

Research on the competition and cooperation mode of expressway and railway transportation in riverside channel

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Abstract

The channel along the Yangtze River is one of the important traffic arteries in China, and the economic development of the areas along the channel is of great significance. The development of the economy has made transportation one of the important drivers of social progress. As representatives of modern transportation modes, highways and railways play a very important role in logistics transportation and enterprise development. However, with the continuous growth of traffic demand, there is a competition and cooperation relationship between highway and railway transportation. How to rationally allocate the resources of these two modes of transportation has become a hot topic in current research. Taking the Yangtze River channel between Shanghai and Chengdu as an example, through the comparative analysis of expressway and railway transportation, this paper discusses how to further optimize their coexistence and achieve mutual benefit and win-win situation under the competition and cooperation mode.

Keywords

River channel ; expressway ; railway transport ; co-opetition mode ; optimization strategy.

1. Introduction

The ' 14th Five-Year Plan ' period is the key five years to accelerate the construction of a strong transportation country and build a modern comprehensive transportation system. In order to improve the comprehensive transportation corridor, in the ' 14th Five-Year Plan for the Development of Modern Comprehensive Transportation System ', the state proposed to build six strategic backbone channels, such as coastal, riverside, border, Xinjiang, Tibet and new land and sea channels in the west, and to build a multi-level integrated comprehensive transportation hub. It is also proposed to unblock the channel along the river, speed up the construction of high-speed railway along the river, and optimize the function of the comprehensive transportation channel along the river with high-grade waterways, trunk railways and expressways as the backbone. In order to scientifically lay out the Yangtze River trunk river-crossing channel and improve the comprehensive transportation network, after approval by the State Council, in March 2020, the National Development and Reform Commission issued the " Yangtze River trunk river-crossing channel layout plan (2020-2035). "[1]

As one of the main external logistics channels in China, the riverside channel runs through the eastern, central and western regions, and connects the inland and ocean. It is an important commodity distribution center and logistics hub in China. On this channel, both highway and railway transportation modes have certain advantages and uniqueness, but there are also some defects and deficiencies.[2]

Through the specific research on the competition and cooperation mode of expressway and railway transportation in the channel along the Yangtze River between Shanghai and Chengdu, it is of great significance to further optimize the logistics efficiency, promote the coordinated utilization of resources, promote the coordinated development of regional economy, improve the sustainability of transportation and guide policy decision-making. This will help to achieve efficient, sustainable and coordinated development of logistics and transportation systems, and promote the healthy development of the regional economy.

2. The basic situation and planning of river channel

2.1. Distribution of channels along the river

The corridor along the Yangtze River is mainly composed of expressways and railways. The existing passenger corridor along the Yangtze River is the Shanghai-Hancheng-Chengdu Railway. Due to the early construction time, different technical standards, passenger transport quality is not high. The design standard of Shanghai to Nanjing and Chongqing to Chengdu is 350 km / h. The design standard of Nanjing-Hefei-Wuhan-Yichang section and Lichuan-Chongqing section is 200 ~ 250 km / h, and that of Yichang-Lichuan is only 160 km / h. The whole process from Shanghai to Chengdu takes up to 12 ~ 14 h. According to the implementation plan of promoting the construction of high-speed railway channels along the Yangtze River Economic Belt, combined with the actual progress of each project, the construction of high-speed railway along the Yangtze River will be divided into three stages.

The first stage : in 2022, with the opening of the whole line of Zhengzhou-Wanzhou high-speed railway, Wuhan to Chengdu-Chongqing area can pass through the Hanshi high-speed railway, Zhengzhou-Wanzhou high-speed railway, Chongqing-Wanzhou intercity high-speed railway, Chengdu-Chongqing high-speed railway to Chongqing and Chengdu.

