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WORLD MARITIME UNIVERSITY

Shanghai, China



**IMPROVEMENT OF COLLECTION AND
DISTRIBUTION SYSTEM OF SHANGHAI**

**-----learn from successful case of the collection and distribution in
foreign countries**

BY

CUI ZHILIN

China

A research paper submitted to the World Maritime University in partial fulfillments of
the requirements for the award the degree of

MASTER OF SCIENCE

ITL

2016

Declaration

I certify that all the material in this research paper that is not my own work has been identified, and that no materials are included for which a degree has previously been conferred on me.

The contents of this research paper reflect my own personal views, and are not necessarily endorsed by the University.

2016-06-15

Supervised by

Professor: Sha Mei

World Maritime University

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Abstracts

This thesis is about how to improve the collection and distribution system of Shanghai. There is no doubt that Shanghai will have a leading role in the implement of the Belt and Road strategy, Shanghai must connect the land-based Silk Road Economic Belt and Maritime Silk Road, but as we can see, the collection and distribution system of Shanghai is not able to meet the demand: too much road transportation; lack of basic equipment in river transportation and Sea-rail intermodal transportation, competition from other essential ports in China...

In this thesis, firstly, I will explain why the collection and distribution system of Shanghai need to be improved, then I will use some successful collection and distribution system in foreign countries as examples, try to learn from them, thirdly I will analysis the problem of Shanghai's collection and distribution system, using the experience of successful case help to improve the collection and distribution system of Shanghai. Observation, investigation and case study will be used to find the solution of the existing problems, combining with the situation of Shanghai.

With the improvement of Shanghai's collection and distribution system, Shanghai will catch the opportunity and better play its leading role in the development of the Belt and Road, transfer its disadvantages to advantages and have a good development not only of itself but also the whole Yangtze River Delta.

Keywords: Collection and distribution system; Port of Shanghai, the Belt and Road, Sea-rail intermodal transportation, Water transit, Sea-land transportation

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Chapter 1 Introduction

1.1 Background

The "Silk Road" refers to the commercial trade routes which start from ancient China, linking to Asia, Africa, and Europe. The narrow sense of the Silk Road generally refers to the Silk Road on the land. Broadly speaking, it is divided into land Silk Road and maritime Silk Road.¹

Since entering into the new century, the Silk Road also meets its new mission.

In Sep 7th 2013, Chinese President Xi Jinping first introduced the Silk Road Economic Belt when he visited the Nazarbayev University in the Republic of Kazakhstan. Later in Oct 3rd 2013, Maritime Silk Road was introduced in the speech in parlemen

Indonesia. In September 2014, China had introduced the development strategy of Yangtze River Economic Zone, and made the requirement of "Speeding up the interconnection of infrastructure with neighboring countries and regions, enhance the cohesion and interaction with 'Silk Road Economic Belt' and 'Maritime Silk Road'".²³

Try to make Yangtze River Economic Zone an opening cooperation corridor which can across the East and West, and connect the north and south." Since then, the latest iterations of this plan, which is called "The Belt and Road" (B&R), was totally spread out before us.⁴

¹ Elisseeff, Vadime (2001). The Silk Roads: Highways of Culture and Commerce. UNESCO Publishing / Berghahn Books. ISBN 978-92-3-103652-1.

²"Getting lost in 'One Belt, One Road'". Hong Kong Economic Journal. 2016-04-12. Retrieved 2016-04-13.

³"One Belt, One Road". Caixin Online. 2014-12-10. Retrieved 2016-04-13.

⁴"Asia-Pacific | Asia takes first step on modern 'Silk Route'". BBC News. 2009-06-22. Retrieved 2013-01-05.

Located in the front of Yangtze Delta, Port of Shanghai is in the middle of 18000km coastline of China's mainland, and the converging point of the east-west transportation channel of Yangtze River and north-south transportation in sea. As the main hub of China's sea port, port of Shanghai is participated actively in the international economic circulating system as well. Shanghai, one of the most important ports in china and the international shipping service center in the near future.

No matter considering the geography location or the role in the economic development, there is no doubt Port of Shanghai is the confluence of three major national development strategies and is the "bridge head" to promote the implementation of the national strategies. In order to catch this opportunity not only to develop Shanghai itself but also the whole Yangtze River Delta, Shanghai must play its leading ,radiation and driving role, participate into the construction of the Belt and Road actively, and give full play to its advantages, comprehensive the coordinated-development.

Collection and distribution of port is a transportation system that served as connection of ports and mainly provide construction and distribution service to the cargo. The system is made up of railway, highway, urban road and corresponding transfer station. Collection and distribution of port is a channel which will help to connect the port and hinterland, so it is the main external condition for a port to survive and develop. Today, every modern port must have a perfect and unblocked collection and distribution system, so that the port can play its important role as land and water transportation pivotal port in the comprehensive transportation network.

But as we can see now, the collection and distribution system of Shanghai is not able to meet the demand: unbalance of the system, competition from other essential ports in China...

In order to solve the problem and totally bring the advantage of Shanghai Port into play, this thesis intends to evaluate the existing problem of Shanghai's collection and distribution, and try to find the improvement of it.

1.2 Objectives of the Study

The first objective of the paper is to discuss why the collection and distribution of Shanghai need to be improved. The second objective of the paper is learn the successful case from foreign countries and try to learn from them. The third objective is to investigate the existing problem of Shanghai's collection and distribution. The fourth objective to using the result I got before to get the improvement suggestion for the collection and distribution of Shanghai.

1.3 Methodology

The purpose of the paper is to analyze the existing problem of Shanghai's collection and distribution and try to find the improvement of it. To achieve the mentioned goal, the paper will first analyze the necessity of improving Shanghai's collection and distribution: why Shanghai's collection and distribution need to be improved, by collection the data of Shanghai port and do some comparison between Port of Shanghai and other important and competitive ports in China. Secondly, through the way of case studies, three case will be studies in order to get experiences. Thirdly, based on the experiences learning from the successful cases, analyze the existing problems in Shanghai's collection and distribution. Trying to finding the optimal schemes not only based on the experience, but also combining the situation of

Shanghai for the collection and distribution of Shanghai.

1.4 Outline of the Paper

Chapter 2, literature review, intends to overview relevant research papers and reports/comments on the successful case of collection and distribution system and the of collection and distribution system of Shanghai. **Chapter 3, the necessary of improving Shanghai's collection and distribution system**. In this chapter, three major reason will be presented and analyzed. **Chapter 4, Successful Cases of collection and distribution system in foreign country**. The successful case of Port of Hamburg, Port of New York and New Jersey and Port of Singapore will be discussed and I will try to learn the experience from them. **Chapter 5, Analysis Shanghai's collection and distribution system**. The problem will be discussed in three different way of collection and distribution: Sea-rail intermodal transportation, Water transit and Sea-land transportation. **Chapter 6, Improvement of Collection and distribution system of Shanghai**. Try to find how to improve the collection and distribution system of Shanghai, combining the experience learning from successful cases with Shanghai's the present situation.

Chapter 2 Literature Review

2.1 Introduction

As I have discussed in the former chapter, the strategy of “the Belt and Road” is the development of ancient Silk Road and is an ambitious plan. With the implement of “the Belt and Road” strategy, China of course will strengthen the connectivity and links between China and the countries along the Silk Road. (Xu Qinduo, 2015)

In order to catch the opportunity and development the port of Shanghai itself, Shanghai must combine its own advantages with the strategy of “the Belt and Road”, implement the construction of “Four Centers” in Shanghai, play its leading, radiation and driving role, participate into the construction of the Belt and Road actively, and give full play to its advantages, comprehensive the coordinated-development. (HE Maochun, 2015)

But the reality shows that there are still lots of problem existing in the construction and distribution system of Shanghai, and these problem will hampered the development of Shanghai Port greatly. (Xu Leling & Liu Bo, 2016)

2.2 Successful cases of the Collection and distribution in Foreign Country

A successful international port will set a goal that to construct the seaport to an international transportation hub, logistics center and Trade Center , so they will pay attention to the construction infrastructure of the port’s collection and distribution system and Regional transportation hub. (Gai Yingwen, 2015)

The process and the management of logistic is highly modernized. The port of

Singapore make full use of advantages of high and new technology, in order to promote the transfer efficiency highly and optimize the management of logistic. (Liu Shan, 2007)

The traffic jam of road transportation lead to the change of collecting and distributing ways, an increase number of ports pay attention to transfer their freight volume from road transportation to the railway transportation and water transportation. For example, the percentage of road transportation in the port of Hamburg is declined from 60% to 37%, in the meanwhile, the railway transportation had increase 5%. (Chen Xiangyan, Chen Weijiong & Lv Changhong, 2013)

