The Research on Evaluating of Port Collecting-distributing Transportation System of Anhui Province

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Abstract

The paper uses the expert investigation and AHP to evaluate the main port through investigating and analyzing the port status of Anhui province, the port distribution, research and analysis geographical hinterland economy, collection and distribution methods and so on, and it provides technical sup-port to major ports in Anhui province.

Keywords

Port; Collection and distribution; Analytic hierarchy process.

1. Introduction

Anhui Province is a typical inland river transportation province. The three major water systems of the Yangtze River, Huai River and Xin'an River flow through the province, and there are 16 ports in total. The total length of the south and north coasts of the Yangtze River is 755 kilometers, the Yigang coastline accounts for more than half, and the total throughput of regional ports accounts for more than 70% of the province. There are six important ports in the basin. Wuhu, Maanshan, Tongling, Chizhou, and Anqing ports are the Yangtze River trunk ports and national first-class water transport ports; Hefei Port is connected to the Yangtze River through the Heyu Channel and is an important container feeder for Anhui Province. To Hong Kong, the national second-class water transport port [1].

This article first investigates and analyzes the distribution, port nature, distribution and geographical location of the ports in Anhui Province, and then investigates the current situation of the main ports in Anhui Province-Wuhu Port and Hefei Port, and then through the expert investigation method and level the analytical method evaluates the two major ports and provides a theoretical basis for the improvement of the major ports in Anhui Province.

2. Analysis of port status in Anhui Province

Inland water transportation in Anhui Province is relatively developed. The golden waterways of the Yangtze River and the mainstream of the Huai River traverse the east and west, and the Shaying River, Heyu Line, Guohe River, Huihe River, Shuiyang River, Chuhe River, Xinanjiang River and other tributary channels are distributed within the territory. At the end of 2018, the total mileage of inland waterways in Anhui Province reached 6,612 kilometers and the navigable mileage was 5,729 kilometers, ranking seventh and eighth in the country respectively. There are 16 ports in Anhui Province. The main functions of the ports currently include bulk cargo and tourist passenger transport services, port industrial development functions and modern logistics functions. As of 2018, the status and throughput of various ports in Anhui Province are detailed in the table 1-1.

The preliminary investigation on the status quo of the ports in Anhui Province provides a basis for the overall grasp of the subsequent port collection and distribution system. At present, the major ports in Anhui Province are still dominated by Wuhu Port and supplemented by other ports. However, Wuhu Port is over-developed and other ports are unbalanced. This article mainly focuses on the study of Wuhu Port and Hefei Port, starting from the current situation of collection and distribution, influencing factors, model establishment and optimization strategies. The throughput of major ports in Anhui Province from 2017 to 2019 is shown in Table 1-2:

Table 1- 1 Status of each port in Anhui Province in 2018

Port	Number of berths (per berth)	Design throughput (10,000 tons/10,000 TEU/10,000 PEOPLE/10,000 vehicles)
Total	876	48 228.80/138.38/728/14
Hefei	123	4 558/50/0/0
Anqing	73	3 257.30/7.46/10/0
Chizhou	86	5 301.40/5/40/70
Tongling	73	7 003/5/67/0
Wuhu	124	10 614.4/22.1/250/14
Ma anshan	109	7 524/24/0/0
Xuancheng	18	492.60/0/10/0
Chuzhou	92	4 156.43/19.3/0/0
Suzhou	4	153/0/0/0
Huaibei	16	214/0/0/0
Bozhou	15	416/0/0/0
Fuyang	35	1 204.82/0/0/0
Huainan	23	993/0/0/0
Liuan	16	531.85
Huangshan	25	6/0/297/0

Table 1- 2 2017-2019 Throughput Table of Ports in Anhui Province (Unit: 10,000 tons/10,000 TEU)

Main port	2017		2018		2019	
	Cargo	Container	Cargo	Container	Cargo	Container
Anqing	2 401	8.3	2 983	12.1	2 511.16	15.04
Wuhu	12 806	70.4	12 016	80.3	12 777.86	100.63
Ma anshan	11 014	25.2	10 355	18	10 092.89	15.43
Hefei	3 545	26.4	4 787	31.7	5 292.04	38.63
Chuzhou	373	2.0	894	2.2	1 625.60	4.45
Tongling	11 095	4.4	10 008	2.7	9 620.82	3.3
Chizhou	4 783	1.5	6 723	1.7	9 750.72	1.81
Total	46 017	138.2	47 766	148.7	51 671.09	179.29

3. Analysis of the current situation of Wuhu Port

Wuhu Port is one of the main hub ports of inland rivers in China, a national first-class port, and an important water and land transportation hub in Anhui Province. It is known as the "gateway to southern Anhui and a giant port on the Yangtze River".

3.1 Basic conditions of Wuhu Port

Wuhu Port is located at the confluence of Qingyi River, Yuncao River and Yangtze River. It is located at 118°22'8" east longitude and 31°22'29" north latitude. It is 96km away from Nanjing Port along the Yangtze River and 48km from Ma'anshan Port. The port's coastline is straight and the water is deep and the current is slow, and it can berth 5000-10000-ton ships all year round.