The second stage : in 2025, the Wuyi section of the high-speed railway along the river and the Yixing connecting line will be built. From Wuhan to Chengdu-Chongqing area, Zhengzhou-Wanzhou high-speed railway can be connected through Wuyi section and Yixing connecting line, and reach Chengdu-Chongqing area through Chongqing-Wanzhou intercity and Chengdu-Chongqing high-speed railway multi-path.

The third stage : it is expected that by 2030, all the high-speed rail corridors along the river will be completed and put into use.

The total length of more than 6000 kilometers, covering the Yangtze River Basin and its surrounding areas, covering a number of provinces and cities, is one of the important traffic arteries.^[3]

2.2. Traffic demand along the river channel

In recent years, with the rapid development of China 's economy, the traffic demand along the river channel is also growing. According to statistics, in 2019, the total traffic volume along the river channel exceeded 120 million people, and the freight volume reached 280 million tons. Among them, the highway traffic volume is about 80 million people, the railway traffic volume is about 40 million people. With the development of economy in the future, the traffic demand along the river channel will continue to grow.^[4]

In addition, China 's traffic demand along the river channel mainly comes from several aspects :

1) Demand for cargo transportation : The river channel is an inland waterway network connecting the main stream and tributaries of the Yangtze River. The surrounding areas are economically developed and the industrial structure is complex. Therefore, a large amount of cargo transportation is needed in logistics and distribution. In addition, many ports in Jiangsu, Zhejiang and other provinces also need to use the channel along the river for sea-rail intermodal transport and land-sea intermodal transport to meet the needs of land-sea trade.

2) Passenger transport demand : The Yangtze River Channel covers many cities and provinces in the Yangtze River Basin and its surrounding areas. It is rich in tourism resources. Therefore, the Yangtze River Channel also undertakes a considerable number of passenger transport tasks, which has certain tourism economic benefits.

3) Transportation demand of agricultural products : The areas along the river channel are mainly rural production. For example, military and civilian agricultural products in Jiangsu, Anhui and other provinces need to be transported to the market through inland rivers. Therefore, the river channel has also become one of the important agricultural transportation channels.

4) Fuel dispatching demand : With the rapid growth of the national economy, the demand for oil and gas, coal and other energy is also increasing, and the channel along the river connects many large oil and gas and coal production bases, becoming an important fuel dispatching channel.^[5]

3. The competition and cooperation mode along the river

The co-opetition mode refers to the mode of both competition and cooperation in the market competition. In the competition and cooperation of highway and railway transportation, the main forms are as follows :

1) Competition mode : In some cases, there may be a direct competitive relationship between highway and railway transportation. Both provide cargo transportation services and compete for market share. In this competitive mode, the two sides compete for customers by reducing transportation costs, increasing transportation speed, and improving service quality.

2) Complementary mode : Highway and railway transportation are complementary in some aspects, each playing a different advantage. For example, highways are suitable for short-distance, small-batch, high-urgent cargo transportation, while rail transport is suitable for long-distance, high-volume cargo transportation. In the complementary mode, the two sides meet the transportation needs of different types of goods through cooperation and coordination, achieve complementary advantages, and improve the overall logistics and transportation efficiency.

3) Collaborative mode : highway and railway transportation can achieve complementary advantages and improve transportation efficiency through collaborative cooperation. For example, the combination of highways and rail transport to achieve multimodal transport, the use of railways for long-distance transport, and then through the highway for terminal distribution. This can make full use of their respective advantages to improve the rapid and efficient transportation of goods.

4) Transfer mode : in some cases, the highway and rail transport may occur the transfer of mode of transport. For example, due to the limitation or shortage of railway transportation, some goods may be transferred to highways for transportation. In this transfer mode, both parties need to recognize their respective transport capacity and limitations, and find the optimal solution to meet the needs of cargo transportation.