According to the <2014 Global trade promotion report >, we can see that the port of Singapore is the most open to the investment and perform best not only in terms of promoting trade development but also in terms of trade facilitation, the tax rate in Singapore is only 18.4% in Singapore, much lower than 67.8% in Shanghai. (Fang Yan, 2016)

The port of Hamburg can provide the service of distribution and storage, which is controlled by computer, so the port can provide the best service to its customers. (Zhang Shuai, 2001)

2.3 The collection and distribution system of Shanghai Port

In 2013, the percentage of railway transportation in the Port of Shanghai is 54.3%, in the meanwhile, the percentage of water transportation is 45.4%, and the railway transportation is only 0.3%, far less than the average level. (Cheng Wei & Wang Zhongqiang, 2015)

The existing problem of Shanghai's construction and distribution system is: too much road transportation which is almost reach the saturation; the infrastructure of inter water is seriously inadequate, so there is still room to improve. The goal of the government should be: improved the inland waterway infrastructure, in order to build the water highway; at the same time, promote the construction of inland port to support the development of inland waterway transport. (Xu Leling, Liu Bo, 2016)

Chapter 3 the necessary of improving Shanghai's collection and distribution system

3.1 Unbalance of Shanghai's collection and distribution system

There are three main way in collection and distribution system. They are: Sea-rail intermodal transportation, water transit and Sea-land transportation.

From the graph 1 we can see that for the other major port in the world, the percentage of road transportation is low and other two ways of transportation are comparatively high. Nearly 10 years ago, the percentage of sea-rail intermodal transportation in Port of Rotterdam, Antwerp, Port of Hamburg Port, the Port of Los Angeles, New York New Jersey Port and other European main ports had already reach 10%, some of them even more than 20%, at the same time, the percentage of water transit is around 5%.

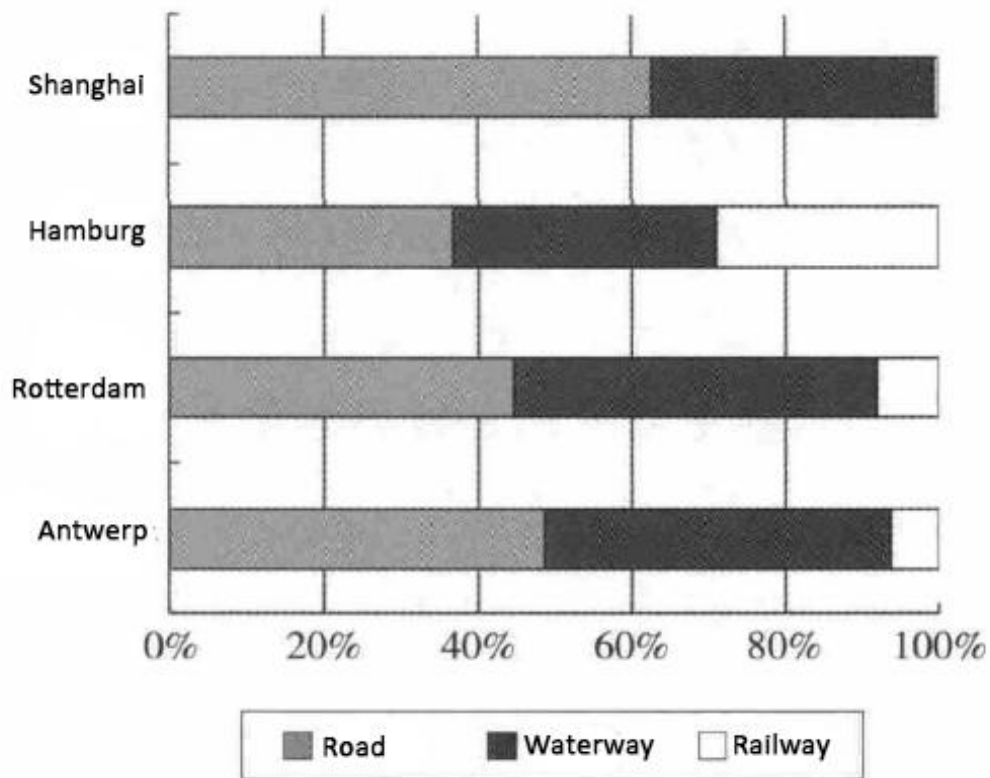


Figure 1 The component of collection and distribution system of the main ports

Source from: Own collection from many website

Comparing to other main ports, Shanghai Port, an international container shipping port with a wide stretch of economic hinterland, does not have a good transportation situation. The main mode of collection and distribution transport is Sea-land transportation, which account for 54% of the total throughput of Shanghai Port, well above the average around the world.

The unbalance of Shanghai's collection and distribution system is even worse in port area. So far, among all the port area in Shanghai, only little ports have railway. For example, Port of Luchao, the railway throughput of Luchaogang is designed for only 172TEU, which is nothing compared with the demand. And three main port areas in Shanghai: Waigaoqiao, Yangshan and Luojing port area, none of them have railway

line and by no means can they transport by sea-rail intermodal transportation. The sea-rail intermodal transportation is less than 0.15% among the collection and distribution transportation.

Currently, the main mode of collection and distribution transportation for most international container port is water transit, but Shanghai does not do a good job in this part, either. Water transit transportation only account for around 45%, which is lower than 50% of most international ports.

The transportation in inland waterway has the advantages of large capacity, low costs, energy saving and environmental protection. There is data shows that the energy consumption of transporting each unit by railway is two times of inland waterway transport. And for trucks, it is much higher, the energy consumption of transporting each unit by truck is seven to ten times of inland waterway transport. Moreover, the environment pollution factor of inland waterway transport is 2, and it is 5 for railway transport and 6 for road transport. Last but not the least, the cost of inland waterway transport is only one third of road transport and three fourth of railway transport. But unfortunately, the inland waterway transport in Shanghai is hardly in motion.

Table 1 Transportation volume of road transport 2010~2014

	2010	2011	2012	2013	2014
Volume(Mio TEU)	17.907	18.599	18.476	18.305	19.075
Proportion	81.60%	58.60%	56.80%	54.20%	54.06%

Source from : <Shanghai's transportation and port administration yearbook>

Table 2 Transportation volume of waterway transport 2010~2014

		2010	2011	2012	2013	2014
Container throughput (Mio TEU)		29.069	31.739	32.529	33.773	35.285
Water transit	Volume (Mio TEU)	11.05	13.04	13.92	15.33	16.15
	Proportion	38.0%	41.1%	42.8%	45.4%	45.8%

Source from:Shanghai International Port(Group) Co.,LTD

Table 3 Transportation volume of railway transport 2010~2014

	2010	2011	2012	2013	2014
Volume(THS TEU)	71.9	102.9	109.9	85.9	51
Increase %	-15.12%	43.12%	6.80%	-21.83%	-40.6%
Proportion	0.25%	0.32%	0.34%	0.25%	0.14%

Source from: Shanghai international shipping service center yearbook

From table 1 to table 3 we can see that, though the unbalance of Shanghai's collection and distribution system is improved year by year, the result is not distinct and more things need to do to change the formal situation.

3.2 The demand of development

With the development trends of large scale, high speed and federalization of modern container vessels, in pursuit of operation economic efficiency, large container vessels are asked the port time as short as possible and loading as much cargoes as possible. For these reasons, international container liners running in the main lines would like to call only some large ports with high efficiency, then transship the cargoes from these large ports to the neighboring regions in order to achieve the radiation.

Today, transshipment of container has already become an important mode of operation, and the percentage of cargoes for transshipment has increased day by day. Under these circumstances, the competition between the major ports for the transshipment cargoes became more and more fierce.

Shanghai, one of the most important cities in China, the international finance and shipping center, must take the responsibility to connect the land-based Silk Road Economic Belt and Maritime Silk Road.

Since 2010, the container throughput of Shanghai Port became the first place in the world. A research shows that the increasing of the throughput of Shanghai Port must be more than 2×10^6 TEU. But the real situation showed that the growth rate of Shanghai's container throughput is declined and is lower than other important ports in China.

Table 4 Throughput of Shanghai Port 2011~2015

	2011	2012	2013	2014	2015
Container throughput (Mio TEU)	31.73	32.52	33.61	35.28	36.53
Throughput (Mio Tons)	728	736	7.76	754	717
Growth rate	2.49%	3.35%	4.97%	3.54%	2.49%

Source from: the website of China ports <http://www.chinaports.com>

As far as I am concerned, one of the essential reasons that would lead to this declining is the unbalance of Shanghai's collection and distribution system, which will lead to low efficiency and comparative high cost, and may drive the potential customers to choose other ports in China for loading and unloading.

