

Analysis on Optimization Model of Hongshuihe Longtan Coal Dump Transportation System

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Abstract. The Hongshui River is an important part of the southwest waterway to the mid-sea channel. It is the hinterland of the “two rivers and one river” in Guizhou, which is rich in resources. The downstream is a new industrial city such as guests and rivers in Guangxi. It has a prominent position in the inland waterway transportation of the Pearl River system and is one of the inland waterway channels that are under construction in China during the 12th Five-Year Plan period. During the “Eleventh Five-Year Plan” period, the shipbuilding facilities of Yantan, Dahua, Bailongtan, Letan and Qiaogong have been completed and put into use. There is already a level of navigation for the four-level channel from Longtan to Datengxia. However, the construction of the Longtan Hub navigation facilities is lagging behind, and the entire line of Hongshui River is seriously affected. The results of the “Study on the Strategy of the Red River River Longtan dam Transportation System” of the Pearl River Shipping Administration's work project of the Ministry of Transport are the basis of this paper. The development status of Hongshuihe Longtan waterway transportation system was analyzed. The principle of cost minimization is based. The economics of different dam transport schemes were studied. Demand analysis and related planning are combined. The layout plan of the Hongshuihe Longtan dam transport system was proposed. The entire Hongshui River is provided as a policy reference.

Keywords: Transportation system; mode; optimization; demand analysis.

1. Introduction

The dam transportation is a unique transportation mode in China. It was originally designed to overcome the influence of factors such as the closure of the Yangtze River flood season on the navigation of a certain section, so that passengers on board can be transported by car. With the normalization, standardization and organization of the transportation mode, the dam transportation also develops from the original public water transportation to the intermodal mode of multiple transportation modes, and the transportation object is also extended from a single passenger to cargo and ro-ro [1][2]. Relevant elements of dam transportation system optimization, including channel mileage and channel scale, road standards and traffic capacity, vehicle and ship standards, vehicle and ship operating organization, storage yard storage capacity, port location and layout, support the composition of the system, etc.

The research on the organization mode of dam transportation is mainly carried out from the route selection of dam transportation and the transportation organization of dam transportation. Route selection Based on the principle of minimizing costs, cost accounting comparisons are made for different routes between two points [2][3].

At the same time, combined with regional transportation development planning, the dam transportation route comparison and selection "Longtan Reservoir Area Development Ro-Ro Ship Transportation Engineering Feasibility Study Report", Guangxi Transportation Department. This method is simple, practical, and operability. Therefore, the domestic dam transportation route is more widely used than the selected one [3][4].

Beginning in 2010, the Hongshuihe Longtan dam transport system was partially launched, and the coal waterway transportation from the 100th floor to the Tianzhu was started. Through the existing docks, roads and bridges, waterway facilities, ship equipment, support and other basic conditions, the dam transportation will realize the partial transportation from the coal mine through the 100-story port to the temporary dock on the Longtan Dam [5][6]. The transportation route is: the coal mine production area (road transportation to) the Baiping Port (water transportation to the temporary pier on the Tianlong Longtan Dam) [7][8].

From the perspective of transportation effects, the basic transportation distance from the coal mine production area to the Baibai Port is within 50 kilometers of the port. Due to the low road grade and poor road conditions, coal has not yet formed a scale through road consolidation [9] [10]. The transportation time is also difficult to guarantee; the waterway transportation from Baibai Port to Tianzhu Port is limited by the low level of infrastructure conditions such as ports and waterways. The fleet capacity is not large, mostly ships of less than 500 tons; Long 3 to 5 hours higher than the normal navigation level; the current navigation channel does not have the night navigation conditions; in the dock cargo loading and unloading, the coal is mainly unloaded by the floating crane and belt conveyor at the temporary dock upstream of the Longtan Dam [11] [12]. The ship is loaded by car and then transported by short-distance transportation to the surrounding areas. However, due to the current small scale of coal transportation, all the coal transported to the Tianzhu Dam is consumed by the local enterprises. The docking of the Longtan Dam has not yet been achieved [13].

