Study on the Development and Problems of Multimodal Transport of Jiaxing

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Abstract: Along with the advancement of the integrated transportation system reform, multimodal transport ushered in the golden period of development. Jiaxing is located in the core hinterland of the Yangtze River Delta region, the structure of highway network is perfect, inland water system is developed, Shanghai-Kunming railway runs through the city. From the transportation of Jiaxing, investigate the three main modes of multimodal transport in Jiaxing, analyze status and characteristics of three models, and calculate the economic distance of “Railway, highway, waterway transportation”. Finally, get the problems of multimodal transport in Jiaxing for reference of future development.

1. Introduction
At present, it is the key period to promote the supply-side structural reform in the transportation industry and accelerate the construction of a comprehensive transportation system. With the development of comprehensive transportation system reform, multi-modal transportation ushered in the golden development period [1]. From the geographical location, Jiaxing is located in the intersection of One Belt And One Road and Yangtze river economic belt, it is one of the important fulcrum of One Belt And One Road and the Yangtze river economic belt state strategy, and it is one of the important channels linking the Yangtze river economic belt and the maritime silk road economic belt. Nowadays, many products of Jiaxing are transported inland, mainly by road vehicles, long distances and high logistics costs. Jiaxing city should take full advantage of the strategic opportunities of the multi-modal transport development, actively promote the development of multi-modal transport, and give full play to the basic and main role of transportation in the development of logistics industry, enhance the overall efficiency of the logistics development of Jiaxing city, consolidate the position in Yangtze river delta important logistics hub city.

2. Multimodal Transport Mainly Operating Mode of Jiaxing

2.1. With Jiaxing Port as the Hub for “Oceans and Rivers Combined Transport”
Oceans and rivers combined transport transport has oceans and rivers combined transport and oceans and rivers combined transport two forms.

Dushan harbor area of Jiaxing port planning the oceans and rivers combined transport direct way, The vessel directly overide into the inland river basin and the inland river ships, But because the rear inland river basin and regional waterway has not yet been built, Business has not yet been carried out. At present, Jiaxing port is given priority to with oceans and rivers combined transport transit, divided into two transfer modes: one is the amphibious water transfer, two is the water transfer [2].
In 2015, Jiaxing port of the total cargo throughput of 62.73 million tons, the container throughput of 1.23 million teus. Oceans and rivers combined transport transport 18.5136 million tons, accounting for 29.5% of the cargo throughput in Hong Kong. Among them:

Land and sea water, from the port of Jiaxing sea port (zhapu, sea salt, dushan) by 5 to 6 km car will roll into the zhapu pond, sea salt, such as after the embarcadero, repass transfer out of the ship.46.8% of the total land and sea water transfer amount of oceans and rivers combined transport transport, cargo mainly coal and its products, fujian Jiang Sha, stone powder.

Water transfer, from the port of Jiaxing sea port (zhapu, haiyan port), through 1 km or so cars short barge transportation to the inland river basin of Jiaxing port, through the inland water transport out [3].46.8% of the total land and sea water transfer amount of oceans and rivers combined transport transport, cargo for coal, liquid chemicals, chemical raw materials, steel, wood, food and building materials.

In 2015, Jiaxing port throughput of 30000 teu container port, accounting for 2.4% of the total container throughput, the proportion is small, but increased by 91.1% from 2014, 2014 - teu. Zhapu port has opened many inland container routes, and actively innovation source organization mode, vigorously promote "loose change set" business, namely the bulk commodities such as coal, copper concentrate, sandstone to container shipping, The future container will become an important source of Jiaxing port.

Oceans and rivers combined transport transport cost advantage is obvious. The coal of northern china transported to Jiaxing Xingjia aisi thermal power plant as an example, it is estimated that different mode of transportation of logistics cost is as shown in table 1.

| coal | Road transport | The entire inland water transport | The railway transport | oceans and rivers combined transport |
|------|----------------|----------------------------------|-----------------------|-------------------------------------|
| The cost per unit (yuan/ton) | 180-200 | 80 | 98 | 60 |
2.2 With Embarcadero as the Hub for “Public Water Transport”

The goods by road set card transport to the Jiaxing embarcadero, by inland waterway to each other on inland port, coastal transport or by the river to the other side the dock, then by road set card to the owner. To develop the water transport, Advocate "land change water", can give full play to the efficiency of water transportation, effectively reduce the energy consumption of highway transport and pollution to the atmospheric environment.