So, it is necessary to improve collection and distribution system of Shanghai.

Otherwise, the transshipment capacity of Shanghai port can't meet its own demand, not to mention being in the leading place under the strategy of the Belt and Road

3.3 To be more competitive

Under the strategy of the Belt and Road, the demand of imports and exports from middle-west region of China to America and East Asia will increase largely. For those increasing demand, only marine transportation can meet them. And in order to connect the land-based Silk Road Economic Belt and Maritime Silk Road and make the biggest

benefits from them, there is no doubt that sea-rail intermodal transportation will be the main way in the collection and distribution system.

There are only several sea ports in the middle-east region can meet the requirement and be selected, they are: port of Shanghai, port of Ningbo, port of Qingdao, port of Lianyungang and port of Tianjin.

Recently according to the < create a good market environment to promote the implementation of the integration of traffic and logistics development program > issued by the national development and Reform Commission, Beijing, Shanghai, Qingdao and other cities have been included in the national comprehensive transportation and logistics pivotal port.

But as we can see, comparing to other ports, Shanghai Port is in an inferior position:

Port of Tianjin is near to inland regions, which means it is more accessible to the inland, more accessible to the land-based Silk Road Economic Belt. Also, in the period of 13th five-year plan, Tianjin will build Keihin intercity, Jingtang intercity railway, build integrated passenger transportation hub in Baodi, airport, coastal, North Metro, in order to improve the intercity railway network. Tianjin will also actively undertake the spillover of Beijing railway freight demand, promote the planning study of Jin Bao Xin West, north to the rail corridors, and improve the layout of Tianjin's freight hub. In the meanwhile, trying to strengthen the transfer function of Tianjin railway hub, in order to become the center of the passenger transport organization and the freight organization center in North China region.

As an important port city, Qingdao has been in a leading position in multimodal transport. Port of Qingdao has a great railway network, which mean its collection and distribution system is much better than Shanghai's, and can easily handle the cargo

from Maritime Silk Road. Last year, Qingdao has completed 30 million TEUs by sea-rail intermodal transportation, increasing of 36% than 2014, ranking first among the ports in China.

Located in the T position of our country's traffic, and relying on the Longhai Lanxin railway, port of Lianyungang can rely on the land bridge to do the transit. As one of Chinese important trunk railway, the Longhai Lanxin line is connected to the new long term, Beijing Shanghai line, the Beijing Kowloon line, connecting Lianyungang port to all parts of the country and help to attract the cargoes from Henan, Shanxi and other middle-western regions.

As a world-class port, Ningbo is one of the few port that can directly get in by special railway line. Cargos transport by rail can directly transit to the vessel. Relying on the Zhejiang Jiangxi railway, and the Xiao Yong - Xuanhang line, Ningbo port can draw supply of cargoes from Jiangxi, Anhui and other areas. What's more, port of Ningbo provides allowance to Sea-rail intermodal transportation, which will lead to the increasing of sea-rail intermodal transportation, and is good for its collection and distribution system.

Table 5 Throughput of rail-water intermodal transportation in major ports from 2011 to 2014(0000TEU)

Port	2011	2012	2013	2014
Port of Shanghai	2.6	3.4	0.6	0.6
Port of Tianjin	26.4	34.6	26.9	26.0
Port of Ningbo	4.7	5.9	10.5	13.5

Port of Qingdao	19.1	23.1	8.4	22.0
Port of Lianyungang	27.5	30.3	25.7	22.0

Source from: the website of China ports <http://www.chinaports.com/thruput>

So, in order to be more comparative, to gain competitive advantages, Shanghai must improve its collection and distribution system.

Chapter 4. Successful Cases of collection and distribution system in foreign countries

4.1 Port of Hamburg

Port of Hamburg (in official usage: Hafen Hamburg) is a sea port in German. Located on the right side of ELBE River in north Germany, port of Hamburg is also the junction of Alster and Bille River, and it is about 76 miles from the mouth of the Elbe into the North Sea. It is the largest port in Germany, its throughput of container ranked the second place in Europe. It is the third busiest container port in Europe as well, and 18th in the world. The port of Hamburg has a total of 43 km of quay walls and equipped

with about three hundred berths, four container terminals. The Port of Hamburg one of the world's most flexible, high-performance universal ports. ⁵

Port of Hamburg is the International Shipping Center in Europe, railway, cars and feeder container vessels are all available at the dock and handle the cargoes quickly and efficiently. At the same time, Hamburg is a famous international aerotropolis, can provide shipping service all around the Europe. Every day, more than 160 international and domestic container trains pass in and out of the port.

The policy goals of multimodal transportation of Germany are: for long distance transportation, railway and water way are the main way to transport; for “door to door” transportation, roadway is the main way. In the meanwhile, Germany focus on developing the center station for multimodal transportation for the intensive transportation organization.

The cargo center of Hamburg Port covers an area of 1.6 square kilometers, operates 24 hours per day, and possesses 90 container trucks, 2 container crane, this cargo center is also equipped with laser radar system and satellite positioning system.

In order to improve its sea-rail intermodal container transportation, port of Hamburg has taken following measures: first of all, strengthen the construction of supporting infrastructure of railway in the terminal area. Secondly, built a marshalling station in Maschen which is able to format a number of 10 thousand railway carriages every day, and this marshalling station will provide service for the port of Hamburg. Thirdly, established a specialized department in the port, which is responsible for the construction of railway station in the port area and the rail lines, so is the rail lines.

⁵ Staff (10 August 2002), Elbe ohne e – Buchstaben fallen weg (in German), Hamburger Abendblatt, retrieved 11 August 2008

Fourthly, built an EDI center which can connect the customs, railway, port, freight forwarder, dock and more than 200 consumers; This center is able to make full use of the internet, satellite positioning, big data and other advanced technique to provide service to the transport vessels; There are more than 80 lines of communication such as packet network, dedicated circuit and dial-up lines are using to transmit information of various of business in marine industry and process electronic documentation in more than 200 format which is relevant to the marine transportation; More than one way of transportation can cooperate well with each other by using this system; what's more, the port of Hamburg will provide the best transportation option to the cargo owner and be more competitive in the market.

By complete all the measures I have mentioned before, container railway lines in port of Hamburg can achieve the goal that the cargo is able arrive in Paris, Berlin, Amsterdam within 24 hours without stop and arrive in Vienna, Barcelona within 48 hours without stop.

Last but not the least, the free port in Hamburg port has a storage stack of more than 1 million square meters and can provide the freest environment for tax in Europe. For this reason, port of Hamburg has attracted lots of industrial enterprises to carry out processing, packaging, distribution and other business there, which make the industry in the port developed well. The service industry in port of Hamburg also developed well, more than 1700 freight forwarding companies are there and can provide services such as warehousing, logistics and distribution business around the whole European area.

4.2 Port of New York and New Jersey

Port of New York and New Jersey is the third largest container port in America, the busiest port on the East Coast of America and one of the largest natural harbors in the world.⁶

Located in New York-Newark metropolitan area, near to the northwest side of the Atlantic, port of New York and New Jersey is a bay estuary. There are three parts of port of New York and New Jersey: New York, New Jersey and Newark, these three parts belong to New York and New Jersey respectively. The port is the nation's top gateway for international flights and its busiest center for overall passenger and air freight flights. There are two foreign-trade zones (FTZ) within the port.

At the very beginning, as the largest container port in east cost of America, the proportion sea-rail intermodal transportation in collection and distribution system is only around 10 percent, the development of sea-rail intermodal transportation of containers is limited by the infrastructure of railway and the capacity of railway. For this reason, since 2003, the port authority make a series of development plan, in order to improve the collecting and distributing of railway transportation. They strived to make the proportion sea-rail intermodal transportation in collection and distribution system rise to 25%, try to reduce the growth of highway transportation by trucks and release the pressure of the local freeway. For example: 70 million dollars are used to the construction of the facilities for the railway multimodal transportation in Elizabeth port area, which is 0.7 square kilometers and can handle a number of one million TEU cargoes per year; there are 12 railway lines for cargoes handling in port of New York and New Jersey, all these railway station are operated by Canadian Pacific railroad

⁶ 2012 Port Map, PANYNJ, January 2012

company, CSX and Norfolk Southern, providing transportation service to the main market between east America and Canada.

