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**WORLD MARITIME UNIVERSITY**

Shanghai, China



**Research on The Impact of Yangtze River Delta Integration on  
the Development of Ports Therein**

By

**JIN ZHENG**

**China**

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

**MASTER OF SCIENCE**

**(INTERNATIONAL TRANSPORT AND LOGISTICS)**

2019

## **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.

**Supervised by**  
**Professor**  
**YinMing**  
**Shanghai Maritime University**

## **Acknowledgement**

First and foremost I want to express my deepest appreciation to my supervisor, Professor Yin Ming. Whenever I asked him about my research, he always gave me scientific advice and patient guidance immediately. Without his help, I cannot finish this work.

I would like to express my profound gratitude to my teacher, Professor Zhang Jie, and all classmates of ITL2019. Mrs Zhang plays a very important role in my college life and has a lot of impact on my college life. My lovely classmates have enriched my college study and life. Because of them, I could enjoy studying in World Maritime University.

I also wish sincerely to express my thanks to my best friend for providing me the access to valuable information and databases, whose brilliant ideas have made immensely constructive.

Finally, my thanks would go to my beloved family for their consistent supports and encouragement. They always give me meaningful advice and help during the writing of the thesis. In addition, they encourage and trust me in my life all the time.

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## **Abstract**

With the development of economic globalization and regional economic integration, the logistics node function of port groups in the Yangtze River Delta plays an increasingly important role in the economic integration development of the Yangtze River Delta region. In this paper, the Yangtze River Delta ports cluster as the research object, according to the regional economic development and port development during the integration of the Yangtze River Delta, to predict the new requirements and impacts that the Yangtze River Delta ports cluster may face, and to analyze the competition and cooperation relationship between ports. Then, the positive and negative impacts of integration are discussed, and Pareto improvement analysis is carried out according to the existing situation of port resource integration, and effective suggestions are given based on the analysis.

**Key words:** Integration, Yangtze River Delta Port Cluster, Competition and Cooperation, Resource Integration, Pareto Improvement

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## **1 Introduction**

### **1.1 Research Background**

At the opening ceremony of the first China International Import Expo, Chinese President Xi Jinping pointed out in his keynote speech that in order to better play the important role of Shanghai and other regions in opening up to the outside world, he decided to support the development of regional integration in the Yangtze River Delta and upgrade it into a national strategy. In terms of regional space, the Yangtze River Delta is located in the intersection area of the "one belt and one road" and the Yangtze River economic belt, which has played an important leading role in the development of the Yangtze River economic belt. At present, the Yangtze River Delta is a leading demonstration area in transformation and development, opening to the outside world, and building the source of scientific and technological innovation. It is of great significance to upgrade the regional integration of the Yangtze River Delta into a national strategy.

### **1.2 Research Objectives**

Firstly, the competitive game model and cooperative game model in game theory are used to analyze the situation of port enterprises. Secondly, the impact of Yangtze River Delta integration on ports is analyzed from both positive and negative aspects. Thirdly, under the background of Yangtze River Delta integration, the future development path of Yangtze River Delta ports is discussed. In addition to qualitative analysis, the optimal model of resource allocation is used for quantitative analysis.

### **1.3 Literature Review**

Wu Hanhong [1] (2008) analyzed the causes of monopoly by examining the

short-term and long-term behavior, price behavior and non-price behavior of monopoly firms, performance evaluation of monopoly and related policy issues, including the analysis of product market monopoly and the general analysis of factor market monopoly, which illustrated the monopoly brought about by monopoly. Policy issues, combined with China's future anti-monopoly issues, put forward policy recommendations.

Zhang Xu and Liu Wei [2] (2008) analyzed the foreign regional port resources integration model, obtained the corresponding law of the regional port resources integration model, and then analyzed the current integration model of the Yangtze River Delta port. They believed that Shanghai Port, Suzhou Port, Ningbo-Zhoushan Port were advancing towards the government-led tight resource integration model, and pointed out that the Yangtze River Delta port resources integration should break out of the zoning restrictions. The integration development is realized and the preliminary conception of implementing the government-led alliance port integration model is given.

Duan Lulu [3] (2014) based on the existing port competition research, aiming at the limitations and shortcomings, established the three-stage dynamic game model of port price service, and the port group competition and cooperation model under the single-population evolution based on Bertrand game model, studied the stability strategy of port group competition. Finally, according to the numerical results of the model and the existing experience abroad, the development status and existing problems of the Yangtze River Delta ports cluster are analyzed, and suggestions and suggestions are put forward.

Chen Jihong, Zheng Shiyu, Luoping, Chen Feier and Ningyue [4] (2015) based on

the statistical survey data of 16 major ports in the Yangtze River Delta, based on the theory of fuzzy clustering, through the combination of statistical data and expert survey to determine the main indicators of port logistics service function classification and its analysis data, combining quantitative and qualitative methods, objectively classified results are obtained.

Zhang Ding, Cao Weidong, Fan Jiaojiao, Zhu Shengqing and Yang Ying [5] (2014) based on the input-output index of urban logistics, with the aid of data envelopment analysis and exploratory data analysis method, analyzed the overall evolution trend, structure and spatial pattern evolution process and evolution mechanism of urban logistics development efficiency in the Yangtze River Delta from 2002 to 2011, and obtained the location advantages, economic policies, industrial knots. Structural adjustment, transformation and upgrading, infrastructure investment and technological progress jointly promote the transformation of the spatial pattern of urban logistics development efficiency.

Guo Zheng, Dong Ping, Lu Yuqian, Huang Qunfang and Ma Yingyi [6] (2018) selected 14 container ports in the Yangtze River Delta as research objects. Based on the data of container throughput and number of container ports from 1990 to 2015, Gini coefficient and migration-share analysis were used to analyze the overall distribution trend and evolution process of container port system in the Yangtze River Delta, focusing on its evolution. The model and the influencing factors of evolution are analyzed.

Dong Yanga, Kelly Yujie Wangb, Hua Xuc, Zhehui Zhang<sup>[7]</sup>(2017) review the development phases of the Yangtze River bulk port system, taking the theoretical (container) port evolution model as a benchmark. Then several hypotheses

addressing certain features of bulk port system development are proposed, followed by using panel data analysis to test these hypotheses. Based on this discussion and analysis, the major driving forces that are reshaping bulk port development along the Yangtze River are then summarized. It is found that evolution of the Yangtze River bulk port system in general follows the port development models in previous literature. However, the trend toward regionalization and an offshore hub have not appeared.

Lili Song , Marina van Geenhuizen<sup>[8]</sup>(2014) estimate the output elasticity of port infrastructure through production function, applying panel data analysis for the period of 1999-2010, and calculate the model at the level of four port regions as well as the port province level. The results indicate clear positive effects of port infrastructure investment in all regions.