The largest coal energy transfer port in the Yangtze River (Wuhu Port Yuxikou Coal Terminal) and the largest foreign trade and container hub port in Anhui Province (Zhujiaqiao Foreign Trade Terminal) are the two main business ports of Wuhu Port. The Yuxikou Coal Terminal of Wuhu Port has an actual annual throughput of 12.8 million tons, a maximum annual throughput of 15.8 million tons, and a coal storage yard of 600,000 tons. The Zhujiaqiao Foreign Trade Terminal is the largest foreign trade terminal in Anhui Province. The main container hub port is an important window for

foreign trade. At present, the annual throughput of the terminal is 6 million tons, the annual container throughput capacity is 100,000 TEU, and the annual car roll-on capacity is 50,000. It is an integrated logistics service for transfer transportation of bulk cargo, general cargo, containers, and automobile roll-on the comprehensive terminal. This port is in the same weight class as Magang Group, but it is dominated by containers and coal [2].

3.2 Port hinterland economy

The economic hinterland of Wuhu Port extends to the east and west abdomen of Anhui, supported by Wuwei, Hanshan, Chaohu and other areas in Jiangbei. Wuhu City, where Wuhu Port is located, has an urban population of 500,000 and an area of 203 square kilometers. Wuhu is one of the "Four Rice Markets" in the country, and grain is the earliest traditional bulk source. Coal from Huainan, Huaibei, Shanxi, Henan, and Shandong is transported by railway to Yuxikou for transit, and its throughput accounts for about 60% of the total in Hong Kong. The hinterland has ample supply of local products, agricultural products, and mineral construction materials, including tea, silk, wood, cotton, steel, sand, cement, ore, etc.

3.3 Collecting and Distributing Ways of Wuhu Port

The source and direction of Wuhu Port's goods are mainly through several channels: road, rail, and water transportation. A complete collection and distribution system helps to improve the turnover efficiency of customer goods.

Table 2- 2 Collecting and Distributing Ways of Wuhu Port

Railway	Huainan Line, Nanjing Copper Line, Wangan Line, Xuanhang Line pass.
Road	With Wuhu City as the center, there are Yuhe (Fei) Line, Ningwu Line, Wutun (xi) Line, Wunan (Ling, Jiuhua Mountain, Huangshan) Line and other highways radiating to cities, counties and neighboring provinces in the province. Wuhu Airport is about to open, and will be able to connect to Beijing, Guangzhou, Xiamen and other places.
Water	Upstream from the river to Tongling, Wuhan, Chongqing, downstream to Ma'anshan, Nanjing, Guansongkou, via Yunlou River to Chaohu, Hefei, and Qingyi River to counties in southern Anhui. At present, there are container liner routes between Wuhu and Kobe in Japan, and freight liners between Wuhu and Japan and Wuhu and Hong Kong, as well as international foreign trade freight services such as North America, Australia and New Zealand.

4. Analysis of the current situation of Hefei Port

Hefei Port is a comprehensive port with bulk cargo, containers, and general cargo transportation as well as tourist passenger transportation; it is an important support for Hefei's urban construction and industrial layout along the river, and is of great significance for undertaking industrial transfer and the development of the Yangtze River Economic Belt . Hefei Port is located between the Yangtze River and Huaihe River. The Jinjiang River embraces the lake. It consists of 8 port areas: Nanfei River, Dianbu River, Pai River, Fengle River, Linhu, Juchao, Skirmishers, and Lujiang.

4.1 Basic conditions of Hefei Port

Hefei Port is located in the upper reaches of the Heyu Line (Hefei~Yuxikou) channel. It is the main hub port in Hefei that connects north and south, east and west, and is the largest waterway freight distribution center in central Anhui. The Hechao section (Hefei-Chaohu) channel of the Quanyu Line has been established as a provincial civilized channel. Ships arrive at ports such as Wuhan, Yichang, and Chongqing, and descend to hinterland ports in provinces (cities) such as Jiangsu, Zhejiang, Anhui, Shanghai, etc., and transit through ports such as Wuhu, Nanjing, Zhangjiagang, Nantong, and Shanghai through river-sea transportation To Hefei or Ningbo, Xiamen, Guangzhou and other major ports along the southeast coast and all over the world.

4.2 Port hinterland economy

The economic hinterland of Hefei Port is mainly Hefei City and its surrounding areas. The hinterland has a developed economy, a strong industrial foundation and abundant agricultural resources. Hefei City has developed into a collection of machinery, electronics, chemicals, textiles, light industry, metallurgy, electricity, food, A new comprehensive industrial city with a complete range of building materials, etc., is one of the province's main foreign trade container production areas.