What's more, the port of New York and New Jersey implement the PIDN plan as well, trying to increase the proportion of collecting and distributing by ocean barge and railway, in order to release the pressure on the environment brought by road transportation. Comparing to traditional highway system, they will pay more attention to improve the efficiency, for example, building a more reasonable toll network for ETC. The port of New York and New Jersey had already invested 60 million us dollar to improve the high speed railway collection and distribution system; at the same time, the port authority also provide 25 million us dollars to the port of New York and the port of New Jersey respectively for the reforming of the local railway system.

However, the success of the port of New York and New Jersey not only because it is a Trans ocean shipping hub which is the most extensive and is able to adapt to the future development most. This port is closely linked to the railway, highway and multimodal transportation, and can transport cargoes to the market with the speed no one can touch. The cargoes which leave the port can reach the market of 1/3 America and half of Canada within 24 hours.

The port of New York and New Jersey provide a wide selection to its customers, make efforts to expand its business, and has been adhering to the principle of focusing on the quality, efficiency and safety. So it is no wonder that the port of New York and New Jersey is always the primary thorough fare for the international trade, and it is always the most popular port in America which is able to provide advanced equipment and efficient operation.

Recently, the port authority had adjusted the existing lease with the Port of Newark

Container Terminal (PNCT), which expanded the acreage of wharf from 180 acres to 287 acres.

In addition, the port authority also plans to deepen the berth of Newark port container terminal. After the completion of this project, there will be three berth of container terminal in Newark port which will reach a depth of 50 miles, and one will reach a depth of 45 miles. The land near the port will also be made the best use of: a cloverleaf junction had been built between the combined transport site (Newark ExpressRail port) and shipping terminal, and after the complication of the cloverleaf junction, the carry capacity of Newark ExpressRail port had increase from 2 lanes to 4 lanes.

All the measures I mentioned before had made the total transport capacity of Newark Port increase to 1.2 million TEU every year.

4.3 Port of Singapore

Port of Singapore is located in the south of the Republic of Singapore, near the southeast of the Strait of Malacca and the north side of the Singapore Strait. It is one of the largest port in the world. The port has opened up more than 250 lines, connected with more than 80 countries and regions in the world and have business with more than 130 shipping companies, for this reason, port of Singapore is called the “port with highest utilization rate in the world” as well.⁷

Since the beginning of 20CN 60s, worldwide container transportation has played a more and more important roles in the international trade. Singapore had catch the

⁷ Aquino, Kristine (17 February 2011). "BMW Costing \$260,000 Means Cars Only for Rich in Singapore as Taxes Climb". Bloomberg L.P. New York. Retrieved 2 July 2011.

opportunity, began to build the dedicated berth for container ships and the first berth put into operation in 1972. By reconstructing and new building the container terminal gradually, combined with positive container transshipment policies, and cooperate with government authorities and relevant industries closely, port of Singapore developed rapidly and became the international container transshipment center in Southeast Asia.

Singapore had built a number of world-class logistics infrastructure, one of the most representative infrastructure is Zhangyi International Airport and container port. Zhangyi International Airport is a free trade zone which operate 24 hours uninterruptly, and the airport is equipped with all the facilities that are needed to load and unload air cargoes. There are more than 200 flights from more than airlines of more than 30 countries taking off and landing in this port. Moreover, the port also take advantage of its unique conditions of deep-water port, construct 4 container terminals, which is able to handle more than 15 million TEU every year. In 2015, the throughput of port of Singapore had reached 30.9 million Tonnage, ranking 2nd in the world.

Currently, port of Singapore has established business relationship with more than 600 ports in about 120 countries. There are more than 430 flights departure the port every week, providing enough choices to the cargo owners. With the guarantee of such high density, all-around liner routes, the containers needed to be transshipped will be quickly handled when arrived at port of Singapore and transport to the next destination. Most containers arrived at port of Singapore only need to be stored less for 3 to 5 days, and 20% of them only need to be stored for 1 day. As an international container transshipment center, port of Singapore improved the overall efficiency of global container transportation system largely, and there is no wonder that the port of Singapore has become an indispensable part of international shipping network. Apart

from marine industry, Singapore also have industrial advantages in air transport, oil refining, shipbuilding and other aspects, as well as important international financial center and trade center. By making the most of its advantages, a lots of additional functions and business derived from its international container transshipment business, enrich and improve the comprehensive serving function as a modern international shipping center.

Table 6 International container transit integrated services in Singapore

Service Agency	Services
International container management and leasing center	Developed container international transit business has attracted lots of shipping company to build their container management and deployment base in Singapore, so an international container management and leasing services market formed in there.
International ship building and repairing center	It is one of the biggest ship repairing base in Asia. There are one 400 thousand ton's giant dry docks and two 300 thousand ton's dry docks, which can repair ships of more than 2 million total gross tonnage. In addition, the dry dock can provide rehandling and building integration services to the international ships, too.
International ship bunker supply center	Singapore is the third largest oil refining center in the world. The top oil companies such as Shell, Exxon Mobil, BP has established its oil refining and storage

	<p>base in Singapore. On the base of such big scales of economy, the price of refined oil for ships is comparatively low, additionally, it is the communications hub of international lines, now Singapore has developed into an international ship bunker supply center.</p>
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Source from: <https://www.singaporepsa.com/>

Port of Singapore is famous all over the world for its operation efficiency. The port committed that for general container vessels, there will be no congestion and containers will be handled within 10 hours. Comparing to 5 days in Malaysia, it is far quicker. The efficiency of scale management efficiency in container terminals is also the highest in the world, the operating rate of ship is 280 cargoes per hour, 52 thousand TEU can be handled in one hectare, 1750 TEU can be handled in one-meter-long's berth, every staff can handle 3800 TEU, the production capacity is two times of Gaoxiong and 1.3 times of Shanghai; an average number of 61 vessels, 80 thousand containers and 8000 trucks can be handled in the port; the container terminal equipped with an unimpeded gate system, with the full automated and paperless operation, it will take only 25 s for a trail car to go through the gate into the port. All these high efficiency benefit from the port logistics information technology and the application of and automation equipment, by using the TRADENET and PORTNET electronic information system, the logistic companies is able to do the whole operation process automatically. TRADENET system belongs to the government, this system gathered all information from 35 regulatory authorities, freight forwarders, export merchant,

shipping companies, Third party logistic companies, warehouse, supplier, insurance companies, import merchant, banks and other units; ORTNET system is a national wide electronic commerce system, by using this system, all the marine industry such as government departments, agents, customs, port group, port users can connected with each other, and this connection has gradually extent to the rest port in the world; at present, there are more than 7000 users and this system handled more than 70 million transactions every year. With the application of all these modern science and technology, the rapid, safe and accuracy of logistic has been ensured, thousands of trail cars are handled every day and the accuracy rate is almost 99.99%.

4.4 Learning and studying

4.4.1 A good congenital condition is the foundation of success

From all the cases above we can see that a good congenital condition is the foundation of success.

Hamburg, New York and New Jersey or Singapore, they are all the important city in their counties and all of them are the pillar of the economy in the country. An advanced economy will lead to an international market, and an international market means there will be a lot of trades happened there. We all know that trade is the basis of shipping, a favorable economic condition will create the demand of transportation of goods and lead to the development of marine industry. A good economy condition means the city has a large hinterland and will have plenty of goods as well.

In addition, transportation system is also an important factor in the development of marine industry. From the cases of the port of Hamburg, the port of New York and New Jersey, and the port of Singapore we can learn that all these ports are located in

the region of transportation hub, which means all the cargoes arrive at the port can be easily and quickly transfer to other place.

4.4.2 Construction of port infrastructure

As I have discussed before, all the ports that want to catch the opportunity and develop must construct its infrastructure first. The good congenital condition is the foundation, but without the construction of port infrastructure, the port is not able to develop, as well. The infrastructure decided the capacity of the port, decided how much cargoes the port can handle.

All the ports I mentioned before have set building international transportation hub, logistics center and trade center as the goal, so they all concentrated on the construction of port transportation infrastructure system and regional transport hub infrastructure. The infrastructure of the port decide how many cargoes can the port handled, with advanced equipment, port time will be reduced and more vessels and cargoes can be handled. As a result, an increase number of shipping companies will be attracted to the port, may be located in the cities, so will the customers.

What's more, if a port want to develop to a collection and distribution center of international trade, the port must have a great collection and distribution system: port, road, railway, inland waterways and airports should be connected reasonably; a container multimodal transportation center must be formed in order to collecting and distributing the containers safely and quickly.

