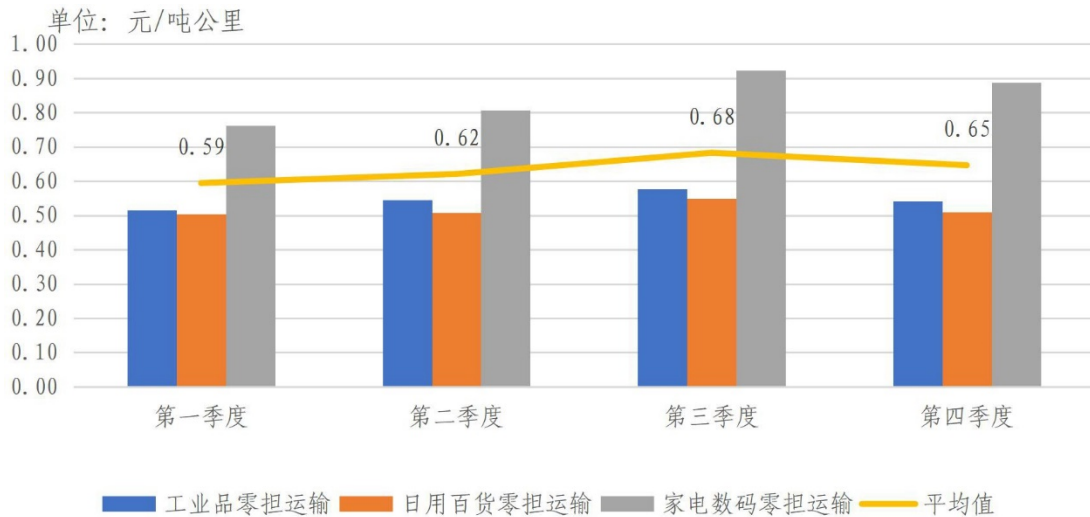
By transportation distance, the price of midway and short distance vehicle transportation basically rose to the same level as last year, with the price of short-distance vehicle transportation rising by 3.6% and that of midway vehicle transportation rising by 0.7%, but the price of long-distance vehicle transportation dropped by 6% compared with last year.

Table 4 Average transportation price change table of different transportation distance

Transportation distance	Average freight rate (yuan/ton kilometer)	Year-on-year
Short distance	0.81	3.6%
Midway	0.41	0.7%
Long distance	0.22	-6%

● The price of less-than-truck-load transportation rebounded, and the freight rate of household appliances and digital goods continued to rise

According to the data monitoring of G7 network freight platform, the average freight rate of less-than-truck-load transportation in 2020 was 0.64 yuan/ton kilometer, an increase of 0.58% over December last year. By cargo category, the price of less-than-truck-load transportation of household appliances and digital goods is higher, which is 0.84 yuan / ton kilometer, an increase of 2.05% over December last year, and the price of less-than-truck-load transportation of daily department stores is 0.52 yuan / ton kilometer, which is basically the same as last year, while the transportation price of industrial products is 0.54 yuan/ton kilometer, down 1.65% compared with December last year.



Source: G7 Highway Freight Index Report

Figure 46 Fluctuation of average less-than-truck-load freight rate in 2020

● **Bulk cargo transport prices showed a trend of "first falling and then rising", down 3.9% year on year**

In 2020, the average freight rate of bulk coal cargo was 0.5 yuan/ton kilometer, down 3.9% from the same period last year. The second quarter was in the stage of economic recovery, the demand for coal in power plants was not high, and the price of coal transportation was the lowest in the whole year. In the second half of the year, it entered the stage of rapid recovery, industrial production continued to rise, and the demand for coal in power plants continued to grow. At the same time, the Australian coal restriction policy drove the domestic coal price to rise continuously, and then the price of coal transportation rose. By distance, there was a trend of "one rise and two falls", with short-distance and long-distance transport falling by 6.9% and 8.7% respectively, while midway transport rose by 3.8%.