In zhejiang fang yuan logistics co., LTD. (hereinafter referred to as the "logistics" fang yuan) and zhejiang valka new materials co., LTD. (hereinafter referred to as the "valka company") of cooperation projects, for instance, Fang yuan logistics carrier for valka company internal PET new material transportation, basically realized the "public water transport", also reflects the greater economic benefits.

![Figure 3 Transport mode 1 of “Public Water Transport”](image1)

![Figure 4 Transport Mode 2 of “Public Water Transport”](image2)

At present, the zhejiang inland port network integration is developing rapidly, Jiaxing with Shanghai, ningbo, taicang port between inland port has opened on inland feeder, at the same time ,the north of Zhejiang province Dongzhou port、Changxing port, anji port, shaoxing, huzhou port Such as dock implement the strategy of “Container routes resource sharing in the north of Zhejiang”.For container "land change water", carrying out the public water transport provides a strong guarantee.

Domestic trade shipping: (1) The goods by road from haining valka company base roll to haining inland public dock, Using bulk carrier after inland waterway to Shanghai or taicang port inland wharf again after the Yangtze river transportation to wuhan, changsha, two places; (2) The goods by road from haining valka company base roll to haining inland public dock, using container ship by inland waterway to the zhapu port area inland river wharf; After inland regional transportation to ningbo port inland port, then ofshoring transport to tianjin, yingkou, guangzhou and other places.

Cost is as follows:

| Short-distance | Jiaxing Inland Terminal depot | Inland Water Transport | Shanghai and Taicang Inland Terminal depot |
|----------------|-------------------------------|------------------------|-------------------------------------------|
| Barge          | Cargo Owner Enterprise        | Inland Water Transport | Shanghai and Ningbo Inland Terminal depot |
| Short-distance | Jiaxing Inland Terminal depot | Inland Water Transport | Sea Transportation                       |
| Barge          | Cargo Owner Enterprise        | Short-distance Barge   | The other Terminal Depot                   |

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| Point of shipment | Destination | Road transport | Road and waterway | Combined transport |
|-------------------|-------------|----------------|-------------------|-------------------|
| Haining inland public dock (5000t bulk carrier) | Wuhan | 350 | 90 |
| | Changsha | 450 | 98 |
| | Tianjin | 350 | 63 |
| Zhapu port (container ship) | Yingkou | 400 | 63 |
| | Guangzhou | 350-400 | 103 |

Foreign trade transport, the cargo from Haining road base valka company short barge to haining inland port, inland water transport in container ship to the zhapu port area, then walk from zhapu port inland regional transportation to ningbo port. Cost is as follows:

| The starting point | Road transport | Road transport | Road and waterway | Combined transport |
|-------------------|----------------|----------------|-------------------|-------------------|
| Haining-Shanghai waigaoqiao port | Haining-yangshan port | Haining-ningbo port |  |
| The average transportation cost (RMB/small box) | 1400 | 1800 | 1200 |

From Zhapu port inland port through the Inland feeder transportation to the port of Shanghai or ningbo, inland river wharf has two advantages: (1) if the goods by road set card transport directly to the yangshan port, in yangshan port pay "container fees" and "port fees". But if you go on inland feeder, the two charges are included in the cost, reduced the cost for the customer directly; (2) exporting goods need can only be released after customs inspection in Shanghai and ningbo port. Such as the sea port of mountain also implement the "customs declaration first, last in Hong Kong" mode of customs clearance, and ports are very busy, Generally don't have any spare yard or warehouse for the owner to store goods, So the limitation on the owner of the goods into the port of shipment time is higher; And zhapu, seven stars embarcadero generally no time limit, the case of customer inventory nervous, can advance shipment, enter the port in advance, have the effect of transfer station.