Last but not the least, the government should improve the connection of railway network in the hinterland, keep innovate in port transport technology and organization mode. For example: how to load more cargoes, double deck container transport by

trains, how to organize the schedule of container trains and set a specialize train for container transportation. With all the measures to construct the port infrastructure, the efficiency of transportation in the port will be improved and more customers and shipping companies will choose the port as the port of call.

4.4.3 Focus on the construction of electronic system

Modern port is more and more important in the whole logistics supply chain, in order to increase the operation rate of supply chain, not only should the port improve its own logistic system, but also it need to increase the collecting and distributing rate in its hinterland. From the cases we can see that the port of Hamburg has the EDI center, the port of Singapore has PORTNET system and TRADENET information center, all these electronic systems have helped the port to be more efficiency and more accessible for the customers.

The process of transportation is also the process of information updating. Without a good electronic information system, every part of transportation will be delayed.

A good electronic information system must be a multimodal transport information platform with transport chain management function, including data processing system for transaction processing and support system for auxiliary decision making, which ensured that all parts of multimodal transportation is involved in the publish cargo transportation information sharing platform. All the information can be seen clearly and it will be easier for customers and other related party to do the business.

In addition, with an efficiency system, all the procedures can be handled quickly as well: the trail car drivers can pass the gate automatically, the transshipment of cargoes will be more efficient and the port time will decline largely. Accuracy rate will raise,

and more customers will be attracted to do business in the port because it is not only efficient but also convenient.

4.4.4 Published preferential policies

The support of the government will help the development of the port. In addition to provide finance support to the port, publishing relevant preferential policies is another way that government can do to help the development of the port. The case of Singapore port is

Preferential policies such as tax free for import and export goods, foreign exchange policies, providing relevant subsidies for marine enterprises and so on, all these policies will create a better market environment to not only the customers but also all the related enterprises and institutions of marine. With a better environment to do business, an increase number of companies and customers will choose the port as destination or departure port, and it will help the port develop into an international shipping center.

4.4.5 Provide more additional services in the port area

In addition to the traditional services port has provided to its customers, the shipping companies, such as loading and unloading, storage, devanning, customs formalities and inspection and quarantine, the port may provide more additional services.

As a modern port, the port must have integrated logistics service function. Services like bonded processing, labeling, repackaging, classification and distribution will help the port to be more competitive in the market and appeal to more customers and

marine companies.

What's more, in order to help the port to be more efficient and convenient to the customers and related companies and institutions, it will be better to set up related institution in the port area: set up regulator such as customs, animal and plant quarantine, commodity inspection, sanitation inspection; set up transportation service institution such as foreign exchange bank, insurance companies, shipping companies and shipping agent. With all these relevant companies and institutions, perfect international port services will be provided to the import and export enterprises and it will be easier for them to connect with the international transportation and the international market.

Chapter 5. Analysis Shanghai's collection and distribution system

Sea-rail intermodal transportation is a way that cargos imports or exports by train will be transited directly to the vessels in the sea ports, or the cargos will be transited directly from the vessel to the train in the sea ports. Sea-rail intermodal transportation is an economical, environmentally friendly and efficient transportation mode.⁸

⁸ <http://baike.baidu.com>

Water transit is way that after the cargos are shipped on board, there is no way that they can be directly transported to the final destination and must transit to other ships in an intermediate port. According to the location of the port, different ways of transport mode, the meaning of water transit is not the same, either. In Port of Shanghai, there are three ways of water transit, they are: international transit, coastal transit and transit in inner branch of Yangtze River.

Sea-land transportation is more flexible than sea-rail intermodal transportation and water transit, sometimes, it is also cheaper. But it is not friendly to the environment and it is not efficient sometimes. So most international ports try to lower the percentage of sea-land transportation.⁹

In this part, I will analyze the three main mode of Shanghai's collection and distribution system separately, collect the data of port of Shanghai as much as possible, and try to find the main problems in different mode of transportation.

5.1 Sea-rail intermodal transportation

5.1.1 The separation of railway and dock

As talked above, there is only few of railway can get through the sea port in Shanghai. At present, only 2 frontiers of container berth in Jungonglu wharf have the railway line, others such as 16 container ship berths and six feeder berths in first-period to fifth-period of Waigaoqiao port area and large container berths in Yangshan deep water port are not connected to railway directly. But as we all know, Waigaoqiao and Yangshan are the two main port area in Shanghai and should be the essential fulcrum

⁹ Forbes Logistics 2006

of the development of sea-rail intermodal transportation. However, the disability of sea-rail intermodal transportation of these two main port will greatly hinder the development.

Although the Luchaogang railway container station, as the match project for Yangshan deep water port, had established and operated with Yangshan Port in the same time, it is about 40 km from the Small Yangshan Island where the Yangshan deep water port is located. What's more, the Small Yangshan Island is separated from the main land, which result in twice load and unload and a freeway short barge transportation for the cargo that need to be collecting and distributing by Luchaogang railway container station. For the reason above, there is no wonder that the cost of collecting and distributing will increase, port time will be longed and the efficiency of collecting and distributing will reduce. So there is no surprise that the operation of Luchaogang railway container station have been relatively sluggish. In 2013, there are only 57 thousand TEU of cargoes that are collecting and distributing in the railway container station, which is much less than the development goal of collecting and distributing of 100 thousand TEU.

Comparing to the in-use Luchaogang railway container station, the Waigaoqiao railway container station is far more lagging. It is still in the period of promoting establishment. The Taicang to Situan section of Shanghai Railway, which is connected to Waigaoqiao railway container station, is still in the period of feasibility study.

Last but not the least, the port area of Yangshan had already put the bonded policy into practice, and the port area of Waigaoqiao had implemented the linkage policy between area and port. But in the meanwhile, the Luchaogang railway container station and the Waigaoqiao railway container station are neither able to share the bonded policy or to

build a bonded area.

5.1.2 Inadequate supply of cargos

Considering the geographical position and economic haul distance, the inland economic hinterland of Shanghai port does not have advantages in railway collecting and distributing, comparing to the middle-west region, especially the area in the middle-west region which develop its inland waterway transportation slowly. But, of course, there is no comparison between the middle-west region and developed eastern region in the demand of export and import, because of its lagging behind development of economy.

With limited supply of cargos, the degree of competition between the sea ports of China will be deepened, main ports will focus more on the organization and attraction of the inland supply of cargos.

5.1.3 Incapable and unstable of transportation service

For the moment, external railway from Shanghai to other province still mainly relies on the Nangjing Shanghai and Shanghai Hangzhou railway. The sea-rail intermodal transportation channels of containers oriented north and south are from the Shanghai Nanjing Line to the Jinpu line to the Longhai line to the Shanghai Hangzhou line to the Zhejiang Jiangxi railway line. The main section of all of these lines are made full use of, and their transport capacity is saturated.

Although the completion of Shanghai Nanjing intercity high speed railway and Shanghai Hangzhou passenger line has released the conveying capacity of the

Shanghai Nanjing Railway and Shanghai Hangzhou Railway in a certain extent, it is still hard to operate a regular train which has a guaranteed stable transportation services. It is difficult to make sure that the station, line, frequency of the train, time and price are fixed.

In addition, Shanghai railway and Shanghai Zhapu Hangzhou railway is still in the planning and construction stage.

5.1.4 High freight rate

According to a research made by Shanghai Railway Bureau in 2012, the result shows that about 78% of participants were showing solicitude for the problem of how to save the cost of railway freight rate mostly.

In 2013, after the organization of China Railway Corporation, it began to clean up and make the regulation of freight charges, at the same time, it draw and published the standards and terms of the related railway services charges as well.

Though the freight rate for rail transportation per unit per mileage is lower than road transportation, due to the increasing of inland stations, handling charges in ports and stations, and charges of short barge between stations and the terminal users, between stations and Harbor docks, the freight rate for medium and short distance sea-rail intermodal transportation of containers is still significantly higher than sea-land transportation.

Last but not the least, even though compared with other main ports in China, Port of Shanghai is still at an unfair disadvantage. In the long distance railway transportation to important middle-west regions, such as Zhengzhou, Xian, port of Qingdao, port of

Tianjin and other ports still have an advantage over port of Shanghai, because of the load distance. What's more, all these ports I had mentioned before are equipped with the railway which can directly connect the port, so their freight rates are more competitive than Shanghai Port's.

