The Exploration on the Collection and Distribution Development of Yangshan Port on the Enlightenment of European Navigation Development--in the Light of China SHFTZ Policy

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Abstract. Compared with the system of collection and distribution in Europe ports, aimed at the construction of international maritime center, Yangshan Port’s transportation by highway is too high and by railway is much low in proportion in transportation means, and the ratio of less polluted water transportation is under improving; the balanced development of the collection and distribution system of Yangshan Port is worth further exploring. The paper studies the new shipping policy of China SHFTZ to improve the developing function of the collection and distribution system in Yangshan Port by analyzing the focal problems with figures in the railway and water transportation development. With the exploration the paper puts forward the corresponding optimized idea and suggestions for the development of shipping business of Yangshan Port enlightened by the international free port development.

1. Introduction
Some well-developed ports such as Rotterdam Port, Hamburg Port, Antwerp Port and others focus on several types of transportation means to assort with the development in the operation of logistic processing in order to reduce the ratio of the comparatively too much use of highway transportation which causes the environment pollution for encouraging more shipping business delivery to select water way or railway in transportation; as it is studied with the figure that among the complete collecting and distributing system in Shanghai the highway transportation takes up 62.5% with the railway transportation only 0.4%; therefore the sea-rail combined transportation of Yangshan deep-water Port has been developed in a slow way. Related research shows that the transportation cost will be reduced by 20% at least on the condition that the collecting and distributing way is reformed from much use of highway into water-water transmit shipping or sea-rail combined transportation. Located in the “One Belt and One Road” and important intersection of economic belt of Yangtze River Yangshan Port is the focus in the development for building Shanghai Port into the international shipping center.
Table 1. GDP Comparative figure of Shanghai Port from 2006 to 2015 (TEU - twenty-food equivalent unit) (GDP- gross domestic product)

| Year | Cargo - TEU (Billion Tons) | TEU (Ten thousand) | GDP (a billion Yuan) | Needed TEU in GDP Unit (ten thousand / billion Yuan) |
|------|---------------------------|--------------------|----------------------|-----------------------------------------------------|
| 2006 | 5.37                      | 2171.9             | 10366.37             | 5.18                                                |
| 2007 | 5.61                      | 2615.2             | 12188.85             | 4.60                                                |
| 2008 | 5.82                      | 2800.6             | 13698.2              | 4.25                                                |
| 2009 | 5.92                      | 2500.2             | 15046.5              | 3.93                                                |
| 2010 | 6.53                      | 2906.9             | 17165.98             | 3.80                                                |
| 2011 | 7.28                      | 3173.9             | 19195.7              | 3.79                                                |
| 2012 | 7.36                      | 3252.9             | 20181.72             | 3.65                                                |
| 2013 | 7.76                      | 3361.7             | 21602.12             | 3.59                                                |
| 2014 | 7.55                      | 3528.5             | 23567.7              | 3.20                                                |
| 2015 | 7.17                      | 3653.7             | 24964.99             | 2.87                                                |
| 2016 | 7.01                      | 3712.2             | 27466.15             | 2.55                                                |

Data from: (www.shtong.gov.cn)

Based on the figure the ranking of the container throughput (TEU) of the global ports the TEU of Shanghai Port had been ranked the No.1 in the succession of 6 years, but during the years of 2014 and 2015 the TEU of Shanghai Port were in negative growth and in the successive two years ranking the lowest in growth of the ten big ports globally; Zhoushan Port of Ningbo in Yangtze delta which was ranked the first in the successive of four year and Suzhou Port ranking the fifth became the largest cargo throughput in speed increase of 2015 by the increase of 13.4%. From the figure1 analysis it can be found out that the cargo throughput figure needed in GDP in per billion Yuan maintains a downward trend. During the years of 2014, 2015 and 2016 the harbor cargo throughput in Shanghai Port was in negative growth; accordingly the driving effect was slow in fueling the harbor cargo throughput in developing Shanghai economy.

2. Driving force for development

2.1 Driving the economy in the hinterland of Yangtze River

Based on the statistical data of Shanghai Port hinterlands, six provinces, Hubei, Hunan, Jiangxi, Anhui, Jiangsu and Zhejiang; two cities, Chongqing and Shanghai in the national economy and social development the transformation and upgrading in production structures of the hinterland groups ,the gradual raise in the proportion for the tertiary industry which affects the port shipping directly on the small scale is one of the reasons leading to the drop in and out of general cargo throughput in shipping in Shanghai Port. The raise in proportion to the tertiary industry is the normal trend in city economic development. Simultaneously when the transformation in industries is going on, it is still obvious that the transportation for the import and export trade cargo in every big city in the Yangtze River delta area relies on Shanghai Port.