2. Analysis on Optimization Scheme of Hongshuihe Longtan Coal dam Transportation System

According to the distance of transportation, the dam transportation route is divided into route A (Southwest to Hechi), Route B (Southwest to Laibin) and Route C (Southwest to Pearl River Delta). In the following, the three routes will be separately demonstrated to study the economics and competitiveness of dam transportation on each route.

2.1 Route A (Southwest to Hechi)tion

After preliminary comparison, coal transportation from southwestern Guizhou to Hechi can be completed by the following three modes of transportation:

- (1) Road transport: Freight vehicles travel directly from the southwest of Fujian to the Hechi route.
- (2) Railway transportation: route through Baise, Nanning to Hechi.
- (3) Transportation of dams: The Baishui Port will be transported through the Longtan dam to the Hechi route.

Route A is "the coal mine production area (road transportation), the 100-storey port (waterway transportation to), Linyou (transported to the dam), eight dozen (waterway transportation to) Donglan Port Area (road transportation to Hechi and beyond). The specific transportation routes, mileage and time of each section are shown in Table 1.

After comparison, it can be found that Route A has reduced the mileage of 440 kilometers compared with the existing road transportation mode, increased the mileage of 340 kilometers of water, and reduced the transportation cost per ton of coal by about 150 yuan; compared with the existing railway transportation mode, The road transportation distance was reduced by nearly 50%, and the total transportation cost per ton of coal was saved by 146 yuan.

2.2 Line B (Southwest to the Guest)

After preliminary comparison, the coal transportation from the southwest of Fujian to Binbin can be completed by the following three modes of transportation: (1) Road transportation: through the road from southwestern Guizhou through Baise and Nanning, direct access to the guests; (2) Railway transportation: passing the Nanning-Yangbin via the Nankun Railway; (3) Transportation of dams: After the dam is turned from the 100-story port through Longtan and Yantan, the water is transported to the guests.

Route B is "Core production area (road transportation to) 100-storey port (waterway transportation to) Linyou (transport to dam transport) eight dozen (waterway transportation to) erect (transfer to dam transport) Dongpu (waterway transportation to) Guest and far away areas."

After comparison, it can be found. Route B is reduced by more than 600 kilometers of road mileage than the existing road transportation scheme, and the mileage of water is increased by 679 kilometers, but the transportation cost per ton of coal is reduced by about 200 yuan; In the existing railway

transportation scheme, the mileage and cost of transportation are not much different, but the transportation time is greatly increased.

Table 1. Transportation mileage and time of each section of Route A

Transport section	Transportation mileage (km)	Mode of transport	Transportation time (hours)
Hundreds of layers - Lin You	218	Waterway transportation	13~15
Lin You-eight dozen	23	Road transport	0.5~1
Eight dozen – Donglan	120	Waterway transportation	7~8
Donglan-Hechi	126	Road transport	2~3

2.3 Line C (Southwest to Pearl River Delta)

After preliminary comparison, coal transportation from southwest Yunnan to the Pearl River Delta can be completed in the following three ways. (1) Railway transportation: via Xingyi, Baise, Nanning, Litang, Maoming Station to Guangzhou; (2) Iron-water combined transport: through the railway to Guigang, the water is transported to the Pearl River Delta region; (3) Transportation of dams: After passing through the dams of Longtan and Yantan, the 100-storey port will be transported to the Pearl River Delta region.

Route C is “the coal mine production area (road transport to) the hundred-story port (water transport to) Lin You (transfer to the dam to transport) eight dozen (water transport to) guests (replace the large ship waterway transport to the Pearl River Delta region)”.

After comparison, it can be found. Among the three transportation schemes, the cost of combined iron and steel transportation is the lowest, and the cost of dam transportation is the highest; the transportation time of railway is the least, and the transportation time of dam transportation is basically the same as that of hot metal combined transportation. Although the shipping cost is much lower than the first three modes of transportation in terms of transportation costs, the price of coal in Qinhuangdao and other ports is much higher than that in Guizhou. Therefore, Guizhou coal has a price advantage.

3. The Strategic Layout of the Dam Transportation of Hongshuihe Longtan

The three phases of highway and waterway transportation infrastructure development of the Ministry of Transport are clearly defined. The descriptions of the first two phases are: the first phase, the road and waterway traffic tensions and constraints must be fully improved; the second phase, road and waterway traffic Achieve basic adaptation.