Patrick Witte, Bart Wiegman, Adolf K.Y. Ng<sup>[9]</sup>(2019) presents a systematic and integrated review of inland port studies, covering 80 international peer-reviewed academic journal papers on inland port development between 1992 and 2017. The results show that much attention is paid on inland ports as components of the 'transport/logistics/supply chain' systems (follower), while their roles as components of the 'regional' systems (leader) are largely overlooked. Such a tweaked focus is likely to pose significant impacts on planning, management, and governance of inland ports.

Weiwei Huo, Wei Zhang, Peggy Shu-Ling Chen<sup>[10]</sup>(2018) proposes the implications with regard to the dynamic port cooperation development for Chinese ports and terminal operators. In theory, the research enriches the current studies by discussing the recent development systematically on port cooperation incentives and trend in

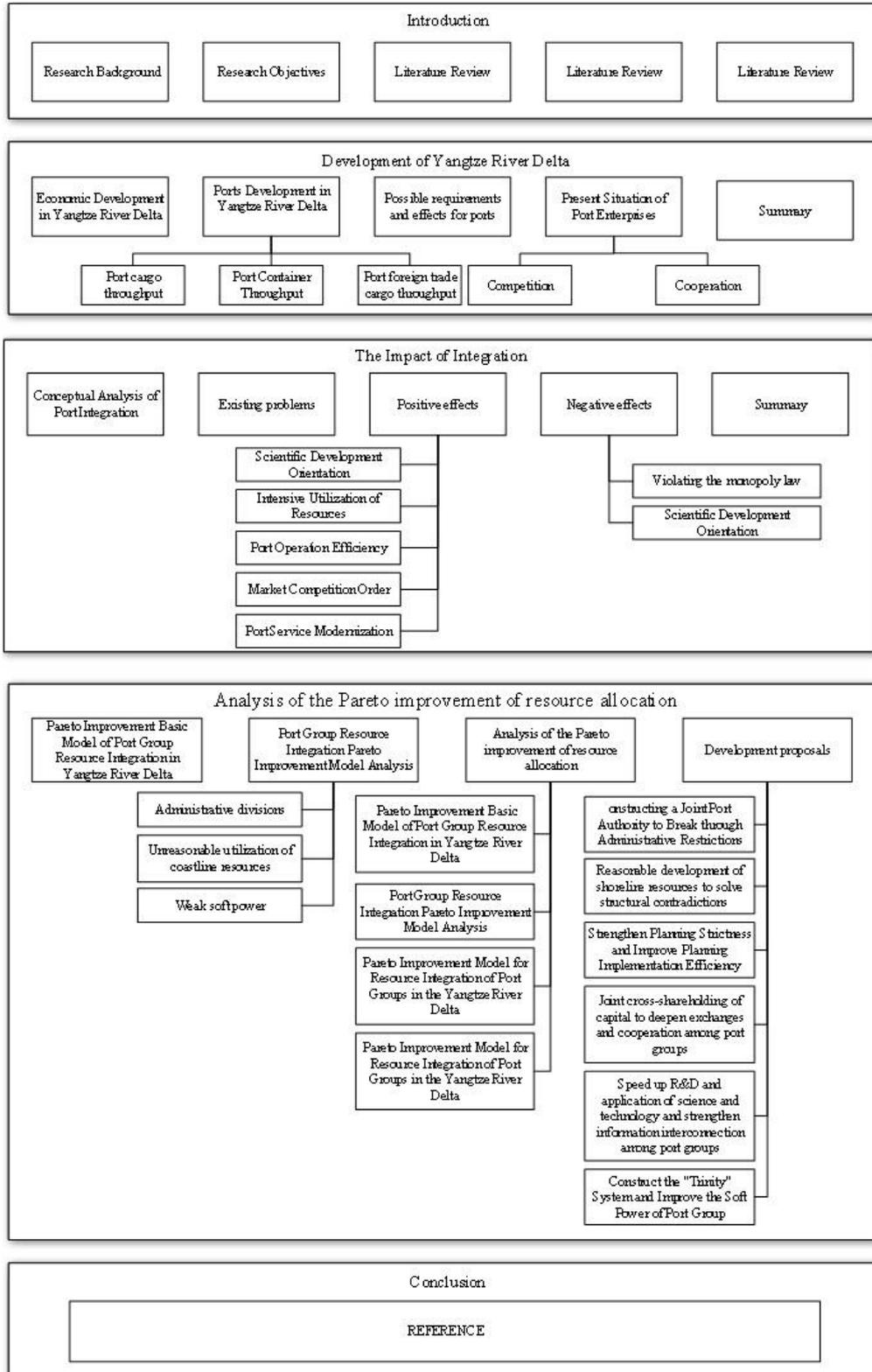
China, as well as the modes of China's international port cooperation strategy. In practice, it draws implications on the performance evaluation and risks associated with Chinese port.

#### **1.4 Methodology**

##### Pareto improved model

Pareto improvement refers to a change in the state of resource allocation that increases the interests of at least one party and does not deteriorate the interests of anyone. In this paper, the Pareto improved model is used to analyze the resource allocation between ports in the Yangtze River Delta, and the absolute cooperation region, potential cooperation region and absolute cooperation region are divided by the model, and corresponding improvement suggestions are put forward according to the results.

## 1.5 Layout of this dissertation



## **2 Development of Yangtze River Delta**

### **2.1 Economic Development in Yangtze River Delta**

On November 5, 2018, when President Xi Jinping delivered a speech at the opening ceremony of the first China International Import fair, he said he would support the development of regional integration in Yangtze River Delta and become a national strategy, focus on the implementation of the new development concept, build a modern economic system, deepen the reform at a higher starting point and open to the outside world at a higher level, with the "one belt and one road" construction and the Beijing Tianjin Hebei Association. Cooperate with development, the development of the Yangtze River Economic Zone and the construction of the Great Bay Area of Guangdong, Hong Kong and Macao to improve the spatial layout of China's reform and opening up.

It is not surprising that the development of regional integration in the Yangtze River Delta has been upgraded to a national strategy. The Yangtze River Delta region, including Shanghai, Jiangsu, Zhejiang and Anhui, has a permanent population of 220 million. It is one-sixth of the country's total economy in 2017. It is nearly one-fourth of the country's total economy. It is an important engine of China's economic growth and plays a decisive role in China's economic and social development and construction.