2.2. The leading port in Yangtze River delta area

In June, 2016 it was pointed out in the notice of Development Planning for City Group in Yangtze River Delta issued by the National Development and Reform Commission that Shanghai was continually located in the core of the city group in Yangtze River Delta Area, leading the integration development in Yangtze River Delta cities, raising the business services in the Yangtze economic belt, developing the National “One Belt and One Road” strategy. With the development of itself it should also focus on the win- win formation of the port group cooperation in Yangtze River Delta area and reduce the repeated constructions in the internal port group and avoid any negative competition.

The division work is obvious between the Port of Waigaoqiao and Yangshangang deep-water port of Shanghai Port, the former being mainly responsible for inland container transit shipping due to the channel depth limit; the latter, Yangshang deep-water port , mainly responsible for international sea
course container transit shipping. The geographical location of Yangshan deep-water port plays an important role in making it become the core construction of Shanghai International Shipping Center as it is located in Zhejiang Shengsi Rocky Islands, outside of Hangzhou Bay, 27.5 kilometers to Luchao Port of Nanhui Shanghai. Yangshan Port connects with Hulu highway of Luchao Port in Nanhui Shanghai by means of Donghai Bridge with the length of 32.5 kilometers. The area of Yangshan is with over-15-meter channel; and it is closer to international sea course in geography, providing advantage in developing container transmit shipping; but due to the too small scale of railway transportation in the system of collection and distribution, water transportation has become a problem to the developed stage.

3. The current railway transportation condition and the problem analysis
The present railway transportation proportion only takes up 3.8% with the present highway transportation taking up 45.2% in proportion in the system of collection and distribution, but it is known that all the developed European ports focus on the railway transportation in developing construction. A case in point is the Antwerp Port, the second largest railway port, the cargo transportation of which port is by lighter, highway, line channel, railway and the proportion is “37 : 47 : 5 : 11”. The sea-rail combined transportation in containers volume in Rotterdam Port accounts for 20% in proportion. All Antwerp ports are connected with railway, in which there are over 26 railways crossing the ports. With the several years’ railway transportation in business service it suits the requirement of over 70 European hinterlands in logistic transportation with over 24 million tons of cargo transported by railway. Each year the suppliers of Antwerp Port Bureau and Railway Transportation Service have been improving high-reel transportation system to offer more selections for the shipping business in sea-rail combined transportation, with the aim of further forming the cross-Europe-Asia railway system of collection and distribution. In the need of integrated transform in developing economy and fueling the shipping industry in the Yangtze River hinterland it should be pointed out that there are respectively two big problems causing the slow development of railway transportation in Yangshan Port.

3.1. Problem 1: The separation of ports from railway blocking the sea-rail combined transportation development
As a deep-water and sea-island port, “the separation of ports from railway” of Yangshan Port blocks the sea-rail development severely. As it can be seen that there have been the inner-port railway going to the harbors directly in Antwerp Port, Hanbao Port and other foreign ports so the cargo delivered from the containers can be transported by railway transportation with the railway connection to the in and out of ports, which can provide flexible project business selection, greatly reducing the cost of money, manpower and time in logistic transportation. But the “the separation of ports from railway” in Yangshan Port is caused by the fact that the East-sea bridge connecting port area with Luchao port of Shanghai Nanhui can only do the highway transportation, thus all the railway-transporting cargo has to be transported to the container center in Luchao port, 40-kilometer distance from the railway before transported to the terminal harbor by water-short refutation or cargo van passing through the East-sea bridge, thus turning the transportation into comparatively too high consumption in transportation with man, material and financial resources.

3.2. Problem 2: The distance of railway transportation causing the shortage of sea-rail transportation in need
With the cargo – sours competition with Qingdao Port, Lianyun Port and others Yangshan Port has disadvantages in terms of the too far distance by using railway transportation. For example, the important component cargo transported by railway-transporting such as large mineral products, energy-class cargo should have be delivered by geographical – advantage hinterland of Yangshan Port but failed, which has caused some difficulty in the sea-rail combined transportation development in Shanghai Port. Even though Luchao Port Center was set up in order to connect Yangshan Port with railway transportation of Shanghai area, which in succession has opened the railway to Chengdu, Hefei, Nanchang and Suzhou, but it is still obvious that the sea-rail combined transportation market is
4. The current development in water transportation and the problem analysis

![Figure 1. The waterway-waterway transit of Shanghai Port and Yangshan Port](image)