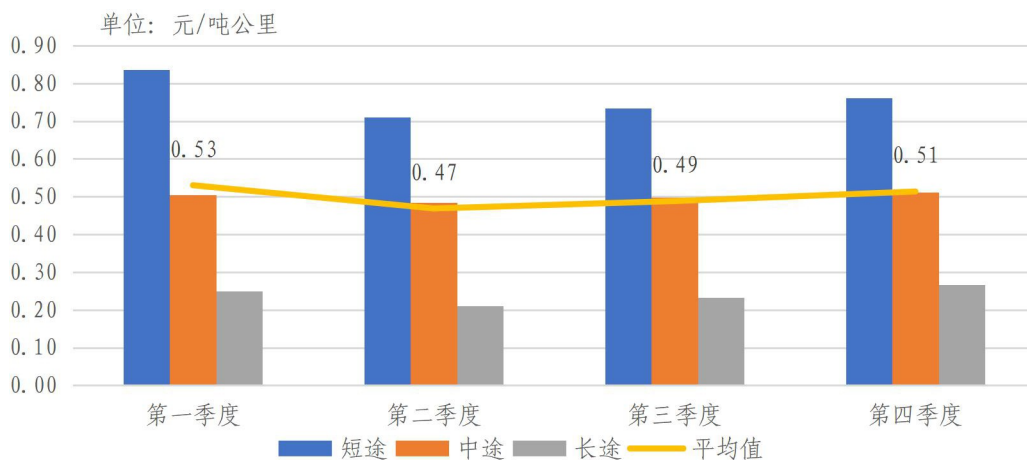


Figure 47 Fluctuation of average freight rate of coal road transport in 2020

- **Container transport prices rebounded, up 1.3% year-on-year**

In 2020, the average freight rate of container highway transportation in Shanghai was 9.27 yuan/container kilometer, up 1.3% year on year. In February, affected by the epidemic, Shanghai and Ningbo ports experienced a serious explosion of warehouses, resulting in a short-term shortage of transport capacity, and the market freight rate increased significantly by 1.8% on a month-on-month basis. In the second half of the year, due to the continuous recovery of China's import and export trade market, the container highway freight rate continued to rise. At the same time, in recent years, there has been a shortage of capacity for truck drivers, generally over 40 years old, and few "post-90s" drivers.

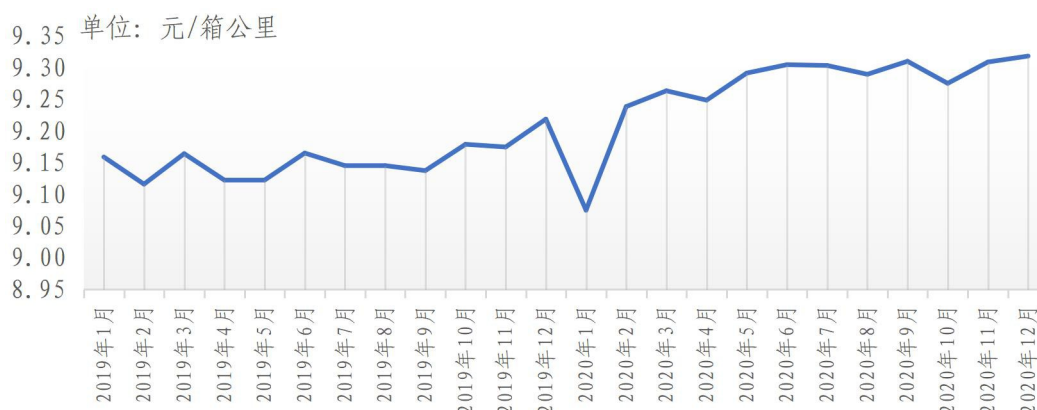


Figure 48 Fluctuation of average freight rate of container highway transport in 2020

2. Cost composition of highway freight

- **Driver's salary has become the first cost of highway freight**

According to the analysis of the actual operation data of the sample enterprises, fuel, road and bridge fees and driver's salary are still the three main costs of freight transport enterprises, accounting for 64.8%. Unlike previous years, driver's salary has become the first cost of highway freight, accounting for 24.4%, mainly due to the free expressway policy in February-April and the continued decline in fuel costs, resulting in structural changes in the cost share.