4. Comparative analysis of highway and railway transportation in riverside channel

Expressway and railway transportation are the two main modes of transportation in the area along the river channel. They have their own advantages and disadvantages, can complement each other, cooperation and competition.^[6]

First of all, the advantages of highway transportation are fast speed, perfect supporting facilities, flexible and convenient, especially for short-distance and small-batch transportation. At the

same time, due to the low transportation cost and low logistics threshold, the competitive advantage of highway transportation in the freight transportation market is more prominent. However, its shortcomings can not be ignored. For example, it is susceptible to severe weather, vehicle congestion and other factors, and the transportation efficiency is easy to decline. At the same time, vehicle accidents will also have a certain impact on traffic safety.

At the same time, the advantage of railway transportation is that it has obvious advantages in transporting large quantities and long-distance goods. Although the railway transportation speed is relatively slow, the transportation capacity is large, the stability is good, and the use cost is relatively low, which ensures the long-term stable logistics demand. The railway also has the advantage of sustainability, because the railway transportation has less environmental pollution and lower noise, so it has more advantages than the highway in protecting the ecological environment.

In terms of competition, it can be seen that railway transportation has a comparative advantage in long-distance bulk goods, while expressways have a certain competitive advantage in short-distance and small-batch goods. The form of competition and cooperation between the two means of transportation is more complicated. In some cases, it is necessary to give full play to each other 's advantages and adopt a common multimodal transport mode to improve the efficiency of logistics operation along the river.^[7]

Therefore, the advantages and disadvantages of expressway and railway transportation in the channel along the river and their competition and cooperation and competition modes should be comprehensively considered according to the actual situation, and promote each other through multimodal transport and other ways to achieve the goal of coordinated development.

5. Analysis of the complementary relationship between expressway and railway transportation in the channel along the river

Expressway and railway transportation are highly complementary in the river channel. The coordinated development between the two can effectively improve logistics efficiency and reduce transportation costs. The complementary relationship between highway and railway transportation in the channel along the river is mainly reflected in two aspects : one is the complementary relationship between highway and railway transportation, and the other is the complementary relationship between highway and railway transportation and other modes of transportation.^[8]

5.1. Strategy of Coordinated Transportation between Expressway and Railway Transportation

5.1.1. Multimodal transportation

Multimodal transportation is the most commonly used collaborative transportation mode between highway and railway transportation. It is the use of different modes of transport their respective advantages, the container in a variety of modes of transport in the free conversion, complete the rapid and efficient transport of goods. In the area along the river channel, multimodal transport can be realized by road-railway, water-railway and so on. This can not only improve transportation efficiency, shorten transportation time and reduce transportation costs, but also effectively solve the problem of door-to-door transportation in medium and long distance transportation.

5.1.2. Refined transportation

Refined transportation refers to the selection of suitable means of transportation according to the characteristics of different goods, and the realization of optimal scheduling management in the process of transportation. For example, for the transportation of bulk goods, long-distance transportation can be carried out by railway first, and then the last kilometer of goods can be

quickly delivered by cooperating with highway or inland waterway transportation. In addition, through data management platforms and other means, we can carefully design transportation routes, arrange transportation time, and optimize stowage to achieve the purpose of improving logistics efficiency and reducing transportation costs.

5.2. Complementarity between expressway and rail transport and other modes of transport

The complementary relationship between expressway and railway transportation and other modes of transportation is mainly reflected in urban distribution and logistics.[9] Due to the high speed of highway transportation, it is suitable for freight and passenger transportation with high timeliness requirements, while railway transportation is suitable for freight and passenger transportation with large volume. Therefore, highway and railway transportation can form collaborative transportation with other modes of transportation to improve transportation efficiency.[10]

6. Case analysis of highway and railway transportation in river channel

6.1. There are different modes of logistics competition and cooperation in different levels of cities along the river channel.

6.1.1. Competitive mode

In this mode, there is a fierce competition between cities in the same region. For example, Suzhou, Wuxi, Changzhou and other cities along the Shanghai-Hangzhou-Ningbo Expressway are very competitive because of their close geographical location and strong economic strength.