2.3 *With Railway Freight Station as the Hub for “Highway Railway Transport”*

Shanghai railway Hangzhou freight center initiates "public iron union", Jiaxing city public transportation in formally started. Mainly by means of urban road network, railway, Shanghai-Kunming line. The Shanghai railway bureau within the jurisdiction of the Hangzhou freight center each sales distribution. The goods delivered from the shipper company shipped to the designated place in Jiaxing.
Figure 5 “Highway and Railway Transport” Process

Mainly represented by zhejiang righteousness letter cargo transport co., LTD. On July 8, 2015 successful operation X8601 trains, In addition to the 10% aging particularly high requirements or cannot be loaded in container outside the transport of goods by road, 90% of business by the railway carriage. There are 40 units of goods every day, Short barge transportation by road set card to "Jiaxing east, north of Hangzhou, xiaoshan, yuyao" four railway freight station field. By the railway transport to guangdong changing, third bridge railway station. Then by road set card will roll to the place of receipt. Return line the same site, the freight back to guangdong in Jiaxing.

Since the trains operation. The company Yixin Diesel consumption declines linearly, from the original 230 tons/month fell to 110 tons/month, a drop of 52.2%.But from the point of time efficiency, "Public transportation" railway freight train diagram on 23 hours plus handling organization such as time, Goods total costs about 2 days to get to the receiving party, compared to road transportation. 1 day to no advantage. From the Angle of transportation cost, "Public transportation" to 180 yuan/ton (including railway loading and unloading fees) plus two head all 12 yuan/box, km highway short barge fee, the price advantage is not obvious.

| Starting point          | Average transport cost                  |
|------------------------|----------------------------------------|
| The north of zhejiang  | 260 yuan/ton                           |
| guangdong              |                                         |
| The entire road transport | 180 yuan/ton                       |
| Combined transport     |                                         |
| Highway, railway transport combined transport | 180 yuan/ton + 2 * 12 yuan/box, km highway short barge fee |

3. Existing Problems in the Development of Jiaxing Multimodal Transport

Logistics base multimodal transport ability is insufficient. From the current important logistics base, the city scale is generally small, and single function, especially in planning and site selection and construction, did not consider the development potential of multimodal transport, difficult to meet multimodal transport hub requirements. For example, covers an area of the largest and most abundant industrial agglomeration types in Jiaxing modern logistics park, the public dock and lack of inland waterway dredging port railway, is almost entirely dependent on road transport; iaxing port dredging port railway integrated logistics park no planning and development, and do not have the function of developing and so on.

The Jiaxing railway freight station Pivotal position is not strong. Jiaxing railway freight yard infrastructure upgrading is not timely, in the present organization operation a list only under the condition of container express X8601. Freight yard handling capacity has become saturated. Severely restricted the further promote development of public transportation in Jiaxing city. According to the layout of railway logistics base planning and construction plan "in 2015-2017.The country will build 208 first and secondary railway logistics base [4], Established in Huzhou north district planning a secondary railway logistics hub, and Jiaxing station is not included in the project. Jiaxing railway
freight station field position will be reduced further, the development of iron and molten iron transport will be more passive.

A variety of ways the linkup of node are restricted. Inland river basin in Jiaxing port construction lags behind, connects with main regional waterway "the last kilometer" has yet to get through, lead to oceans and rivers combined transport can't seamless, oceans and rivers combined transport direct transit not implemented; Around the harbor, large comprehensive logistics park, operations such as the railway hub node. Dredging port road, the construction of the main shipping channel level is low, ability is insufficient. Layout is unreasonable, unable to adapt to the multimodal transport demand; In the fight for national railway construction planning, without fully considering the dredging port railway and so on.

The low degree of standardization of vehicle. Due to the low road freight industry threshold. At present, Jiaxing freight vehicle standardization degree is low. In 2015, the city has 36000 commercial freight vehicles, and the special truck (container truck, trailer, tank car) only 4300 vehicles, the standardization of conform to the requirements of the multimodal transport vehicles accounted for less than 12%, and the basic flat from a year earlier, the development speed is slow.

Drop and pull transportation develops slowly. As the basis of multimodal transport links, Europe and the United States large-scale logistics enterprise hang transportation completed by more than 70% of the traffic volume. At present, only two ministerial jiaxing drop and pull pilot and three provincial pilot enterprises, drop and pull vehicle standard lack of commonality, freight station field layout unreasonable factors, enterprise informatization level is not high, drop and pull this advanced mode of transport organization has yet to get a wide range of application.

Transport cargo is relatively single. As a comparative advantage of water transport and railway transport. Applying commodity is relatively single. The main coal, iron, ore, grain and other "smuggled goods" give priority to. And industrial machinery, electronic appliances, daily provisions, such as "heroin" developmental delay in transport. Existing on inland water transport of "heroin" ability is insufficient, restricted the further development of multimodal transport.