Since the reform and opening up, the Yangtze River Delta urban agglomeration has made great achievements in economic development as a pioneer area of China's opening up. Under the background of globalization and marketization, the market mechanism and factor market in the region have been continuously improved, the

total economic volume of the region has expanded rapidly, and the industrial structure has been continuously upgraded. According to the speed of economic development and the evolution process of industrial structure, the regional development of urban agglomeration in the Yangtze River Delta can be roughly divided into three stages: the economic transformation period in the 1980s, the comprehensive liberalization period in the 1990s and the transformation of core cities and the overall development of the region since China's entry into WTO in 2002. From the point of view of the overall economic scale growth, the gross domestic product of the Yangtze River Delta urban agglomeration region increased from 64.478 billion yuan in 1978 to 8631.4 billion yuan in 2010, with an average annual growth rate of 18%, which is far higher than the average annual growth rate of the whole country. In terms of specific time series, from 1978 to 1990, the regional gross domestic product increased from 64.478 billion yuan to 31.174 billion yuan, with an average annual growth rate of 13%; from 1991 to 2002, the regional gross domestic product increased by 2435.248 billion yuan, the economic scale expanded nearly eight times, and the average annual growth rate continued to rise to 19%; after joining the WTO in 2002, the growth of economic scale further expanded, reaching 863.12 billion yuan by 2010. The average annual growth rate has declined from the previous stage, but it still maintains a 17% high growth level. Comparing the economic scale of three provinces and cities within the urban agglomeration region, we can see that the advantages of Jiangsu's total economic scale began to appear in the 1990s, and by 2010, Jiangsu's intellectual economy scale accounted for 77% of the whole region. The economic growth of the three provinces and cities has experienced three stages: slow growth, rapid growth and high growth. In the first two periods, the average annual growth rate of Zhejiang Province was the highest, followed by Jiangsu and Shanghai. After 2002, Jiangsu's economic growth began to surpass that of Zhejiang and became the fastest growing region, reflecting the

achievements of Jiangsu's economic development since it entered the era of globalization in an all-round way.

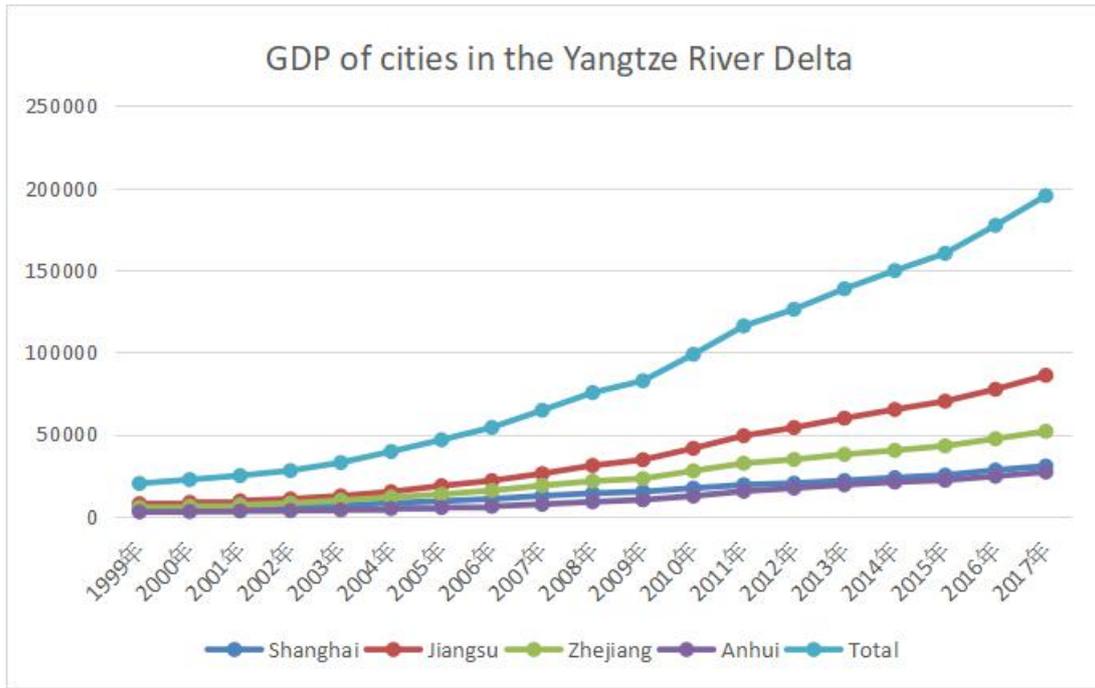


Figure 2.1 GDP of cities in the Yangtze River Delta from 1999-2017

Source: National Bureau of Statistics of China

## 2.2 Ports Development in Yangtze River Delta

The premise of the integration of the Yangtze River Delta is to realize the interconnection of infrastructure, the port is an important carrier to realize the most basic tangible interconnection, and plays an important strategic pivotal role in promoting the integration of the Yangtze River Delta. Therefore, it is necessary to study port development. Among many indicators, port cargo throughput, port container throughput and port foreign trade cargo throughput are relatively representative. They can reflect the comprehensive capacity of the port. Therefore, the development of the port in the Yangtze River Delta is analyzed from these three aspects.

### **2.2.1 Port cargo throughput**

In 2017, the total cargo throughput of ports above the national scale is estimated to be 12.637 billion tons, an increase of 6.34% over the previous year, an increase of 3.2 percentage points over the previous year. Among them, the total cargo throughput of coastal ports is 8.626 billion tons, and that of inland ports is 4.022 billion tons.

In 2017, the cargo throughput of major ports in the Yangtze River Delta region reached 4.513 billion tons, an increase of 8.12% over the previous year, accounting for 35.71% of the cargo throughput of ports above the national scale. Among them, the cargo throughput of Shanghai Port reached 749 million tons, an increase of 6.1 billion tons, an increase of 10.88% over the previous year; and the cargo throughput of major ports in Jiangsu Province reached 749 million tons, an increase of 6.1 billion tons over the previous year. The volume is 2.212 billion tons, an increase of 7.84% over the previous year; the cargo throughput of major ports in Anhui Province is 388 million tons, an increase of 2.73% over the previous year. The integration of regional port resources has greatly promoted the production efficiency of port groups in the Yangtze River Delta region, and strongly supported the 21st century Maritime Silk Road Initiative and the smooth implementation of the national strategy of the Yangtze River Economic Zone. Compared with 2016, the cargo throughput of major ports in the Yangtze River Delta region increased significantly in 2017. Jiaying Port led the major ports in the Yangtze River Delta by 29.52% as Dushan Coal Transfer Terminal entered the trial operation stage and D6 berths in Chapu Port Area and C5 and C6 berths in Haiyan Port Area were completed and accepted. In addition, Huzhou Port, Jiangyin Port and Hefei Port led the increase in cargo throughput. The cargo throughput of other inland ports also increased by more than 20%.

### **2.2.2 Port Container Throughput**

In 2017, the container throughput of ports above the national scale reached 236.82 million TEU, an increase of 8.33% over the previous year. Among them, the container throughput of coastal ports reached 209.83 million TEU, and that of inland ports reached 26.99 million TEU.

In 2017, the container throughput of major ports in the Yangtze River Delta region reached 85.5022 million TEU, an increase of 9.53% over the previous year, accounting for 36.12% of the total container throughput of ports above the national scale. Among them, the container throughput of Shanghai Port reached 40.2321 million TEU, an increase of 8.38% over the previous year, and the container throughput of Shanghai Port continued to be the world's largest. The capacity of Zhejiang's main ports has increased by 27 million 214 thousand and 300 TEU, up by 14.16% over the previous year; the main port of Jiangsu completed 16 million 791 thousand and 100 TEU of container throughput, an increase of 4.62% over the previous year; the main port of Anhui completed 1 million 264 thousand and 400 TEU of container throughput, an increase of 18.31% over the previous year. The container throughput of the main ports in the Yangtze River Delta has maintained a good growth trend as a whole: the container throughput of Taizhou Port, Huzhou Port, Nantong Port, Taizhou Port and Hefei Port all increased by more than 20%, of which the container throughput of Huzhou Port increased by 71.55%.