Note: Proportion of the waterway-waterway transit of Shanghai Port and that of Yangshan Port
Data from: www.shtong.gov.cn

From the Table 1 it can be studied that during the time of 2006 to 2015 the container throughput in the waterway-waterway transit of Shanghai Port and Yangshan Port is clearly shown. Apart from the negative impact from the global financial crisis breaking out in 2008 causing the ratio of the waterway-waterway transit falling back within short two years, but the general container throughput of Shanghai Port was on the increase and the box volume in waterway-waterway transit of Yangshan Port in proportion had been higher than that of the same period value of Shanghai Port since 2007. But after the negative impact from the global financial crisis the increase of the ratio in the waterway-waterway transit of Shanghai Port has been slow down and in 2015 the ratio waterway-waterway transit of Yangshan Port was 48.9%, compared with that in 2013, a drop of 0.8%.

4.1. Problem 1: Lower capacity in international transmit
It can be studied from the ratio that international transmit container box volume of Shanghai Ports which takes up the whole container box throughput in the whole port after the global financial crisis, the highest year was only 7.1% in 2014 while that of Rotterdam Port, London Port and others were above 50%. The global pivotal ports in container all will strive for international transmit container box volume transportation as the basic policy for port development.

With the comparison with other international transit hub ports, the way of transportation by means of short barge, “shuttle bus”, between Waigaoqiao and Yangshan Port, going back and forth to transport inernational transit containers is largely limited in terms of transportation capacity and is time and man consuming, so within short term the international transmit container box volume of the close-to Yangshan port is hard to increase.

Moreover, the distance from Yangshan Port to Luchao Port in Nanhui Shanghai is near 27.5 kilometers but the international transmit box collection center is too far from the located on the Yangshan Port island, which causes the much more time-costing in transporting and slower container-set-up- speed as the short barge, “shuttle bus”, must pass through the transmit box collection center located within Luchao Port before once-more loading and unloading of cargo to deliver the cargo to other countries.

4.2. Problems 2: Taichang’s impact on the transmit shipping in the Yangtze River internal branch line
In the volume of container transmit of Yangshan Port the internal branch line of Yangtze River takes up over 50% in proportion.

The container-source-undertaking business in the middle and upper reaches of the Yangtze has
been transported into Taichang, Jiangsu from Waigaoqiao Port since July, 2014. The container-transmit transportation with the five-fixed liners by “Taichang Shuttle” between Taichang and Yangshan Port has saved the transportation cost and shortened the distance close to 205 kilometers before cargo of the internal branch line of Yangtze River goes to Yangshan Port. Even though with the policy of the government supporting there still exist the same problems such as the not-uniformed distribution in box volume to the ports; the under-optimizing collecting and distributing system in Taichang Port.

The following table is the analysis of implementing the container-source-undertaking business in the middle and upper reaches of the Yangtze River:

**Table 2. The SWOT analysis on the container-transmit-undertaking business in the internal branch of the Yangtze River of Yangshan port to Taichang port**

| S (Superiority) | W (Weakness) |
|-----------------|---------------|
| 1. Promotion in Transportation of “Taichang Shuttle” | 1. Policy for integration in Crossing Ports |
| 2. Sea-port Management in Taichang Port | 2. Existed Congestion in Taichang Port Traffic |
| 3. Distance Shortage in Water Transportation | 3. Low Load rate of “Taichang Shuttle” on Average with low Utilization Rate |
| 4. Superiority of Logistic Cost | |

| O (Opportunity) | T (Threat) |
|-----------------|------------|
| 1. Full support of Jiangsu Province | 1. Disorderly Internal Competition in Yangtze Delta Region ports |
| 2. Implement for Logistic Model of “Shang-Taichang” | 2. Unclear Location of Each Port |

5. **Suggestions on optimal collection and distribution with shipping policy**

5.1. **Developing sea-rail combined transportation system**

In the Light of “One Belt and One Road” in Shanghai the exploration and perfection in rail transportation system and the development for Asia-Europe bridge construction are important components in “Land Silk Way” strategy. Shanghai Railway Bureau has designed and opened 25 container lines of rail-water combined transportation and rail-sea combined transportation, attracting the hinterland cargo sources in the Middle and Lower Reaches of the Yangtze River, and step by step exploring and expanding the domestic coastal cities and international railway transportation business. In 2016 Shanghai Port planned to launch a serried of service of “Changjiang Express” and Railwa y Bureau designed and opened quite a few rail and sea combined lines to ease the pressure of evacuating cargoes from ports along Lianyun Port, Ningbo Port and Shanghai Port to inland cities.