6.1.2. Modality for cooperation

In this mode, cities cooperate with each other to form a relationship of benefit sharing and resource sharing. For example, Nanjing and Shanghai on the Shanghai-Nanjing Expressway are both core cities in the Yangtze River Delta region. Through cooperation, they can form regional logistics centers, optimize logistics resource allocation, and improve logistics efficiency.

6.1.3. Complementary model

In this mode, the functions and industries between cities complement each other, forming a mutually beneficial and win-win situation. For example, Shanghai is the center of international trade, financial services and cultural exchanges, and Kunshan is the manufacturing and production base, forming a close industrial chain between them.

6.1.4. Location mode

In this mode, cities bear different logistics service functions according to different location characteristics. For example, Haining, located in Jiading City, is one of the most dynamic economic development areas in the Yangtze River Delta region. It is famous for light industries such as wool and knitwear, and is the center of the home textile industry.

In general, there are different modes of logistics competition and cooperation in different levels of cities along the river channel. The change of this competition and cooperation mode will also be affected by factors such as policy, market demand and technology.[11]

6.2. Analysis of competition and cooperation between expressway and railway transportation in Shanghai riverside passageway

6.2.1. Shanghai-Nanjing Expressway in Shanghai Riverside Passageway

Shanghai-Nanjing Expressway is one of the important traffic arteries along the Yangtze River in Shanghai, which connects Shanghai and Nanjing. The expressway is about 300 kilometers long and has a large transportation capacity, which greatly reduces the logistics time and cost between Shanghai and Nanjing, and promotes trade and logistics activities between Shanghai

and Nanjing. Goods can be transported quickly and efficiently through the highway, which improves the efficiency and reliability of logistics transportation.[12] In addition, cities and economic regions along the route have also been better connected and developed, attracting more investment and industrial agglomeration. The Shanghai-Nanjing Expressway also provides a convenient way for the flow of people, further promoting economic and cultural exchanges.

6.2.2. The Shanghai-Nanjing Railway in the Yangtze River Channel of Shanghai

The Shanghai-Nanjing Railway is a key railway channel connecting Shanghai and Nanjing, with a total length of about 300 km. It is an important part of China's railway network and an important logistics hub along the Yangtze River in Shanghai. The construction and operation of the Shanghai-Nanjing Railway has brought efficient railway logistics services to the Shanghai Yangtze River channel. The goods can be transported quickly and safely through the Shanghai-Nanjing Railway, connecting the two cities of Shanghai and Nanjing, and further extending to inland areas of China. This has promoted trade between regions and created opportunities for the economic development of cities along the route.[13] In addition, the Shanghai-Nanjing Railway also provides sustainable transportation options, reducing dependence on road traffic and alleviating traffic pressure and environmental burden.

6.3. Analysis of competition and cooperation between expressway and railway transportation in Chengdu riverside channel

6.3.1. Chengdu-Chongqing Expressway in Chengdu Riverside Corridor

The Chengdu-Chongqing Expressway connects two important cities, Chengdu and Chongqing, and is one of the important traffic arteries along the Yangtze River in Chengdu. The expressway is about 310 kilometers long and has strong transportation capacity, which greatly shortens the logistics time and cost between Chengdu and Chongqing, and promotes the trade and logistics activities between Chengdu and Chongqing.[14] Through this highway, goods can be transported quickly and efficiently, which improves the efficiency and reliability of logistics transportation.