### **2.2.3 Port foreign trade cargo throughput**

In 2017, the throughput of foreign trade cargo for ports above the national scale is expected to reach 4.020 billion tons, an increase of 5.7% over the previous year.

Among them, the throughput of foreign trade cargo for coastal ports is 3.571 billion tons and that for inland ports is 431 million tons.

In 2017, the throughput of foreign trade cargo of major ports in the Yangtze River Delta region reached 13.92 billion tons, an increase of 8.63% over the previous year, accounting for 34.68% of the total throughput of foreign trade cargo of ports above the national scale. Among them, the throughput of foreign trade cargo of Shanghai Port reached 412 million tons, an increase of 8.06% over the previous year, and the import and export of foreign trade cargo of Shanghai Port accounted for 98.87% of the total foreign trade of major ports. The throughput of goods reached 502 million tons, an increase of 9.77% over the previous year; the throughput of foreign trade goods completed by major ports in Jiangsu Province was 465 million tons, an increase of 8.28% over the previous year; and the throughput of foreign trade goods completed by major ports in Anhui Province was 116 million tons, a decrease of 3.45% over the previous year. Benefiting from the continuous improvement of the inland water network and the increasing promotion of water transfer, the foreign trade cargo throughput of Huzhou Port, Jiangyin Port, Changzhou Port, Zhenjiang Port, Yangzhou Port and Hefei Port increased by more than 20%, of which the increase of Huzhou Port's foreign trade cargo throughput was as high as 92.31%.

### **2.3 Possible requirements and effects for ports**

In recent years, with the deepening of reform and opening up in coastal cities, ports play an important role in promoting the development of coastal cities. Long-term and reasonable port development and planning are more urgent and important for the

development of port areas. However, the planning and development of ports are often limited by geographical location and have a certain degree of monopoly. Due to the differences between China's port system and foreign countries, each port has its own system. With the rapid growth of international and regional trade, the tendency of localization of ports is obvious. The emergence of disorderly competition and repeated construction has led to the inadequate utilization of coastal resources and the decline of economic benefits of port enterprises. With the development of related theories, many large enterprises are now increasingly developing from the original competition to the present competition, both competition and cooperation, seeking win-win development. At present, the global enterprise alliance has developed into many fields such as communication, transportation, steel, consumer goods and so on. It is the trend of port development to integrate existing port resources, form port clusters in developed economic regions and realize the simultaneous development of port and regional economy.

#### **2.4 Present Situation of Port Enterprises**

The Yangtze River Delta is one of the fastest growing regions in China, which is bordering on the Yangtze River and the sea. The coastline of "two provinces and one city" in the region is 3500 kilometers long, accounting for 20% of the whole country, the coastline of islands is 4600 kilometers long, accounting for 40% of the whole country, the section of the Yangtze River below Nanjing is 400 kilometers, the coastline of both sides is 800 kilometers, and there are also four-way inland waterway network. Rich resources along the river and coastline breed many ports such as Shanghai Port, Ningbo Port, Nanjing Port, Zhangjiagang Port, Nantong Port, Zhenjiang Port, Jiangyin Port and Taicang Port. At present, there are about 900

productive berths in the Yangtze River Delta ports cluster, of which 250 are deepwater berths and the port capacity is more than 560 million tons. They not only undertake the task of transporting import and export goods in the region, but also are important ports for foreign trade in the economic hinterland of the middle and upper reaches of the Yangtze River, and are also important basic conditions for the construction of Shanghai International Shipping Center. In the process of development, there will inevitably be a lot of competition and cooperation, on this point, the following analysis combined with the current situation.

#### **2.4.1 Competition**

With the formation and improvement of the port market in China, the competition between ports, as the symbol of port market economy, is becoming more and more distinct. Ports in the Yangtze River Delta, like ports in other regions, have shown a fierce competitive situation. First, the ports in the Yangtze River Delta share the same economic hinterland. The ports in this region are all responsible for the transportation of goods in the hinterland, which leads to the competition for the supply of goods in the hinterland. Secondly, similar port functions have intensified port competition. Recently, China's port functions are still in the transport function of loading and unloading. The interests of the port are closely related to the loading and unloading of goods. Therefore, relying on the improvement of cargo throughput, competing for good cargo sources has become the focus of port competition. Thirdly, the imbalance between supply and demand of cargo transport has an impact on port competition. For example, in recent years, the demand of container transport is greater than the capacity of container handling in ports, and the loading and unloading is good. Therefore, all ports are committed to the construction of large container terminals,

resulting in competition among container ports.

In short, the port competition is the product of the port market and the inevitable result of the operation of the port market. To deal with the port market competition, it is important to understand the port competition. The understanding of port competition has both positive and negative aspects. The enthusiasm of port competition lies in: first, market-oriented, promoting the construction and development of ports. Under the condition of market economy, port construction projects can be decided by port enterprises on their own according to the needs of social and economic development. Port construction breaks the traditional practice of complete administrative instructions and is conducive to the beneficial and festive development of the port itself. Secondly, aiming at the market, the service quality of the port has been improved. Under the condition of market economy, the survival and development of port enterprises are more dependent on the service objects. Therefore, to some extent, port competition is worse than service quality. Therefore, port enterprises pay more attention to improving their own service quality than at any time in the past. Thirdly, taking service as the leading factor, the management concept of port enterprises has been renewed. In order to improve their competitiveness, port enterprises have coupped up the past "port boss" business style, attaching importance to the establishment of a new concept of port management, that is, the port should provide value-added services for customers. Fourthly, for the purpose of sustainable development, we should constantly expand port functions and move forward to modern ports. The competition between Hong Kong and Japan has made the enterprises realize that they must adopt new technology, new equipment and new management to expand the logistics industry of Hong Kong and Japan in order to make the port and Japan obtain the motive force of sustainable development. Therefore, expanding the logistics function of Hong Kong and Japan has become the

mainstream of the current port development. All the progress of these ports stems from the competition between Hong Kong and Japan. Therefore, the competition between ports is not a bad thing, and its positive significance is promoting.

#### Development of Inbound Ports

However, the competition between Hong Kong and Japan is also negative. That is the side effect caused by excessive competition and super competition. [The so-called "super competition" refers to the fact that for various reasons, any enterprise in a factory is allowed to maintain the advantage of long-term competition. [For example, in order to adapt to the rapid changes of the market, the operators of Hong Kong enterprises must always consider their own business strategy, according to market demand and competition. The opponent's strategy, examining his existing market positioning, and by constantly adjusting the strategy, combining with the favorable opportunities for his own development, re-positioning the market, in order to avoid the risk of business, therefore, the successful business strategy of the past does not necessarily apply to the present.