Transport radiation range is not wide. Jiaxing characteristic of export-oriented economy is obvious, showing a large number of imports of a large number of export characteristics, according to the city's road waterway freight flow analysis. Transport radiation scope mainly concentrated in Hangzhou, Jiaxing, Huzhou, Shaoxing, Suzhou, Shanghai and other places, Hinterland range distance not far. All within the railway economic transport distance. Cause waterway, railway link cost advantage is not obvious difficult to form the advantages of multimodal transport development.

Oceans and rivers combined transport has high additional cost. Restricted by the special of the qiantang river tide characteristics, Jiaxing oceans and rivers combined transport cost advantages play there two factors: One is the road short barge high cost. Because rivers in Jiaxing are not directly connected, connected to the Internet channel level is low, like bridge clearance smaller transportation channel not free, the need for highway short barge, the container still need to add two hoisting 32 yuan/box additional handling charges. The second is through the gate and other charges is high. Taking container transportation as an example, the current Zhejiang provincial highway charges about 30 yuan per 100 kilometers per. The ship lock stand to increase the cost of each container about 50 yuan/times, restrict the development of inland water container transportation [4].

The rail transport high additional cost. One is the unified pricing by China railway group for the short barge of highway and railway transport highway. Road to the railway station of short barge expenses obviously higher than the market price of the trunk line. The second is the weakness of technical equipment, resulting in high cost of time, the container gantry crane in the freight yard of Jiaxing east station is a product of the 1980s,loading and unloading time is long, low efficiency; In the process of transportation, the time of marshalling decoration is too long,and unable to trace the location of the goods in transit; In addition, the social source box on the railway transport, lead to a single container structure, The highway transportation enterprises shall purchase the corresponding facilities and equipment, increasing the enterprise's business operation cost. Three is the mechanism is
not sound of the high cost of extra. Because of the railway itself caused the goods delay, the loss has yet to establish compensation mechanism, shall be borne by the road transport enterprises at present.

Lack of advanced subject and restrict the development of integrated operation. The individual private economy in the region of Zhejiang province is developed, Jiaxing cargo enterprises are generally smaller, the degree of intensification is not high, Most of the existing logistics services remain in the traditional transportation, warehousing, freight forwarding, etc. Be focused on subentries or Sub - links of logistics services, low level competition, the overall level of service is not high, modern high value-added logistics service industry development is slow. As the logistics enterprise intensive degree is not high, and upstream and downstream enterprises docking is not sufficient, cannot provide high-quality supply chain solutions, it is difficult to provide one-stop multimodal transport logistics services.

4. Conclusion
In general, Jiaxing City, the development of multimodal transport there is still a long way to go, should adhere to market-led, government guidance principles, based on the main support of logistics channel, exploring innovative multimodal transport organization mode, popularizing and using rapid transit equipment technology, improving the level of transport standardization and information technology, continuously optimize multimodal transport soft environment, To promote the logistics industry "authors efficiency" [5].Strive to the end of the much starker choices-and graver consequences-in, foster a batch of logistics enterprises will guide of whole construction machinery demonstration platform type, initially formed a few hot metal river transport, multimodal transport, and rail transport function of comprehensive logistics hub, steadily improving waterway, railway freight or proportion of the total container transport, to speed up the exploration combined transport service "one system" mode, making logistics standardization level, integration level and transit equipment, improving efficiency, multimodal transport services and the fusion of upstream and downstream industry linkage development with certain benefits, to protect important material transportation, enhance the level of logistics services, drive along the economic development to provide strong support.

References
[1] The state council. The logistics industry planning for the medium and long term (2014 ~ 2020) [R], 2014.
[2] Zhang Shixin. Oceans and rivers combined transport transport jiaxing Marine new "engine" of economic development [J]. Journal of Yangtze river delta, 2011 (6): 42-43.
[3] Jiaxing city traffic transport. Logistics operation statistics of traffic in 2015 [Z]. 2015.
[4] China railway corporation railway. logistics base layout planning and construction plan for 2015 - 2017[Z]. 2015.
[5] Ministry of communications and the development and reform Commission. technical guidelines on multimodal transport development[Z]. 2016.