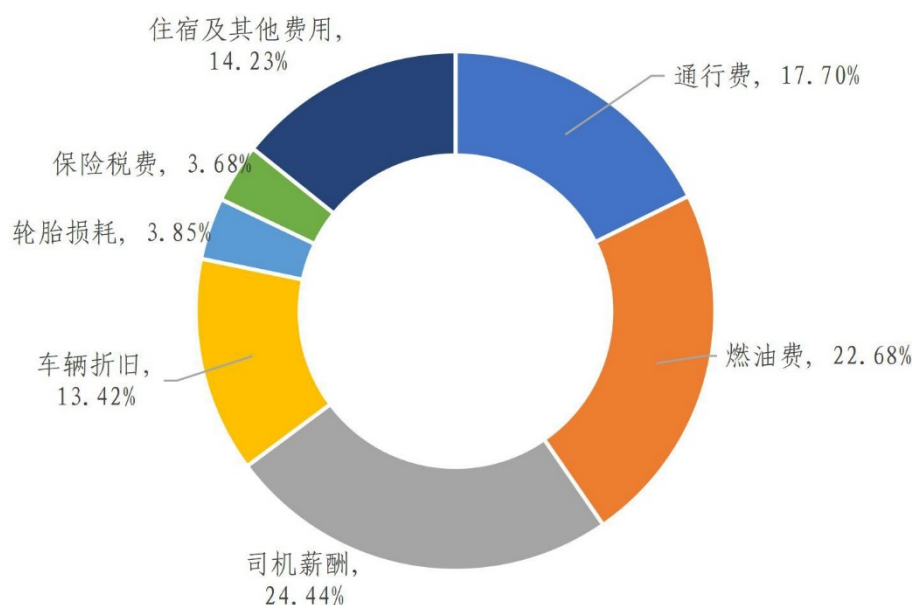


Figure 49 Proportion of main cost composition of highway freight transportation

● **Toll reduction and exemption policy reduces the cost of enterprises, and the ETC utilization rate of trucks exceeds 50%**

The toll-free policy of tollway has released the policy dividend to the maximum extent, effectively promoted the resumption of production in the freight industry, and ensured the sustained and healthy development of the economy and society. At the same time, deepening the reform of tollway system and abolishing provincial toll stations in expressway is a major reform task deployed by the Party Central Committee and the State Council, as well as a major livelihood project related to the vital interests of the people. Since the resumption of toll collection on May 6, the expressway network has been running smoothly, and various problems in the initial stage of system conversion and running-in have been basically effectively solved, with the ETC utilization rate of trucks exceeding 53%. With the rapid popularization of ETC, the efficiency of expressway in China will be further improved.

Part VI Challenges and Prospects

1. Development trend

● **Under the new development pattern of double circulation, the demand for freight transport has increased steadily**

In 2020, in the face of the impact of the epidemic and the complex

and severe domestic and international environment, governments at all levels, in accordance with the important strategic deployment of the Party Central Committee and the State Council, coordinated the prevention and control of COVID-19 pandemic and economic and social development, did a solid job of "six stability" and fully implemented the task of "six guarantees", and launched a series of policies and measures to help the resumption of work and production. It took the lead in restoring positive economic growth in the world's major economies and achieved an annual economic growth rate of 2.3%. In 2021, under the new development pattern of double circulation, "expanding domestic demand" will give full play to China's super-large-scale market advantages and consumption potential, realize the two-wheel drive of "expanding investment" and "promoting consumption", and the freight demand will maintain stable growth. The adjustment of demand structure and the change of development pattern require accelerating the transformation and upgrading of modern logistics system under the new normal conditions, further realizing logistics cost reduction and efficiency enhancement, innovating service mode and improving service network.

● **Optimization and adjustment of transport structure and continuous innovation of combined transport service**

Since 2018, through the implementation of nationwide actions such as railway transport capacity upgrading, water transport system upgrading, highway freight control, multimodal transport speed-up, information resources integration and urban green distribution, the service capacity of rail freight has been enhanced, and the "transfer of iron to railways" of bulk materials in ports, industrial and mining enterprises and the elimination of old diesel vehicles have been promoted. In 2020, the adjustment of transport structure achieved positive results. The railway freight volume reached 4.55 billion tons, an increase of 3.2% over the same period last year. The highway freight volume of bulk goods in coastal ports decreased significantly. The proportion of iron ore railway dredging ports in the Bohai Rim region, major coastal ports in Shandong Province, Tangshan Port and Huanghua Port increased significantly. In 2021, we will continue to optimize the transport structure, tap the market potential of transport structure adjustment, and improve the level of multimodal transport services.

- **With the upgrading of consumption and the optimization of industrial structure, the demand for specialized transportation has increased**

In 2020, China's economic development steadily improved, the industrial structure continued to optimize, the added value of the tertiary industry accounted for 54.5% of GDP, emerging industries and high-tech manufacturing industries continued to maintain rapid growth, and the supporting role was further strengthened. China's per capita GDP has exceeded 10,000 US dollars, ranking steadily in the ranks of middle- and high-income countries, and the expansion of middle-income groups will bring about sustained consumption upgrading. The consumption structure tends to be multi-category and high quality, with increasing demand for fresh products, imported products and high-end high-value items, further driving the demand for specialized transportation such as cold chain, containers and large items to maintain a continuous expansion.