"Excessive competition" means that operators overestimate market demand and underestimate market supply blindly and optimistically, which leads to excessive market investment and dilemma of operators in narrow market space. Super-competition and over-competition in the port market have brought disadvantage to society and enterprises, which is embodied in two aspects: first, the unreasonable allocation of port resources, and the waste of valuable coastline resources, and secondly, the low efficiency of port enterprises and the deterioration of social efficiency.

### **2.4.2 Cooperation**

The essence of port group operation cooperation in the Yangtze River Delta is market-oriented joint operation among port enterprises. Its connotation is that according to the inherent relationship of the Yangtze River Delta geo-economy, the historical evolution of the development of Hong Kong and Japan and the needs of the construction of Shanghai International Shipping Center, the functions and advantages of the ports in the three regions of Jiangsu, Zhejiang and Shanghai complement each other in terms of operation and whole blood cooperation or joint operation, so as to promote the overall coordination of the port group. The process of orderly development to make full use of port resources. Under the situation of reform and opening-up in Shenzhen, Hong Kong and Japan, facing fierce competition in the port market at home and abroad, the Yangtze River Delta port competition must make full use of the positive role of competition and overcome its negative impact. Port alliance and operation cooperation is a new development idea. Firstly, the joint operation and cooperation of the Yangtze and Erjiao ports is the demand of the social and economic integration of the Yangtze River Delta. The Party's Fifth Session of the Fourth Central Committee of the Communist Party of China clearly put forward that the Yangtze River Delta and the economic belt along the Yangtze River should be constructed with the sea as the leading factor, and the economic integration of the Yangtze River Delta should be accelerated to form various industries according to the industrialization level of each city. Vertical and horizontal integration ports are the gateway of regional and urban external relations. The integration of social economy in Changwanjiao needs to rely on the integration of ports. Therefore, it is necessary to strengthen the connection between ports in different levels through direct division of labor. For ports in the same level, it is necessary to strengthen the connection through complementary horizontal division of ports.

Secondly, due to the limited coastal resources and the non-renewable nature of the coastal resources, the efficiency of the Port-day can no longer follow the traditional practice of "occupying a large number of coastlines and large-scale port-building", but must integrate the port resources through the joint Port-day operation and cooperation, so that the existing Port-day efficiency can be achieved. To make more effective use of and give full play to the needs of ports for social and economic development

Thirdly, the purpose of Port Alliance and operation cooperation is to improve the overall competitiveness of port groups in the Yangtze River Delta and to accelerate the construction of Shanghai International Shipping Center. Due to the expansion of modern port functions, the role of ports in the international market of regional economic integration has become more and more prominent, so the competition of international ports has become increasingly fierce. In the Asia-Pacific region alone, there are serious challenges from Busan, South Korea, Kobe, Japan and Kaohsiung, Taiwan, to China's mainland ports. In order to improve the international status of China's ports, the central decision to build Shanghai International Shipping Center and effectively integrate port resources and Port Alliance has become one of the important tasks of building an international shipping center.

Fourthly, the reform of port management system has created conditions for joint and cooperative operation of ports. In recent years, with the implementation of the reform of China's port management system, port management has achieved "separation of government and enterprise". Port groups have been set up and market management mechanism has been implemented. The autonomy of port companies is conducive to the combination and cooperation between port and Japanese enterprises, and also

creates conditions for the integration of port resources.

## **2.5 Summary**

"Homogeneous competition, differentiated development" is the starting point of the current port cooperation strategy, which is also in line with the actual situation of the port in the Yangtze River Delta. This is because the traditional port functions are gradually formed in the long-term development and further strengthened in the long period of planned economy. At present, our ports have not been able to get rid of the historical traces of the traditional port functions, especially the Yangtze River Delta ports clusters with similar geographical areas, the same hinterland and the same transport market demand, resulting in the same functions of the port groups. Therefore, the competition between ports is present. It takes time and change of operation to change the characteristics of "homogeneous competition", but it is difficult to get out of "homogeneous competition" in the short term because of the huge investment in port infrastructure. In order to improve their competitiveness, port enterprises should face up to this reality. Under the condition of homogeneous competition, they should make full use of their own advantages of differentiated operation and complement each other's advantages through the cooperation and cooperation among port enterprises, so as to achieve more win-win results.

The concepts of "win-win" and "synergy" should be established in the joint cooperation of port enterprises in the Yangtze River Delta. The integration of port resources in the Yangtze River Delta reflects the thinking of "win-win" and "synergy" between the development of bonded areas and the development of ports and towns in the new era, from the pursuit of self-interest of ports in the past to the pursuit of

"win-win" benefits of multi-port cooperation, the strategic thinking of modern social and economic competition, and the development thinking of "synergy" and "win-win" among ports.

### **3 The Impact of Integration**

#### **3.1 Conceptual Analysis of Port Integration**

Port integration means that by creating a good and open environment for port development, establishing an effective cooperative mechanism and partly improving the constraints of administrative barriers and market barriers, each port in the region has its own advantages and functions fully brought into play, forming a situation of "reasonable division of labor, complementary advantages, benign competition, common development, mutual benefit and win-win" and realizing the allocation of port resources. The development process of continuous optimization, continuous improvement of port operation mechanism and continuous enhancement and effective utilization of port comprehensive capacity.

Port integration embodies the concept of coordinated development of regional ports. Port integration embodies the development of ports in the region towards optimum combination, which is the process of increasing the degree of coordination among ports in the region. Port integration is a complex concept, which should include at least the following four aspects

(1) The precondition of port integration is that there are some internal relations among a group of ports, such as similar geographical location, related port shoreline resources, overlapping parts of economic hinterland, overlapping parts of port

functions and so on.

(2) Port integration is a process, not a result. It refers to the dynamic process of coordinated development of ports, not the concept of static integration.

(3) Port integration reflects the strengthening of the interrelationship and interaction among the independent ports in the region, so that the functions of the ports can be transformed from greater overlap to a clear division of labor, so as to achieve strong complementarity. Port integration is not the same as port integration. Ports are still independent in operation and management.

(4) The purpose and result of port integration are: the integration and effective utilization of regional port resources, the improvement of the overall economic benefits of regional ports, the rationalization of internal competition, the obvious reduction of internal friction, and the significant enhancement of the overall international and domestic competitiveness of the region.

According to the core content of the coordinated development of ports, the integration of ports can be subdivided as follows:

1. The integration of port planning and construction refers to the gradual establishment or gradual formation of a regional port in the process of planning and construction, which is conducive to the integration of port planning and construction in the area of specialized terminals and facilities, the coordination of construction and the gradual formation of a rational division of labor, a clear hierarchy, a rational layout, a scientific distribution system, and the allocation of ports. Port group structure with perfect system interoperability. Target orientation: According to the

function of water depth and cargo source differentiation, the layout of the wharf joins the main and branch ports, highlighting their respective advantages, complementing each other's capabilities, linking up the routes, and closely linking up the port collection and distribution system.