Moreover the solution to “separation in Ports from Railway” which has been put into “135” planning objective, since 2014 it has been planned to put the second East Bridge under constructing into a rail-high way combined bridge to develop sea-rail combined transportation, which plays a great role in fueling the reach of the international standard in developing inland transportation system.

In terms of the solution to the problems such as the problem of the geographical distance in transportation of Yangshan Port, the European ports focus on the concept of economical distance in transportation which refers to shortening the gap in transportation such as reducing fee cost and time cost to compete with the business of other ports, so that to realize the optimization of collecting and distributing system.

In terms of the time invested in transportation, the transportation management system of railway container in Yangshan Port still lacks flexibility, such as the fact that the Railway Center of Luchao for the business service of Yangshan Port needs to have customs-transmit formalities simplified; transfer-customs selection time needs to be shortened. In Yangshan Port during the time when the second East bridge is driven to be built to solve the problem of separation ports from railway it also should focus on the synchronous development in railway transporting, matching facilities in port area.

5.2. **Pushing forward international transit business by sea transportation**
In Nov. 2014 Shanghai Customs issued a notice about implementing the shipping international transmit business in China SHFTZ, the aim of which is to push forward to carry out the logistic business of international cargo transit as a proposed warehouse setting assembly of oversea transit of setting assembly in China, SHFTZ. In 2015, the preliminary public service platform of international transmit setting assembly was set up in the Waigaoqiao bonded logistic area. Concerned with the phenomenon that the international transfer box volume was too low in Yangshan Port and on the condition that transmit setting assembly business can be carried out directly within the Yangshan island, the lightering fee of 500-600 Yuan could be saved for one standard box. Enlightened on the high additional value of Singapore, Hong Kong and other countries, develop processing type and service-typed setting assembly are developed as the main business to get more shipping economic benefit, which Yangshan port should follow in the future for the same-typed business development.

5.3. Strengthening to build inland waterway shipping courses
As it can be studied from the network of inland waterway shipping courses in Shanghai the cargo sources from Jiangsu and Zhejiang shipped into Shanghai mainly by way of Su-Shen inner harbor, Su-Shen outer harbor and Hang-Shen shipping courses and forwarded by way of Zhaojiagou course to Waigaoqiao port area, or through Dalu shipping course in south-east Shanghai to reach Luchao Port before arriving at Yangshan Port. During the “125” Shanghai government devoted itself to the implementing of renovating “one –ring- ten -shots” high-grading inland waterway shipping course in the city, among which that of the Hang-Shen shipping course has been completed and the second project of Dalu course and the east part of Zhaojia Gou are under ordered renovating while the east part of Zhaojia Gou (bridge part ) will be soon renovated.

Well-developed inland river transportation net is the key to developing water transportation. It is in this way that Port of Hamburg of Germany has been developed to be the container hub port of Boluo sea area by making the best use of transportation net. The German inland waterway covers 6000 kilometers, of which man-digged channel length is close to 25%, to connect each channel net in the territory so that the main and branch level of canalization can be improved up to form its developed inland transportation system. A case in point is the construction of Rhine shipping course, of which many time dredging for river courses have been undertaken to implement piece-wise governance to ease inland water shipping as the priority. The distance of Rhine shipping course amounts to 719 kilometers, offering the powerful ensuring foundation for the Port of Hamburg to meet the shipping logistic requirement for some industry cities of Bonn and Cologne along the Rhine River area. The whole inner water transportation takes up over 50% in proportion of the general transportation of the main ports, among which the inner water container transportation occupies above 20% to 30% in ports transportation. In Main, the Branch of Rhine, the Danube shipping course of which has further offered the developing business for exploring new hinterland. Besides in the area of Germany the Rhine shipping course has reached the river-sea combined shipping of standardized shipping courses so that all the cargo in the city commercial centers in the main inner land of Europe can be shipped directly to Antwerp Port and Rotterdam Port by scheduled means of transportation means like vans, reducing the cost of time caused by dead port pressure cargo. Compared with this the inner water transportation net concerned with Yangshan Port is under developing and the dredging engineering of shipping course needs driving step by step.

In the light of the superiority in port water way shipping development from the Rhine shipping course construction it is suggested that in Shanghai more focuses must be on the net construction of inland shipping course and the inevitable trend is to transform the highway box- source transportation which previously took up main ratio into water transport shipping. Due to the contradictory condition caused by the development for the current channel classification and large ship model the inland waterway - shipping - routes reforming is under further speeding up. During the 135 period how to further develop the intensive inner water transportation is essential to raise up the water transportation in proportion of the general transportation.