Table 7 Comparison of the freight rates between cities in middle-west and main sea ports

Origin	Destination	Distance /km	Freight rate/¥	Loading cost/¥	Unloading cost/¥	Total cost/¥
Xian	Port of Shanghai	1534	5936.2	195	195	6326.2
	Port of Tianjin	1240	4949.3	195	195	5339.3
	Port of Qingdao	1366	5153.7	195	195	5543.7
Zhengzhou	Port of Shanghai	1022	5285.4	195	195	5675.4
	Port of Tianjin	815	3656.8	195	195	4046.8
	Port of Qingdao	854	3502.9	195	195	3892.9

Notes: All the data showed in the Table are collected from function of freight rate calculation in the China Railway Customer Service Center(www.12306.cn); The settings for the cargoes are: a 20ft container which is owned by the shipper which

contains “toy cars”; service in the origin and destination are all choosed the option“Railway loading and unloading”.

Source from:www.12306.cn

5.1.5 Weak in management system

There are lots of department will get involved in the process of sea-rail intermodal transportation, such as port authorities, railways authorities, shipping companies, customs, inspection and Quarantine Authorities. So the sea-rail intermodal transportation is kind of system engineering, it need all parties involved in the sea-rail intermodal transportation to share information with each other and cooperate with each other, in order to make the transportation faster, more efficient, seamless.

One reason that lead to the development of the sea-rail intermodal transportation in Shanghai port behind other main ports in China is lacking of collaboration and coordination between all parties. The management system is relatively backward, which will cause the isolation of the information among all departments, the information cannot be exchanged in time.

The management system of railway container transport in China is still not out of the mode of planned economy, which means it is still under the unified command and highly concentrated. This management system will make the operating mechanism inflexible and it is difficult to adjust to the demand of market.

At the same time, an efficient information system is absent, too. The information system of Shanghai port and railway system failed to link with each other, information is not able to share, and the documents is not transferred, either.

On the other side, the freight forwarding industry in railway transportation is also developed slowly. They don't have a strong sense of service and react to the demand of market tardily. They don't have an efficient way to transfer resource and information, either.

5.1.6 Low running speed of railway container train

For railway container trains, high speed is one important characteristic. In European countries, the railway for multimodal transport usually running at a speed of more than 100 km per hour, most of them can reach a speed of 120 km per hour, some railways for a special manufacture can even achieve a speed of 140 km per hour. In French, the highest speed of fast container train is 120 km per hour; in Germany, the express container train operating at night can be even faster and running at a speed of 140 km per hour.

However, the speed of container train in China is much slower, it will take more times for the cargoes to transport to a certain place. We always said that time is money, especially for some time-efficient goods, so there is no wonder that most customers will choose the sea-land transportation rather than sea-rail intermodal transportation.

5.2 Water transit

5.2.1 The limitation of natural condition

First of all, not like other natural harbor, the natural condition of Shanghai port is not good. Such as Yangshan Port, there is little cover in Shengsi sea area, which Yangshan port located in. The surface on the sea is quite unstable, which greatly hampered the

transshipping of international ships and feeder vessels.

In the next place, the adverse weather condition of Yangtze River is not good for the water transit, either. There are lots of adverse weather conditions may happened in Yangtze River, mainly are: fog, typhoon, rainstorm, cold, and snow... Located in the subtropical zone, the alternation of monsoon of Yangtze River is obvious during summer and winter, and the four seasons are quite distinct there, so the adverse weather has different characteristics due to the Festival. What's more, from the capesize of the passenger ship "Oriental Star" we can see that most of these adverse weather conditions are unpredictability and are not able to be detected, which largely increase the accident rate in Yangtze River.

In the end, the water level of Yangtze River would also impede the water transit. In recent years, affected by the global climate change, the torrential rain, drought and other extreme weather occurred frequently in Yangtze River Basin, leading to the advance or delay of the appearance of extreme water level, the randomness is increasing constantly, and the duration of extreme high or low water level undergo some changes, too.

From Table we can see that during the period from 2004 to 2012, the annual proportion of extreme water level in flood period is relatively stable, and according to the predict, the annual proportion of extreme water level in flood period of 2013 ~ 2020 is higher than that of the previous year.

Table 8 The historical water level of main hydrologic station in Yangtze River 2004~2012

Station	Averag	Highest water level	Lowest water level	Chang
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	e water level/m	Example/m	Appearance time(y/m/d)	Example/m	Appearance time(y/m/d)	e of water level
Yichang	42.54	51.65	2010/7/27	38.46	2005/2/18	12.33
Sha City	34.78	43.34	2004/9/9	30.54	2004/2/24 2007/1/11	10.92
Chengling ji	25.04	33.4	2012/8/1	19.29	2004/2/25	10.62
Hankou	23.94	27.3	2010/7/30	13.43	2004/5/9	11.23
Jiujiang	12.92	20.61	2010/7/19	7.77	2004/2/27	10.33

Source from:hydrological year book from 2004 to 2012

The low water level will cause the narrow of channel and the exposure of the shoal, which will have a bad effect on the navigation safety. When the water level is too high, the reef and the coastal beach will be inundated, and in addition, the velocity of flow will increase, which will make the boat speed up when running in backflow and slow down when running in down-stream. It is bad for the ship operators to control the vessel, and furthermore, it will influence the navigation safety, too.

5.2.2 Rules and regulations

Yangshan Port is located in a place which is classified as second-class sea area. According to the rules and regulations published by the government, such second-class sea area is not accessible to river boat, so the river boat is not able to get touch to the Yangshan Port. In the meanwhile, seagoing vessels are not suitable to running in Yangtze River. So presently, the transshipping of cargo among Waigaoqiao and Yangshan Port can only be achieved by the shuttle bus. But by that way, the cost will increase because of the repetition of cargo packing. In addition, the efficiency of transport will decrease, too.

Also, according to the < Regulations of the People's Republic of China on international maritime transport > article twenty-eighth, "Foreign international vessel operators are not allowed to engage in the operation of vessel transportation between Chinese ports, or by any other ways to do the business such as using the chartered vessels and shipping space that have the nationality of China, or by switching space with vessels that have the nationality of China. Currently, though the coastal area is open to some Chinese vessel with convenient flag, due to the operation of customs, inspection and quarantine, and other standard procedures doing by the relevant departments cannot connect to each other well, so in the actual operation, only few vessels can finish such process. The right of transportation between the ports lead to the result that foreign liner company is not able to doing the water transit through its own lines.

5.2.3 The construction of inner waterway

There are about 210 inland waterway in Shanghai, the navigable mileage is about 2100

km. River ports mainly spread in about 170 inland waterway in Shanghai, mostly are concentrate in Yunzao Jing, Dazhi River, Chuanyang River, Pudong Canal... There are “one ring”, from Huangpu River through Dapu Line, Zhaojiagou, Zaobang, Port of Youdun, then go back to Huangpu River; “ten shooting” refers to the Shanghai Hangzhou line, Taipu River, Su Shen outer harbor line, Shen Su Hong Kong line, Luo river, Chuan Yang River, large reed line, Jinhui Hong, Hong Kong Longquan, flat Shen line.

But comparing with the quick development of sea port, the construction of the inner river and the river port is far flower because of lacking of finance and policy support, which will lead to the low efficient connection of the river ports and sea ports. What’s more, the standardization of river ships is low.

Last but not the least, the construction of inland waterway in Yangtze Delta region is relatively backward, apart from the inland water transport in the trunk line of the Yangtze River, the class of other channels are low, so are the river ports. During the process of inland waterway construction, the construction of some highway, main rail lines also limit the net height of inland waterway and block the way of large river vessels.

5.2.4 Clearance of span

The clearance of span is the key factor that will restrict the river-sea-through transportation. For the moment, the shortage of clearance of span is the bottleneck problem for the interprovincial shipping in the inland river of Yangtze River Delta. For example, the clearance of span of the third and fourth class channel of trunk line in the south area of Jiangsu Province can be 5.2 meters and 4.6 meters, so that the container

ships which can fully loaded three layers (three layers need a 7 meters' clearance of span) are not able to pass the channel unless they only loaded two layers. The capacity will lose one third and the transportation cost for a single ship will increase. Not only will it affected the efficiency of transportation, but also lead to the problem of imbalance in freight and more reloading in port.

5.2.5 Limited by bonded function

On reason to construct the Shanghai international shipping center is to promote the international competitiveness of Shanghai port, in order to participate in the competition of pivotal port in East Asia.

Yangshan deep water port is the first place in China that implement the bonded port policies, the policies is similar to the international free port policies. The supervision of customs is broaden and preferential so as to attract shipping companies and cargo owners to choose the Yangshan deep water port as the transit port.