- **Strengthen innovation-driven leadership and gradually improve collaboration capability**

The new generation of information technology is deeply integrated with transportation, presenting many new realistic scenarios, and is becoming an important economic growth point. The network freight platform gathered social scattered capacity of 2.87 million vehicles, and the traditional extensive development mode is unsustainable. The new development pattern and environment require freight logistics to speed up upgrading. With the continuous improvement of information construction in recent years, data resources are constantly enriched, with data as the key element to enable transport development, promote the linkage innovation of mode, format, products and services, and enhance collaborative management capabilities. Technologies such as 5G, Beidou Navigation and new generation communication systems continue to mature, promoting the intelligent use of driverless, logistics robots, unmanned distribution vehicles and unmanned aerial vehicles in the industry, and driving the industry to improve quality and efficiency.

- **Strengthen industry safety management by safety first development concept**

In his speech at the Fifth Plenary Session of the Nineteenth Central Committee of the Communist Party of China, General Secretary Xi Jinping pointed out that safety is the prerequisite for development and development is the guarantee of safety, which complement

each other. The continuous strengthening of safety production is the inevitable trend of industry management in the future. To do a good job of safety in the field of highway freight transport, the core is to grasp the four areas and sectors with major potential safety hazards, namely, dangerous goods transport, heavy goods vehicles, cold chain logistics and less-than-truckload freight transport. Focusing on the four key areas, we should improve the ability of safety management and consolidate the foundation of safety development.

● **Transportation reform continues to deepen and the business environment continues to improve**

In 2020, we will continue to optimize the business environment, deepen the reform of decentralization, decentralization and optimization of services, promote the construction of "Internet + supervision" system, and deepen the construction of "credit transportation province". We will continue to carry out the action of reducing certificates for the convenience of the people, realize the "one-network operation" and "cross-provincial operation" of government services such as large transport permits, and constantly improve the "good and bad evaluation" mechanism of government services. At the same time, more than 420 "driver's homes" have been built nationwide, and the online "driver's home" APP has been officially released, and the driver's satisfaction has been increasing. In 2021, we will accelerate the reform of the industry's streamline administration and delegate power, improve regulation, and upgrade services, change from strong licensing to industry credit supervision based on big data, optimize and improve tollway policies, promote differentiated charges for expressway, strengthen operation monitoring, and ensure the smooth operation of the industry. Faced with the driver group, we should further improve the social status and recognition of drivers, so that the majority of truck drivers can work in a decent way, comfortable labor, happy life.

2. Existing problems

● **The low-level transport capacity of the industry is excessive, and the homogeneous competition is fierce**

China's road freight industry is one of the industries with the earliest opening time and the highest degree of marketization. On the whole, the freight market has a low degree of intensification, and the market capacity has been in oversupply for a long time. Especially under the background of continuous optimization of transport structure and accelerated adjustment of industrial structure, the problem of

excess capacity will be further highlighted. At the same time, the market risk awareness of practitioners is weak, many people are still blindly entering the market with excess capacity, and the whole industry ecology is fragile. Excessive competition has brought many problems to the whole freight industry, such as overloading, large tons and small standards, illegal modification and so on, which has caused great potential safety hazards to road traffic safety.

● **Truck traffic accidents occur frequently, and the situation of safe production is still grim**

In recent years, the pressure of safety production in China's road freight industry is still high, and the accidents of safety production in road transportation are still in a "high fluctuation period". According to statistical data, in 2020, the proportion of major accidents caused by trucks reached 84%, especially those caused by heavy goods vehicles over 12 tons, and the proportion of accidents caused by drivers' illegal behaviors, such as overloading, speeding, fatigue driving and improper operation, reached 81%, and there were phenomena of overrun and overloaded as well as illegal modification. It is necessary to further strengthen the safety access supervision of freight vehicles, drivers and freight enterprises from the source, prevent illegally refitted freight vehicles from entering the market, improve the level of road traffic safety production, and ensure the safety of people's lives and property.

● **Platform operation is not standardized, which damages the interests of truck drivers**

The "Internet +" freight platform takes advantage of the monopoly position of market resources to induce truck drivers to bid maliciously by adjusting trading rules, dispatching rules and bidding rules, as well as collecting membership fees, service fees and commissions, which reduces the profit space of drivers and increases the operating burden of drivers. In the survey, many drivers reported that there were unfair competition behaviors in the network freight platform, such as false source information, inconsistent description of source information, setting the lowest freight rate, limiting the highest freight rate, implementing one price, not allowing drivers to bargain, and complaints could not be effectively handled.