2. The integration of port policy in China has not only a national unified macro-policy, but also the laws, regulations and systems formulated by local governments. The national laws and regulations are universally applicable. This mainly refers to the consistency of local laws, regulations and systems. In the process of development of regional ports, especially in the initial stage, local governments will basically formulate some preferential policies to encourage port construction and operation. This policy is very beneficial to promote port development, but from the overall point of view of regional ports, it will have both advantages and disadvantages. On the one hand, when the supply is insufficient, it will help to speed up the construction of port terminals and improve the overall capacity of regional ports; on the other hand, when the total supply is excessive, it will break the basic balance of port groups, intensify the competition between ports, produce internal friction and damage the overall port interests.

Objectives: The investment, construction and management policies, fee and collection standards and technical standards of each port in the region are relatively unified and basically consistent, which enables investors and operators at home and abroad to enjoy the same preferential policies and good operating environment at each port in the region, and to obtain fairly and legally high returns under the conditions of operating according to law.

2. The integration of port management is regulated by the port law, and the port

management is limited to administrative divisions. Port administrations at all levels exercise jurisdictional functions and powers within their jurisdictions. The integration of port management mainly refers to the establishment of very close communication and cooperation relations among various port management agencies in the region, the maintenance of smooth communication channels and good information transmission mechanism among them. In the region, the port enterprises operating in accordance with the law can enjoy the same good management services. The enterprises that engage in illegal speculation and even some market disruption can transparently understand their bad behavior, and restrict and regulate it. In order to standardize law-abiding enterprises to create a wide range of good business space in the region. Administrators at all levels not only abide by the leadership of their immediate superiors, but also jointly safeguard the overall order of regional ports. In dealing with specific matters, they take into account the needs of Hong Kong's development and examine them within the regional framework.

Target orientation: the regional port management agencies have smooth channels of communication, good communication mechanism, implementation of policies and norms, managers are faithful to their duties and regional overall concept. The management results are not only in line with the interests of Hong Kong's port, but also conducive to the healthy development of regional port groups, mutual coordination and long-term overall interests. Form regional management agencies, intermediary organizations and port and shipping enterprises to have their own place, cooperate with each other to maintain a good market operation mechanism, and cultivate a fair competition, mutual benefit, win-win, interdependent and common development market environment for the ports in the region.

3. Port planning, port management and port policy are all creating good mechanism

and environment for the scientific development and healthy development of ports. To really play the role of ports in serving regional and national economy, serving people's livelihood and serving society, it is mainly through port operation. Port operation integration mainly refers to the establishment of better competition and cooperation among various ports and shipping enterprises in the region, orderly market competition, reasonable means of competition, standardized competition behavior and fair competition. A good investment and financing mechanism has been formed in the region, with mutual equity participation in assets, mutual cooperation in operation, rational sharing of interests and distribution according to capital and work. The operating cost accounting of each port is basically reasonable, and each port maintains a relatively high level.

Target orientation: smooth investment and financing channels, integration of assets operation, close business cooperation, reasonable competition and cooperation relationship between port and shipping enterprises, high efficiency of port operation, stable and considerable operating benefits.

4. Port information integration information technology is an extremely important means to improve the efficiency and economic benefits of port operation, and is the premise and foundation to realize the integration of port planning, management and operation. Integration of port information mainly refers to making full use of advanced information technology means to establish a very close relationship between information transmission and data resources sharing in policy management, business operation, asset cooperation and other aspects of regional ports, enabling port management agencies at all levels to formulate policies and implement management, enabling port shipping enterprises to carry out business management, arrange production operations and carry out route layout. To make production plans

and other aspects can maximize the overall situation and examine the overall situation of the region. Through the smooth, complete, timely and accurate information, the efficiency of port management agencies and enterprises in the region is imperceptibly optimized.

Target orientation: Regional port information is networked to the maximum extent, the data transmission channels of various ports in the region are smooth, and the port business is basically paperless office, providing accurate and timely information services and support for service objects and various service demanders. The power of information guiding decision-making, assisting operation and promoting cooperation has been greatly enhanced.

### **3.2 Existing problems**

After the rapid construction of the 11th and 12th Five-Year Plan, the Yangtze River Delta ports cluster has made remarkable achievements. In recent years, the port throughput has maintained a high growth rate. From the perspective of industry value chain, the Yangtze River Delta ports cluster value chain is composed of delivery, shipping, port enterprises and receiving customers, and port enterprises play a connecting role in the port industry value chain system. Nevertheless, there are still some problems in the development of port groups in the Yangtze River Delta, which are mainly reflected in port construction and port management.

First, the construction of homogeneity and structural contradictions. The main manifestations are as follows: (1) With the development of the port and shipping industry, the trend of container loading is remarkable, and the degree of

mechanization of container ports is high and the profit margin is high. Therefore, various ports are competing to develop large-scale investment in container business and expand container terminals. For example, Yangshan Port Area of Shanghai Port and Beichang Port Area of Zhoushan Port of Ningbo. Yangshan Port has consolidated the position of Shanghai Port as an international shipping center. As an important point for Shanghai Port to develop large container ports, Ningbo Port itself has the advantage of natural water depth, and its container business is also rapidly rising with port investment. (2) High homogeneity of cargo demand, each port pursues large and comprehensive business development. Ports in the Yangtze River Delta are dense, and the business homogeneity of large and small ports is high, involving container, coal, petroleum, petrochemical, natural gas, non-ferrous metals and other cargo categories. For example, Shanghai Yangshan Oil Storage Base, planned for construction in 2006, was one of the largest commercial oil storage bases in China at the initial stage. Recently, the Guanghui 10,000-ton oil terminal project in Waitangdao, Laotangshan Port Area, Zhoushan Port, Ningbo, has been approved.

The homogeneity of port investment construction and cargo source competition brings waste of resources and diversion of cargo sources, weakens the comprehensive competitiveness of Shanghai Port and Shipping International Center, is not conducive to the development of the Yangtze River Delta port hub port group, is not conducive to the scale effect of the whole port cluster, and affects the competitiveness of Shanghai International Shipping Center in Northeast Asia port group.

Second, the overall planning and management is inadequate, and ports in the Yangtze River Delta are in a tripartite position. The main manifestations are as follows:(1) The role of the Shanghai Port Combination Commission needs to be strengthened.