Since the implement of the bonded port policy, the number of cargoes transit in Yangshan port has increased a lot, but the actual situation reflected by the cargo owners and shipping companies showed that the function of bonded policies have a certain distance with the internationally accepted free port policies. The port of Yangshan is still lack of "freedom", the freedom of import and export goods, freedom of financial exchange and freedom of staff is limited, the policy of "cargo within territory but out of customs" is not actually realized, the water transit function of the port can't be brought in to play.

In addition, there is not enough place for the cargoes to devanning and do the LCL business, this congenitally deficient is also an important restriction for the

development of international transit business in port of Shanghai.

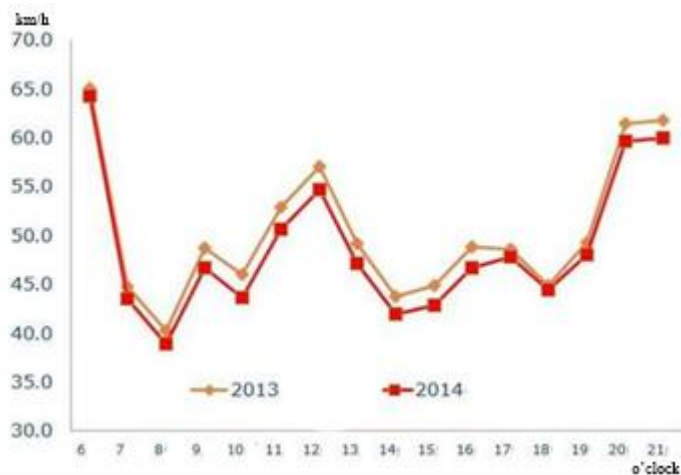
5.3. Sea-land transportation

5.3.1 Congestion of traffic

As is known to all, Shanghai is one of the most crowded cities in the world, and get the 24th place in the statistic of the most crowded cities. The traffic jam of expressway is much worse, which is 6th congested around the world. A report showed that, only in the year of 2014, every driver may caught in a traffic jam during the evening peak for more than 100 hours. The outer ring (Waigaoqiao direction) of Shanghai never be travelable during the rush hour, which will cause serious congestion to the container transit to the sea port. The inner ring is designed for only medium and small vehicles to pass, not for trucks. The trucks to transit containers can pass the inner ring only if you want to the serious accident happened again.

From graph 1 we can see that during the rush hour, the average speed in express way is under 40 km/h, which is far slower than the lowest speed limitation 60km/h, even in the off-peak period, the speed is low, too.

Figure 2 Time distribution of average speed in expressway during working days



Source from: www.pconline.com.cn

Also, the external express way system in Shanghai is extremely weak. Today, there are few express ways are connected to the port area, and only S2, G1501, S20 and A30 can connect the city express way network to the express way network of Yangtze River Delta. What's more, S2 and A30 are not free to go through, which will increase the transportation cost for the company.

Last but not the least, with the increasing traffic flow in the East China Sea Bridge, accident rate certainly will increase, which will have a bad influence to the traffic situation.

5.3.2 Lack of management

There are nearly 30 thousand trucks in Shanghai, with external trucks without entering in the records, the actual number of trucks operating in Shanghai may be 40 thousand to 50 thousand. More than tens of thousands drivers, mostly have the origin of the

Henan and Shangdong, operate their trucks under affiliated operators.

At present, the situation of container road transportation market is comparatively chaotic, malignant competition from individual proprietor leads to the quitting of state-owned enterprises, only few state-owned enterprises are willing to get involved in the container road transport market.

The related organization in this industry had made a commission recently to the Shanghai Maritime University to work on the related contract model for container road transport market. But it cannot be predict that in what extend will this contract model help to solve the existing chaotic situation.

Chapter 6. Improvement of Collection and distribution system of Shanghai

In order to solve the existing problem of Shanghai's collection and distribution system I have found in Chapter 5, I will combine them with the experience learn from the foreign port in Chapter 4, try to find the improvement measures for the port of Shanghai.

6.1 Sea-rail intermodal transportation

As far as I am concerned, sea-rail intermodal transportation should be the main way

for Shanghai to do the transportation, especially under the development of the Belt and Road, most cargoes are from the middle-west regions. The main measures to develop the sea-rail intermodal transportation are:

6.1.1 Promote the construction of infrastructure

The key point to solve the problem of separation of the port and railway, railway transportation capacity and other issues is to pay more attention to the construction of infrastructure of sea-rail intermodal transportation. The port of Shanghai should strengthen its connection with railway administration, establish the railway collection and distribution system which can expand to the main port area of Shanghai port as soon as possible; accelerating the construction of Shanghai railway, Shanghai Zhapu Hangzhou railway, and the planning and construction of the East China Sea Bridge II, try to form a platform of basic railway transportation which can provide smooth channel to the outside, perfect internal branch lines and hub station with full function. At the present stage, the pivotal port function of Luchaogang railway container station should be gave full play to, in addition, the port of Shanghai should also bring the transportation capacity advantage of Pudong railway into full play, go a further step to promote the handling efficiency of Luchaogang railway container station.

In addition, it is needed to carry out the feasibility study of the new east railway bridge actively, the government should accelerate the construction of Shanghai railway in Waigaoqiao port area, improve the proportion and efficiency of sea-rail intermodal transportation, try to solve the necklace which restraint the development of sea-rail intermodal transportation.

6.1.2 Expend source of inland cargoes actively

Considering the competition of cargoes from cross economic hinterland around the port area, substitutability by other transportation mode and the radiation range of main railway line, I will classified the inland source area. For example: the hinterland of port of Shanghai can be divide in to the core hinterland, the general competitive hinterland and the hinterland with potential. The core hinterland includes Southern Jiangsu, Northern Zhejiang area; the general competitive hinterland consists of Anhui, Jiangxi, Hunan, Hubei, Henan and other areas; the hinterland with potential involves in Sichuan, Shaanxi and other western regions. The port of Shanghai should rely on its concentrated and comprehensive shipping line network, seek for more hinterland cargoes actively, develop the core hinterland, strive for the general competitive hinterland and cultivate the hinterland with potential.

At the government level, the communication and cooperation with the government of inland cities should be strengthened, in order to build the market of sea-rail intermodal transportation; at enterprise level, the port of Shanghai should stick to the principle of mutual benefit and win-win, try its best to provide the thorough and convenient cargo service to its customers, for example: port of Shanghai must accelerate the construction of inland dry port and cooperate with enterprises which already have built the inland dry ports.

6.1.3 Establish the integrated coordination mechanism

Breaking the traditional vertical division system, establishing a sea-rail intermodal transportation coordination institution which is able to coordinate the construction of infrastructure, transportation organization, information sharing between departments

and other aspects of the work; formatting a comprehensive container sea-rail intermodal transportation system, gathering the information from companies of consignor, port enterprises, railroad transport enterprises, shipping companies, freight forwarding companies, banks and inspection institutions; establishing an electronic data exchange system for users, and building a modern electronic commerce information platform for container sea-rail intermodal transportation, with this platform, online booking, booking, inquiry, consultation, online trading, warehousing management, agent management, electronic payment and personalized service and other functions can be done easily and conveniently by customers themselves; promoting the integration of business such as container management, empty container transportation, shipping space, cut-off time and other business.

6.1.4 Introduce support policies

Sticking to developing the container sea-rail intermodal transportation with marketization operation, in the meanwhile, introduce related support policies in the interest of the healthy and rapid development of the container sea-rail intermodal transportation market. The government of Shanghai should format the development planning of container sea-rail intermodal transportation in port of Shanghai, introduce support policies such as tax preferences and financial assistance.

The government also need to focus on cultivating and support one or some container sea-rail intermodal transportation carriers which have the advantages of technology, finance and the potential of development, use them as the business entities of container sea-rail intermodal transportation market to associate with other freight forwarders and other related operators, in order to form the organization network of container

sea-rail intermodal transportation business.

What's more, as a builder of good market environment, the government of Shanghai should clean up the unreasonable charges that existing in the process of container sea-rail intermodal transportation. For instance, the port of Shanghai may consider merging the fee items of truck short barge, Luchaogang railway container station and Yangshan deep water port, implementing the unified package charges of port and stations.

6.1.5 Cut down the freight rate, keep the stable of transport capacity

The government of Shanghai may provide some preferential policy and special allowance to the companies which choose the railway short barge between the Yangshan port and Luchaogang railway container station, reform the structure of the railway freight rate, and adjust the freight rate according to the change in the market.