● **The ability of comprehensive governance is insufficient, and the level of industry management needs to be improved**

In the management of industry safety supervision, pollution

prevention and control, overload and overrun, there is no overall use of economic regulation, credit management, administrative penalties and other comprehensive means, transportation law enforcement and public security traffic management are not closely coordinated, and the industry governance pattern of department coordination, up-down linkage, regional cooperation and social co-governance has not yet been formed. In this context, the governance of illegal and irregular acts in the industry, a large number of transmissions to the end of law enforcement links, easily lead to social conflicts. At the same time, the outstanding problems found in law enforcement have not been resolved in time through the combination of source control and dredging and blocking.

- **The social caring atmosphere is not enough, and the sense of belonging of the driver industry is not strong**

Although the average income of truck drivers is relatively high, they are basically at the bottom of the industrial chain because of their long working hours, high mental pressure, poor working environment, low social status and weak ability to resist risks. The society does not care enough for individual drivers, lacks the atmosphere of caring and respecting truck drivers' labor, and lacks dignity and respect in the profession, and even lacks the sense of honor and belonging in the profession. Most drivers in the survey think that their social status is low, their occupation is "just a means of livelihood", their sense of honor is poor, their recognition is low, their satisfaction is low, and they are unwilling to let their families re-enter the industry. More than 50% of the freight transport enterprises respond to the problems of "Difficult Recruitment" and "Unable to Retain". The weak position of individual drivers also determines their psychological fragility. In case of trouble, they will inevitably take the opportunity to vent their dissatisfaction and bring some hidden dangers to the comprehensive management of society.

3. Policy recommendations

- **Strengthen industry operation monitoring and guidance, and rationally guide and regulate market supply and demand**

Guide industry associations and scientific research institutions to strengthen the monitoring of road freight market operation by means of information technology such as big data, regularly announce the supply and demand information of road freight market to the public, timely guide and rationally regulate the market capacity, and achieve a basic balance between supply and demand. Regularly publish the road freight price index, actively guide the market freight

rate expectations, and promote the formation of a reasonable interest chain among cargo owners, logistics enterprises, platform enterprises and truck drivers.

- **Standardize market order and create a fair and orderly business environment**

Focus on illegal modification of trucks, "large tons and small standards", reselling certificates, overloading, etc., improve the supervision and reporting mechanism, encourage provinces and cities to open complaint hotlines and complaint mailboxes, improve law enforcement complaint channels, and handle complaints, further standardize the order of road transport market, and create a fair and orderly business environment.

- **Standardize the operation of new forms of freight transport and improve the efficiency of transport organization**

Actively promote the development of new forms of road freight transport, urge freight platform companies to reasonably determine service fees, membership fees and other standards, and strictly prohibit inducing truck drivers to compete at low prices. Carry out special inspections on market monopoly, unreasonable pricing and unreasonable charges of platform-based enterprises, and investigate and deal with monopolistic behaviors that damage the legitimate rights and interests of truck drivers according to law. Strengthen the supervision of network freight enterprises, establish a scientific and reasonable assessment system, and guide the standardized development of platform enterprises; strengthen the responsibility of network freight enterprises for cargo transportation, fully tap data resources, innovate service modes, improve the efficiency of transportation organization, and create new business profit points.

- **Promote the intensive development of the industry and improve the level of organization**

Accelerate the cultivation of leading backbone demonstration enterprises of road freight transportation, guide small and micro freight transportation enterprises to carry out alliance cooperation, and encourage the innovative development of large fleet mode providing high-quality trunk transportation capacity services. Further implement the establishment of branches for freight enterprises that have obtained road transport business licenses, add business outlets which do not need to apply for filing procedures.

- **Continue to deepen the reform of "streamline**

administration and delegate power, improve regulation, and upgrade services" and reduce the operating costs of enterprises

Cancel the road cargo transport driver qualification examination except road dangerous goods transport, and the driver shall apply for the road cargo transport driver qualification certificate with the training certificate and motor vehicle driver's license, so as to effectively reduce the burden on truck drivers. Continue to promote the policy of different place inspection and online annual inspection of ordinary freight vehicles, and reduce the time and economic cost for trucks to return to their places of registration for inspection.

● **Improve the working environment of truck drivers and reduce the operating burden of drivers**

Do a good job in the layout planning of "driver's home", continue to promote the construction of "driver's home" with practical, economical, convenient and fast functions, and effectively provide convenient services for truck drivers and improve rest conditions. Promote the construction of online and offline "driver's home", form a driver service system with online and offline linkage and covering the whole chain of freight logistics, and further reduce the operating costs and burdens of truck drivers through centralized procurement of vehicles, fuel, insurance and maintenance.