Founded in 1997, Shanghai Port Group is centered on Shanghai and Jiangsu and Zhejiang are two wings. It aims to coordinate the operation and division of work of container terminals within the scope of Port Group, optimize the allocation of resources, avoid disorderly competition and promote the operation and division of work in accordance with the principles and economic laws of "reasonable division of labor, complementary advantages and jointly building Shanghai International Shipping Center" without changing administrative relations. Ports in the Yangtze River Delta should strengthen business cooperation and promote port planning, management, policy, operation, information integration and cross-regional cooperation in the Yangtze River Delta region. However, from the current situation of the development of port groups in the Yangtze River Delta, the combined port has not achieved its goal. From their own interests, the provinces and municipalities have developed the port industry vigorously. The layout of one body and two wings has gradually shifted to two hubs and the structure of many trunk ports. Among them, Yangshan Port is better than Zhejiang Province in administration, and the port is integrated into Shanghai Port for planning and development, Zhejiang Province vigorously develops the construction of "Trinity" port logistics service system, and Jiangsu Province makes every effort to build the brand of Dasuzhou Port. In order to compete for advantageous port status, each port neglects the global effect.

Lack of overall planning management leads to blind investment, waste of resources, and inefficient division of labor. The inadequate use of excellent shoreline resources, also intensified the competition between various ports, resulting in price war. More importantly, it is not conducive to the construction and development of the overall logistics network in the Yangtze River Delta region, the interaction between port and city, and the long-term development of port cities, especially small and medium-sized cities.

### **3.3 Positive effects**

#### **3.3.1 Scientific Development Orientation**

Optimize the location of port division of labor in the whole province. A "one-in-one, two-in-one and multi-in-one" port development pattern has been formed, with Ningbo-Zhoushan Port as the main body and Hangzhou Bay Port around southeastern Zhejiang and Northern Zhejiang as the two wings, linking the development of Yiwu International Waterless Port and seven inland river ports. The internal functional layout of Ningbo-Zhoushan Port was optimized. The bulk cargo berths are mainly located in the northern region and the container berths in the southern region, thus realizing the rational division of functions and dislocation development.

#### **3.3.2 Intensive Utilization of Resources**

The port is further developing towards large-scale and hub. Ningbo-Zhoushan Port ranked third in container throughput in the world in the first half of this year. The status of container hub port was further consolidated. Of the first seven 400,000 tons of ore berths in China, Zhejiang Province occupied three. The level of intensive and large-scale operation has been further improved. In 2016, Ningbo-Zhoushan Port completed 920 million tons of cargo throughput, ranking first in the world for eight consecutive years. With the acceleration of the construction of port centralized transportation system, the level of intensive utilization of resources of shoreline and

transport corridor has been significantly improved. Third, the function adjustment of the old port area and the development of the new port area should be coordinated. Optimizing the utilization of stock resources, carrying out technical transformation and relocation of old wharfs, adjusting the functions of old port areas, promoting the new port areas to undertake the transfer of freight transport functions of old port areas, and promoting the development of advanced manufacturing industries in port vicinity.

### **3.3.3 Port Operation Efficiency**

Operational efficiency has been greatly improved. The integrated operation of coastal ports, the linkage development with inland ports, and the promotion of information and intelligent development of ports, effectively enhance the efficiency of port operations and services. Transport organization is further optimized. With the rapid development of rail-water intermodal transport, river-sea intermodal transport and water transfer, Ningbo-Zhoushan Port has opened 11 container rail-water intermodal transport lines. In the first half of the year, the volume of container rail-water intermodal transport was 182,000, an increase of 82% over the previous year. In the first half of the year, the throughput of river-sea combined transport, water-to-water transfer containers was 256,000 and 332,000, respectively, up 55% and 24% year-on-year. Third, the comprehensive strength of the port has been further strengthened. Zhejiang Haigang Group's total assets exceeded 100 billion yuan, net assets nearly 70 billion yuan, and debt ratio dropped to 36.2%.

### **3.3.4 Market Competition Order**

Regional ports have changed from decentralized competition and self-governing to coordinated development. With the rational division of functions and the integrated operation of ports, the contradiction of excess capacity of some ports has been solved, and the vicious competition of homogeneity has been avoided. The cooperation between ports has been effectively strengthened, and the effect of synergistic development has been gradually enlarged. The leading effect appears. Under the leadership of Ningbo-Zhoushan Port, Wenzhou and Jiaxing Ports have opened a number of new foreign trade container routes, improved the service network of routes, accelerated the adjustment of terminal functions, and actively developed modern logistics and shipping services.

### **3.3.5 Port Service Modernization**

To meet the needs of the new round of urban development and opening up. Under the strong impetus of Zhejiang Harbour Group, Wenzhou Port, combined with the layout of urban development, gradually shifted some functions of the Old Port Area of Oujiang River, and added cruise functions to the Zongyuan Lanxin Port Area. The pace of integration and development of Hong Kong, industry and city has been accelerated. Jiaxing Binhai District has set up provincial pilot zones for the overall development of port production cities to build leading areas for sea-river intermodal transport, advanced manufacturing demonstration zones for port-vicinity and pioneer areas for the construction of new coastal cities. Taizhou Port Toumen Port District has accelerated the implementation of comprehensive development of port production cities and further strengthened its port service capacity. Third, the ability to serve the national strategy has been further strengthened. The construction of

Zhoushan River-Sea Intermodal Transport Service Center has been accelerated, and cooperation with ports in the Yangtze River Basin and inland waterless ports such as Wuhan in Hubei Province and Taicang in Jiangsu Province has been deepened. A friendly port with 17 ports along the "one belt and one road" has been established, 82 routes have been opened, 9 million containers have been completed, and the global port service network has been continuously improved.

### **3.4 Negative effects**

#### **3.4.1 Violating the monopoly law**

The reason why the Price Law brings port charges into the category of national pricing is that port enterprises are quasi-monopolistic enterprises providing port services to the whole society. It is unknown whether they can consciously abide by market rules and reasonable pricing by putting port charges on the market and pricing freely, and the emergence of super-large port alliances promoted by port integration. Number, because from the history of Chinese shipping, we can draw a positive conclusion that the port has never corrected itself as a shipping auxiliary industry, but as a "harbor boss" to oppress shipowners and cargo owners. The essence of port integration is concentration of operators. According to the provisions of Article 20 and 21 of the Anti-monopoly Law, no matter whether the ports are merged by shares or alliance by contract, they should declare to the anti-monopoly organ designated by the State Council, and the concentration of operators shall not be implemented without declaration. In fact, neither official nor other media reports have seen any reports of port integration declared in accordance with the law. Even the Ministry of Transport's Notice on Learning from Zhejiang's Experience and Promoting Regional Port Integration Reform, which supports port integration, has

not mentioned the issue of legal declaration. This can be used to counter the "Anti-Port Enterprises and Shipping Management Organs" of China. The unfamiliarity of the Monopoly Law is evident.