Moreover, in order to keep the transport capacity stable, the government may improve the organization ability for transportation, try to guarantee the station, line, frequency of the train, time and price are fixed, increase the transport density of railway for sea-rail intermodal transportation.

6.2 Water transit

From <On the implementation of the construction of two centers promoting by the State Council >, we can see that government of Shanghai point out specially that: improvement the modern collection and distribution system, make great efforts in development of water transit. The main measures to develop the water transit in the

port of Shanghai are:

6.2.1 Enhance the construction of base and supporting facilities

The port authority need to accelerate the construction of special quay for container water transit.

On the one hand, it will make the shuttle bus and other vessels for transit berth in a single point and reduce the influence on the regular production in the port area so as to make sure that the branch vessels can berth on time, load and unload on time, and guarantee the shipping schedule efficiently. What's more, the operation efficiency of dock will be improved as well.

On the other hand, for the supporting facilities of inner water transportation, the port authority need to accelerate the construction of harbor basin of inner water transportation in Yangshan port. The port authority also need to strive for making the inland waterway of Yanghsan and the inland waterway of Luchaogang connected, set up the water bus for inner water container transportation.

Last but not the least, the government should speed up the construction of the high-grade waterway system in Yangtze River Delta, especially the waterway network of "one circle and ten radiation", solve the problem of the "Zero Distance" connection between the Zhaojiagou waterway, Lu line waterway and Waigaoqiao and Yangshan Port as soon as possible, and form the collection and distribution channel for river-sea-through transportation; improve and integrate the resource inland port in Yangtze River Delta, make full use of the golden channel of Yangtze River, establish and improve shipping alliance in Yangtze River which may include the river-and-sea coordinated transport, inland river shipping and port resources integration; revise the

<navigation standard of inland waterway>, raise the lowest standards for the navigation, identify the reasonable classification level of channel in Yangtze River region.

6.2.2 Take a devious route to evade the coastal transportation rights

As I have mentioned before, the coastal transportation rights in China imposed a strict ban on foreign vessels (international liners without a Chinese nationality) operating the transportation between two Chinese ports. The carriers of foreign vessels may choose a devious route outside the country's borders to evade the limitation of the coastal transportation rights. This measure not only will guarantee the national sovereign rights and national safety not violated, but also make the carrier of international line benefit from the transportation, and protest that more international liner will call at the port of Shanghai.

6.2.3 Update the existing “shuttle bus” mode completely

As I have mentioned in chapter 5, the transfer in Yangshan port and Waigaoqiao port mainly relies on the “shuttle bus”, the capacity of shuttle bus is low and the efficiency is low, either. That’s one reason that make the transfer capacity of Yangshan port not easy to improve.

To direct against this problem, the government of Shanghai should upgrade the existing “shuttle bus” mode completely: first of all, add the number of shuttle buses which operating between the second-period of Waigaoqiao, the forth-period of Waigaoqiao and Yanghsan port, try to solve the existing problem of capacity;

secondly, expand the scope of operating for shuttle bus, allowing the shuttle buses to carry cargoes in bond, in order to improve the linkage between Yangshan port and Waigaoqiao port, and provide a better environment for the transshipment business; thirdly, updating the mode of existing water shuttle bus short barge; last but not the least, make the type and transport capacity of shuttle water buses between the second-period of Waigaoqiao, the forth-period of Waigaoqiao and Yangshan port standardization, at the same time, open up new route for the transportation of shuttle water buses between the inland waterway of Yangshan and the inland waterway of Luchaogang.

6.2.4 Established a reward mechanism

Learning from the successful cases, I think it will be good to establish a reward mechanism.

For the marine companies which transship their cargoes in the port of Shanghai more than 50 thousand TEU every year, encouraging them by award; for the marine companies which transship their cargoes in the port of Shanghai more than 10 thousand TEU every year and the volume of transit cargoes is greater than the average volume of the last two year, the port authority will give them some discount on the port tariff, the discount is based on the growth of the volume of transit cargoes.

In addition, special treatments such as berthing priority and handling priority are available for the VIP shipping companies in the rush hours, in order to attract the liners to call at the port of Shanghai and transit the cargoes in the port of Shanghai.

6.2.5 Promote the standardization of ship type

In the interest of development of inland waterway container transport in Shanghai, the port authority should take advantages of the inborn navigation condition in the port of Shanghai, develop the specialized vessel with different tonnage and different type, innovate in the vessels for the river-and-sea coordinated transport which is serialization and standardization and is able to meet the demand of Yangtze River channels, build the vessels which is able to operate in not only the sea but also the river.

What's more, the structure of inland waterway transportation capacity also need to adjust, use vessels which have a good performance, economic and practical in use and have low price instead of the vessels with low safety and low speed, so as to solve the problem that it is difficult to make the river boats enter into the sea and it is too expensive to make the sea vessels to enter the river.

6.2.6 Build the linkage mechanism

Inland waterway container transportation is a project which need strong relevance and systematicness. The government of Shanghai need to give full play to policies, information, business organizations, ships, docks, improve the waterway transportation.

In addition, the government of Shanghai also need to promote the integration of the inland waterway container transportation information in Yangtze River Delta, develop the linkage mechanism actively, develop a platform for the data of inland waterway transportation, expand the channel for network business, standardize the business process of container transportation, so as to provide service with quality and

convenience to shipping enterprises.

6.3 Sea-land transportation

With the problem of traffic congestion in the highway, low transportation efficiency and unfriendly to the environment, more and more international shipping centers pay attention to the transfer of capacity. In port of Shanghai, the proportion of collection and distribution system need to change, too, the percentage of sea-land transportation need to decrease. But the adjustment of collection and distribution system cannot finished in a short time, so at present, we have to find the way to solve the congestion in the road as much as possible.

6.3.1 Draft the preferential policies for the tolls

For the sake of attracting more cargoes to the port of Shanghai and cut the cost of collection and distribution in the port area, I suggest that exempt container vehicles whichinward and outward the port through the freeway from tolls or give them some subsidies.

6.3.2 Construct the competition system of highway container transportation market

The main task to construct the collection and distribution system of highway container transportation is to build a fair competition system of the market. The concrete measures that the government is able to take include: speeding up the process of legislating the laws and regulations of highway container transportation, clearly defined the illegal and irregular acts while the process of highway container

transportation, confirm the subject of law enforcement and punitive measure in the form of law and regulation; crack down on unfair competition and practice such as overloading, evasion of highway fee, using illegally license plate and so on, try to create a good market environment for freeway container transportation.

What's more, by using means of economy and administration, phase out the container vehicles which are technological laggard, have security threat and have a low efficiency of operating, in order to ensure the efficiency and safety of highway container transportation system.

6.3.3 Strengthen the management and construction of highway

At present, the most feasible way to improve the collection and distribution system in Shanghai is to strengthen the construction of highway. The government of Shanghai should set up accommodation lanes for the container trucks and prohibit other cars passing them or only can pass these accommodation lanes for certain time. The government also should restrict the ordinary vehicles from the freeway that connect with the port area, to make sure that the freeways are travelable for container trucks. In addition, the government and transportation authorities should improve the process of passing the barrier, try to simplify the process and increase the pass rate, in order to achieve the purpose of improving the efficiency of transportation.

Last but not the least, the companies of freeway transportation should avoid operating in the rush hour, and avoid transport cargoes in the main road, in these way the transport efficiency would be improved to a certain degree.

Chapter 7. Conclusion

Under the National strategic pattern, in August 2014, the president of China, Xi Jinping asked Shanghai to participate in the construction and development of "the Silk Road Economic Belt" and "maritime Silk Road", in accordance with the unified planning and unified deployment of the nation. Shanghai should promote the construction of the Yangtze River Economic Belt, it is the mission of Shanghai during the 13th Five-Year plan period.

One important part of construction of the 21st century Maritime Silk Road, the new Silk Road Economic Belt and the Yangtze River economic belt is to build and improve the interconnection and interworking of the infrastructure between regions, so as to promote the economic development not only regions of China, but also countries along the silk road. In the terms of the interconnection and interworking of the infrastructure under the strategy of the Belt and Road, it is important to build the sea and land transportation channels between China and the countries along the silk road, but optimize the interconnection between different transport modes is the key point to develop the strategy of the Belt and Road.

The port of Shanghai, the largest container port in China, even the largest container port in the world, must catch the opportunity and play its leading role in the development of the Belt and Road, must do something to improve the collection and distribution system, and must change the proportion of Shanghai's collection and

distribution system. Developing the intermodal transportation, improving the collection and distribution system and building an integrated transport network is also a positive response to the implement of the national strategy.

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