The agricultural and sideline products in the hinterland of Hefei Port sell well all over the country. Now more than 20 industries including chemicals, machinery, hardware, building materials, textiles, grains, oils and foodstuffs, and shipbuilding have been formed. At present, ocean-going container transportation in Hefei is mainly shipped by land to Wuhu and Nanjing. , Transported by water to Shanghai or directly transported to Shanghai by land for shipment, and then ocean transportation; whether it is transported to Wuhu, Nanjing or Shanghai, the comprehensive freight rate is higher than that of shipment from Hefei Port (preliminary calculations for shipment from Wuhu or Nanjing It is about 400 yuan/TEU higher than the comprehensive freight rate for shipping from Hefei, and the comprehensive freight rate for shipping directly from Shanghai is higher).

4.3 Collecting and Distributing Ways of Hefei Port

Hefei Port Railway is connected by Huainan Railway, Hejiu Railway, Ningxi Railway, and Hefu High Speed Railway, and the highway is connected by Hefei-Anqing Expressway and Hefei-Xuzhou Expressway. The port enters the Yangtze River via the Chaohu and Yuxi Rivers relying on the Hefei City Waterway.

5. Index Evaluation of Wuhu Port and Hefei Port

5.1 Selection of Influencing Factors in Port Collection and Distribution System

The port collection and distribution system is affected and restricted by many factors [3]. First of all, from the perspective of the composition of the collection and distribution system, including collection and distribution facilities, collection and distribution methods, and collection and distribution management. Secondly, from the internal analysis of the collection and distribution system, the location of the port, the construction of the collection and distribution infrastructure, the hinterland economy, and the port freight volume also greatly affect the development of the port collection and distribution.

5.2 Index level determination

According to the data survey of the two major ports in the previous period, the Delphi method was used to issue questionnaires to 20 experts and logistics-related professors based on the survey information of Wuhu Port and Hefei Port, and the opinions of experts were repeatedly consulted in an anonymous manner, and finally summarized An analysis result of a three-level indicator layer [4].

5.3 Implementation steps

The destination level in Table 4-1 is the comprehensive collection and distribution level, the first level is a comprehensive index, the second level is the criterion level, and the third level is the program level. The research adopts the following steps combined with the Delphi expert survey method. The steps are as follows:

Step1: Analyze the relationship between the basic elements in the evaluation system, and establish the hierarchical structure of the system.

Step2: Compare the importance of each element of the same level with respect to a criterion in the previous level to construct a judgment matrix.

Step3: Calculate the relative weight of the compared element to the criterion by the judgment matrix.

Step4: Calculate the composite (total) weight of the elements of each layer relative to the system purpose (total target), and sort the schemes accordingly (incidence matrix table and weighted sum method).

Table 4- 1 Analysis table of influence factors of distribution system

Primary Index Layer	Secondary index layer	Tertiary Index Layer
Port conditions for collection and distribution	Geographic location	Transport distance
		Hinterland economy
	Throughput	Cargo throughput
		Container throughput
	Governmental support	Government/system service level
		Policy support
Collection and distribution facility indicators	Highway facilities	Highway construction investment
		Total highway mileage
		Connectivity of the road network
	Railway facilities	Railway construction investment
		Total railway mileage
		Railway network connectivity
	Port facilities	Port construction investment
		Number of 10,000-ton berths in ports/ports
		Port yard area
		Port shoreline length
		Port passing capacity
Consolidation and distribution transportation mode indicators	Road transportation	Highway capacity
		Freight volume
	Railway transportation	Railway capacity
		Freight volume
	Waterway transportation	Whether there is inland water transportation
		Number of ships
		Flight density
	Air transportation	Freight volume
		Flight density

According to the judgment matrix, determine the value evaluation value k of each level index relative to the upper level index, that is, the relative importance of the i-th layer relative to the i-1th layer. Using the comprehensive expert survey method and the analytic hierarchy process, the comprehensive scores of the collection and distribution levels of the two major ports are shown in Table 4-2::

Table 4- 2 Comprehensive port evaluation score

	Collection and distribution port conditions	Collection and distribution facilities	Collection and distribution method	overall ratings
Wuhu	6.60	12.77	10.06	10.8314
Yingkou	4.99	11.19	7.22	8.9178

Therefore, comprehensively comparing the collection and distribution elements of Wuhu Port and Hefei Port, the level of collection and distribution of Wuhu Port is slightly higher than that of Hefei Port. Combining Wuhu Port as an important container trunk port, it has not given full play to its advantages. Dispersal system.

References

[1] Pei Hanjie. Analysis on the status quo of water transportation in Wanjiang city belt[J]. Traffic and Transportation, 2014(1): 29-30.

[2] Wang Weili. Analysis and evaluation of port collection and distribution system [D]. Dalian: Dalian Maritime University (Master's thesis), 2011.

[3] Wang Xiao, Li Ming, Shi Chengqiu. Analyze the main influencing factors of port collection and distribution system based on ISM model. Port Economy, 2010(8): 21-24.

[4] Song Jincheng. Research on the Adaptability Evaluation of Port Collection and Distribution System [D]. Tianjin: Hebei University of Technology (Master's Thesis), 2010.