6.3.2. Chengdu-Kunming Railway in the channel along the Yangtze River in Chengdu

The Chengdu-Kunming Railway is an important railway line connecting Chengdu and Kunming, with a total length of about 891 kilometers. It passes through mountainous and plateau areas and is one of the key railway corridors along the Yangtze River in Chengdu.[15] The construction and operation of the Chengdu-Kunming Railway has brought efficient railway logistics services to the Chengdu Riverside Corridor. Through the Chengdu-Kunming Railway, a large number of goods can be transported quickly and safely, connecting Chengdu and Kunming, and further extending to Southwest China and Southeast Asia. This not only promotes trade between regions, but also creates opportunities for the economic development of cities along the route.[16]

6.4. Analysis of different modes of expressway and railway transportation in Shanghai and Chengdu along the Yangtze River channel

In the channel along the Yangtze River in Shanghai and Chengdu, there are some differences between highway and railway transportation in terms of competition and cooperation.

6.4.1. Geographical location and regional development

The Shanghai Yangtze River Corridor is an economic area connecting Shanghai and the Yangtze River Basin, while the Chengdu Yangtze River Corridor connects cities such as Chengdu and Chongqing. Due to the differences in geographical location and regional development, there may be some differences in logistics demand and transportation characteristics between the two channels. For example, the Shanghai Yangtze River Corridor focuses more on international

trade and export-oriented logistics, while the Chengdu Yangtze River Corridor focuses more on logistics connectivity and inland economic development in the western region.

6.4.2. Choice of mode of transport

Although highway and railway transportation play an important role in the field of logistics, their choices of transportation modes may be different in Shanghai and Chengdu along the Yangtze River. The expressway network along the Yangtze River in Shanghai is relatively developed and the economic activities are concentrated. Therefore, the freight demand of the expressway in this area is large. Due to geographical conditions and mountain traffic restrictions, railway transportation has more advantages in crossing long distances and transporting large quantities of goods.

6.4.3. Regional economic development pattern

The economic development of Shanghai along the Yangtze River channel is earlier, and has formed a relatively perfect industrial chain and supply chain system. In the region, highways and rail transport tend to be competitive because they both compete for market share in freight transport. The Chengdu Riverside Passage pays more attention to the economic development and resource integration within the region, and the highway and railway transportation are often more cooperative to jointly promote the coordinated development of the regional economy. [17]

In general, the co-competition relationship between highway and railway transportation in Shanghai and Chengdu along the Yangtze River is affected by factors such as geography, regional economic development model and transportation demand.[18]Understanding these differences can provide reference for the planning and management of logistics and transportation, so as to maximize the advantages of the two modes of transportation and achieve sustainable economic development.

7. Conclusion

Based on the competition and cooperation relationship between expressway and railway transportation in the channel along the river, aiming at the innovation of resource allocation and transportation organization mode, the following are some optimization strategies :

7.1. Strengthen information construction

The information platform of expressway and railway transportation is established to realize the whole process data management and rapid transmission of transportation demand information, cargo information, vehicle information and route information. This can improve the overall coordination ability, monitor the transportation process in time, and achieve efficient and accurate scheduling.

7.2. Promoting multimodal transport

We will continue to promote the transportation system of railways, highways and waterways, strengthen the connection and transshipment capabilities between the two modes of transportation, and carry out multimodal transport business. By opening up the transportation link, reducing the collection and transportation costs of containers, bulk cargo and other items, improving transportation efficiency, and achieving the effect of optimizing resource allocation.

7.3. Guide green traffic

Give full play to the advantages of low-carbon green transportation such as railways and waterways, encourage enterprises to choose green transportation, and gradually achieve sustainable development. Government departments can issue relevant tax and financial

support policies according to the actual situation, and guide enterprises to implement green handling, reasonable vehicle stowage, air transportation and other measures.

7.4. Promote fine management

Strengthen the management of transportation organization and stowage, through advanced logistics information technology, optimize the stowage plan and other measures to achieve the maximum utilization of transportation capacity, reduce logistics costs, and improve logistics service efficiency.

7.5. Developing a Shared Economy

Promote the sharing economy model, build railway and highway logistics distribution bases, encourage diversified cooperation among logistics distribution enterprises, expand business scope, and increase revenue. In this way, in addition to improving the efficiency of resource utilization, it can also drive employment and economic development in the areas along the route.

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