5.4. Speeding up the reform of the intensity for harbors and encouraging developing ship research
There are 1984 berths in inland river ports in Shanghai, of which the largest design of berth capacity is
3000 ton. Compared with the harbor layout in the main ports in Germany and the condition that the inland river ports have basically completed the intensity for harbors in Germany, the throughput of inland river ports in Shanghai is not low but the harbor layouts and facilities etc. are in clearly urgent need to be reformed. In 2015 the public harbor in east port area of Lingang industry in Yangshan Port has been in operation, and there have been built 16 container berths for special use in Yangshan Port to further implement to construct the water-water transmit collection and distribution for special use for harbor berths, promoting the west port’s landing and unloading efficiency to ensure the need in transmit cargo source shipping capacity of the Yangtze river branch lines to attract more international transmit cargo sources.

The ships with standardized big tonnage berth in inland waterway of Yangtze river delta in system takes up a small ratio while in Germany the average tonnage of inland river ships has reached 1670 Ton / a ship with the large-scale standardized reform, and in recent years the average tonnage has increase by 1% to reduce transportation cost. With the some kinds of restrictions against from the present shipping development into the international transmit pivot port, during the period of “135” the inland river should be strengthened in construction in Shanghai and should be further driven to transform the old ship forms into fitting the research on large-scale container shipping of inland river and at the same time the Yangtze standardized ship forms are to be fueled; and in order to launch and develop the non stopping rive-sea shipping to reduce the transportation cost of inland river shipping and waterway-waterway transmit, which is the base for durable development of the environment conservation in water transportation, large investment should be put.

5.5. Proposed coastal business and the liberal restrictions for tax refund policy
Due to the fact that the former international coastal transporting rules of our country were limited the foreign carriers tend to select free ports as Fushan Port instead of Yangshan Port to do the business of container transmit transportation. Therefore at the end of September, 2013 the Ministry of Transport issued a non Chinese flag with coastal international shipping notice with a new policy, a proposed Coastal Business, in order to drive the development of transmit in the coastal area of Shanghai Port. But due to the fact that the standardized implementation of the new policy was in the optimizing phase and there were strong disordered competitions in the coastal ports along Yangtze delta the transmit box volume along the coastal area of Shanghai port is far fewer than that of the free ports in Europe.

Furthermore, since 2012, a proposal for launching shipping from Qingdao and Wuhan has been implemented, the launching and the proposed implementation for cargo tax refund policy has been carried out by the Port of Departure which has driven the increase on water-water transmit box volume of Yangshan. If the tax refund policy of departure wants to attract more increase of transmit box volume in the branch line of the Yangtze River, the liberal restrictions for tax refund policy are needed and the tendency goes to make more ports in the middle and upper reaches of Yangtze River engaged in business doing. The trend is that more and more ports are encouraged with policy implementation with the demand for supporting ships and the need of adjustment of formalities for customs clearance.

6. Conclusion
Yangshan Port, the leading Port in Yangtze River Delta Area, has been playing an important role in driving the import and export transportation of cargo of big cities in Yangtze River basin and pushing the economic development of Yangtze River Delta Area and the hinterland. Compared with the system of collection and distribution in Europe ports, the railway transportation and water transportation in Yangshan Port are in developing stage. With the light of the case in point of the present development in railway transportation of Antwerp Port, it is vitally important for every big port to make the system of collection and distribution perfect while the development in Yangshan Port is slow due to the factors such as “the separation of the railway from the port” and the geographically distant transportation. With the support of “One Belt and One Road”, “135”Planning and related policy more sea-rail combined transportations will be open; the second-term construction of the double-use of railway and highway will further drive the improvement of railway transportation proportion in Yangshan Port. At the same time, with reference to European ports, the emphasis on economical transport distance it will be the effectively optimized recommendations to improve the railway
transportation in scale volume in Yangshan Port with discounted price policy in transportation. In terms of water transportation proportion in recent years the transportation proportion of collection and distribution has been on the rise, but the majority of the water transportation cargo supply just comes from the transfer business of Yangtze internal branch. Fortunately a series of related new shipping policies of China SHFTZ have pushed the development in international assembly transfer and coastal transportation business.

On the enlightenment of the development in Hamburg water transportation which closely combines with Rhine shipping construction it will be the optimal direction in developing Yangshan water transportation to strengthen the developed internal shipping net construction and at the same time focus on port construction and ship development to better coordinate water-water transfer transportation, which will play a more important role in building Yangshan deep-water port into international transfer junction port on the premise of the balanced development in the proportion in high-way, water and railway transportation.

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