According to the deployment of the Ministry of Transport, combined with the actual economic and transportation development of the “Two Rivers and One River” basin, this report divides the Hongshui River dam transportation into two development stages. Guizhou coal will be established through the waterway to establish a dam transportation channel from the Baidu Port through the Longtan Hub to the downstream Laibin Port. The goal of two rivers and one river is comprehensive navigation.

This stage is the exploration and implementation stage of the Red River dam transportation. According to the existing conditions for the development of Hongshui River transportation, with the

background advantage of the construction of the southwestern central passage of the country, it is appropriate to adapt to local conditions and do what it can. Promote development by construction, promote development by development. Improve the utilization efficiency of completed infrastructure by carrying out short-distance dam transportation in the early stage, and then drive the construction of related infrastructure to promote the dam transportation to a higher level and further distance. By point connection, line-to-face--through the construction of transportation nodes, the conversion efficiency between different modes of transportation is improved; through the optimization of transportation routes and transportation channels, the comprehensive development of the economy of the "two rivers and one river" basin is promoted.

The relationship between Guizhou-Guangxi waterway transportation and social and economic development has leapfrogged from "not adaptable" to "basic mitigation". The southwestern Tongchi and Laibin areas have taken the lead in achieving coal-water combined transport. Ports, highways and bridges can basically meet the needs of local coal handling and transportation. The Longtan hub has the capacity to store and transport coal. Basically, the dam transportation system with complete facilities, complete transportation means and organization and coordination will be formed. The parts of the vehicles, ships and other vehicles will be standardized, the transportation capacity structure will be improved, and the transportation efficiency will be significantly improved. The navigation channel is basically unblocked, and the hubs are scientifically dispatched and managed in a unified manner to maintain the normal navigation level of the navigation channel. The transportation market is basically established, and the transportation supply can basically meet the coal transportation needs of Hechi, the guests and surrounding areas.

Focus on promoting the construction of port collection and distribution channels, continue to promote the construction of coal-specific roads in mining areas, and accelerate the planning and construction of port land transportation channels such as Linyou to achieve rapid concentration and distribution of coal in ports; focus on the design and construction of dam roads. While using the existing dam to transport roads, it is planned to bypass the new dam transport road in Tianzhu District.

Priority will be given to the design and construction of major dam transport ports such as Fufeng, Linyou and Bazaar; accelerate the construction of relevant supporting ports such as slabs and rock slabs, and strive to complete the above ports during the "Twelfth Five-Year Plan" period. The transformation of Donglan, Dahua and the various port areas of Laibin speed up the upgrading and construction of new operation areas, and realize the undertaking of downstream ports after the substantial increase in water transportation volume.

Accelerate the construction of the Tianzhu Coal Distribution Center, first meet the 1 million tons of coal storage capacity; conduct demonstration research on the market function and logistics function expansion of Tianzhu Coal Distribution Center; strive to complete the Southwestern Coal Distribution Center in the early stage of the "Twelfth Five-Year Plan" site selection and planning work, and a cooperation mechanism with coal supply enterprises in the province.

Invest in the maritime department of the Hongshui River Basin, expand the existing law enforcement team, upgrade the level of software and hardware facilities. Build the training center for Hongshui River water transport practitioners, upgrade the level of hardware facilities and teachers of the training center, and promote mutual training between Guizhou and Guangxi. Certification.

Based on the existing resumption of navigation coordination mechanism, the Yangtze River dam dam organization model will be formed to form the Red River Rehabilitation Coordination Leading Group; the interaction mechanism between the southwestern Guizhou, Hechi and Laibin will be realized, and the next three strategic cooperation will be achieved. Preparation in advance.

First, the governments of the three places should introduce preferential policies on loans and taxes as soon as possible to attract enterprises to enter the construction of the dam transportation market. Secondly, accelerate the standardization of ship types in the reservoir area. Third, establish shipbuilding funds and ship standardization compensation. The fund will improve the transportation capacity and transportation efficiency of ships in the region and enhance the competitiveness of water transportation.

By 2020, based on the previous dam transportation, the radiation range of dam transportation will be extended to most parts of Guangxi and a convenient water and land transportation system will be established in the Longtan reservoir area to establish the transportation of Hongshui River in Guizhou and Guangxi provinces. An important position in the system.

With the gradual improvement of the navigation capacity of the Hongshui River and the Xijiang trunk line, the transportation cost of the waterway is gradually reduced. The transportation route is extended to the lower reaches of the Pearl River in a timely manner, and the radiation range of the dam transportation is extended from Guangxi to the Pearl River Delta region of Guangdong, establishing a branch from Guizhou to Guangdong. Turn over the dam transportation channel.

This stage is the overall development stage of the Red River dam transportation. Through the key developments in the previous five years, the internal and external development environment of the Hongshui River dam transportation has been further improved. Governments and enterprises at all levels have paid more attention to waterway transportation. Water transportation has formed a three-pronged trend with roads and railways to jointly support regional transportation. system. At this stage, the infrastructure needs to be basically improved, and the links between shipping, port, freight yard and land transportation will be effectively connected and unified management, so that Longtan dam transportation will become an organized and standardized water-land transportation mode. In the end, coal transportation in southwestern Guizhou can meet the energy needs of most of Guangxi, such as Hechi, Laibin, Nanning and Liuzhou. At the same time, according to the actual situation, timely advance the construction of shipping corridors from Guizhou to Guangdong.

The relationship between coal waterway transportation and social economic development has leaped from “basic mitigation “to” overall adaptation”, and the Hongshui River has realized the coal-water combined transportation pattern across the board. The roads are networked and can fully meet the local coal handling and transportation needs, and can be moderately advanced. Southwest Guizhou has become an important export channel for Guizhou's coal transportation. The Tianzhu Dam and the guests form two regional coal logistics distribution centers. The port has achieved mechanization and modernization, and has basically reached the development level of the second-generation port. Some important ports have gradually developed into regional logistics centers integrating loading, unloading, warehousing and distribution. All the vehicles are standardized, large-scale and specialized. The transportation market is developed, and the transportation supply can meet the coal needs of Hechi, Laibin, Liuzhou and surrounding areas. At the same time, the radiation range of dam transportation will further expand to Guangdong.

Based on the previous development, we will further broaden the development ideas of the Red River River dam transport. Improve the construction level of dam transportation infrastructure in the region, meet the requirements of 8 million tons of dam transport capacity; establish strategic cooperative relations in the upper and lower reaches of Hongshui River, consolidate the cooperation relationship between shippers, transport enterprises and consumer enterprises, and upgrade Hongshui. The radiation range and coverage level of the river dam transportation; the port as the link, the multi-level cooperation of roads and waterways is established, and the hinterland of dam transportation is extended to the deep areas of Yunnan, Guizhou and Guangxi provinces to construct a convenient water-land transportation system.

4. Optimization Conclusion of Hongshuihe Longtan Coal Dam Transportation System

When short-distance transportation is the main mode of transportation. Line A is a short-distance transportation. In this line, dam transportation has the advantages of large capacity, short time and low cost compared with other modes of transportation. It can become the main mode of transportation in the future from southwest Yunnan to Hechi.

When medium distance transportation is a supplementary mode of transportation. Line B is a medium-distance transportation. The transportation cost of dam transportation is equivalent to that of the railway, and the transportation time is slightly higher than that of the railway. It can be used as an

alternative transportation method for bulk bulk goods and as the main mode of transportation for groceries and small bulk goods.

The current conditions are not suitable for long distance transportation. Line C is a long-distance transportation. In this transportation line, the dam is transported for a long time, and the transportation cost is much higher than that of the combined transportation of iron and water and railway transportation. The development space is limited. With the upgrading of the navigation channel of the Pearl River Delta and the Xijiang shipping trunk line, the development of the industrial layout along the Yangtze River, the large-scale and standardization of transport vessels, the improvement of port loading and unloading efficiency, and the continuous upgrading and upgrading of the shipbuilding facilities. The competitiveness of dam transport will be further enhanced and the radiation range will be further expanded.

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