### **3.4.2 Inadequate overall plan**

The CPC Central Committee and the State Council attach great importance to the coordinated economic development in the Yangtze River Delta region and approved the construction of Shanghai Pudong New Area in 1990. In 1996, Shanghai was proposed as the main body and Zhejiang and Jiangsu as regional shipping centers. In 2007, Premier Wen convened a symposium on coordinated development in the Yangtze River Delta region in Shanghai, emphasizing that the Yangtze River Delta region should integrate infrastructure and not engage in duplicate construction. However, due to repeated construction, competition for resources and disorderly competition for the hinterland under the guidance of local interests, the "internal friction" caused by "homogeneous competition" prevents the port groups in the Yangtze River Delta from forming a scale effect. For example, Shanghai Port and Ningbo-Zhoushan Port are positioned as a world-wide comprehensive port at the same time, with homogeneous business development and serious competition for hinterland resources. With the continuous opening and development of China's economy, foreign capital and other enterprises have been stationed in the Yangtze River Delta region. However, due to the immature mechanism and lack of due risk awareness, the region often strives for supply through vicious competition. This kind of vicious competition will lead to the unreasonable logistics structure, which makes the cargo owner unable to choose the port according to the reasonable route of cargo transportation, thus resulting in a large number of unreasonable transportation

phenomena, on the contrary, it increases the total logistics cost of the port.

### **3.5 Summary**

Generally speaking, the integration of the Yangtze River Delta has both advantages and disadvantages. On the one hand, it can promote a rational division of labor, complementary advantages, healthy competition, common development, mutual benefit and win-win situation, optimize the allocation of port resources, improve the port operation mechanism, and improve and effectively utilize the comprehensive capacity of the port. On the other hand, it will also form monopoly, increase costs and reduce competitiveness, resulting in insufficient effective investment and corruption. So how to deal with the resource allocation between ports in the Yangtze River Delta is very important. The following will focus on its analysis and put forward suggestions for development.

## **4 Development Path of Port Industry under the Background of Yangtze River Delta Integration**

### **4.1 Port resource allocation**

With the continuous development of the Yangtze River Delta, the Pearl River Delta, Beijing, Tianjin and Hebei and other urban agglomerations, the corresponding port groups have gradually formed. According to the National Coastal Port Layout Plan, there are five major port groups along the coast of China. Apart from the port groups in the Yangtze River Delta, the order from north to south is Bohai Rim Port Group, Southeast Coastal Port Group, Pearl River Delta Port Group and Southwest Port

Group. The Yangtze River Delta ports cluster is located in the eastern coastal area of China and the combination of the Yangtze River Basin. It has a convenient collection and distribution system connecting the north and south, radiating the central and Western regions. Its economic hinterland is vast and covers 16 cities in the Yangtze River Delta, including Shanghai, Hangzhou, Ningbo and Shaoxing in Zhejiang Province, and the south of Jiangsu Province. Beijing, Suzhou and other eight cities have an area of 1.1% of the country, a population of 1/10, and natural resources are not abundant. However, the Yangtze River Delta region has become one of the most important areas in China by virtue of its good location, economy and culture. Its economic contribution is particularly prominent. In 2010, two provinces and one city in the Yangtze River Delta region completed a GDP of 8397.2 billion yuan. It accounts for 21.1% of the whole country, which provides a good driving force for the development of port groups. The cargo throughput of port groups in the Yangtze River Delta has reached 3.365 billion tons, accounting for 38.5% of the mainland of China.

Although the Yangtze River Delta ports cluster has carried out more cooperation in resource integration, most of the cooperation is for the purpose of competition. The cooperation is mainly carried out between some major ports along the Yangtze River and Ningbo-Zhoushan Port and Shanghai Port. Ningbo-Zhoushan Port and Shanghai Port could have been the best partners, but most of the cooperation between the two ports in the past few years has only stayed in the past few years. On the surface, there is little substantive cooperation, and the two ports are close to each other, so as to develop the "Yangtze River Strategy". Although such a resource integration development strategy has certain rationality, its starting point is to emphasize the competition between Ningbo-Zhoushan Port and Shanghai Port, while ignoring the main contradictions that restrict the development of port groups in the Yangtze River

Delta. As can be seen from Table 3.3, the comprehensive strength of ports has the highest score. The two major ports are Shanghai Port and Ningbo-Zhoushan Port, and the substantive cooperation between the two ports is less. Therefore, the main contradiction in the development of the port group in the Yangtze River Delta is the contradiction between the resource integration of Ningbo-Zhoushan Port and Shanghai Port. At the same time, we also find that the complementary features of the resource integration of the port group in the Yangtze River Delta are not reflected in the port group, and the complementary functions are just the resource integration of the As the core of the integration, it can be concluded that the resource integration of the Yangtze River Delta ports cluster is still in the primary stage of development. Only through more substantial cooperation between Shanghai Port and Ningbo-Zhoushan Port, will the resource integration of the Yangtze River Delta ports cluster have a qualitative breakthrough.

## **4.2 Problems in Resources Integration of Port Groups in the Yangtze River Delta**

### **4.2.1 Administrative divisions**

Although the state attaches great importance to the integration of port resources in the Yangtze River Delta and makes relevant regulations on the positioning of port groups in the Yangtze River Delta, the ports in the ports belong to the administrative regions of Shanghai, Jiangsu, Zhejiang and Anhui respectively. Each local government has a certain say in its own ports. They put forward the development direction of their ports from their respective interests. Lack of necessary exchanges and cooperation between them has led to confusion in port group planning in the

Yangtze River Delta, reduced synergy, intensified vicious competition, reduced integration of port group resources, and lack of effective long-term cooperation mechanism.

#### **4.2.2 Unreasonable utilization of coastline resources**

The unreasonable utilization of port group's shoreline resources leads to structural contradictions in the supply of port services relative to demand. Some ports exceed the actual demand, while others are seriously insufficient. There are two main reasons. First, the construction of port infrastructure has its special advanced nature. After the reform and opening up, the Yangtze River Delta economy has developed rapidly, and port throughput has shown rapid growth. The excess capacity is mostly due to the advanced investment ideas in the past few years. Secondly, the excess capacity mainly concentrates on large crude oil terminals, while the problem of insufficient capacity still exists in bulk dry bulk terminals, especially iron ore terminals and container terminals. After 2012, the supply capacity of container terminals in the Yangtze River Delta is smaller than the international freight volume, and the trend of supply less than demand is gradually expanding. By 2020, the gap between supply and demand of container terminals is expected to reach 25 million TEU per year. This problem is mainly due to the fact that the port groups in the Yangtze River Delta belong to three administrative regions. Each administrative region expands the port terminals from its own interests, without considering the integration interests of the Yangtze River Delta, which leads to unreasonable utilization of the port lines in the Yangtze River Delta and structural contradictions in supply. To solve this problem, it is necessary to rely on the formation of the joint port authority of the Yangtze River Delta ports cluster. Only in this way can the port

authority reasonably develop the coastline resources from the perspective of integrating the interests of the port groups in the Yangtze River Delta.

#### **4.2.3 Weak soft power**

Although the cargo throughput of the Yangtze River Delta ports cluster has been increasing continuously in recent years and it is in the leading position in the world, the division of labour in the process is not reasonable, the function of the port group has been simplified, and the goal of cargo throughput or container throughput has been blindly taken, ignoring the importance of building a service port. The so-called service port means serving customers. To provide comprehensive services for customers, besides freight transportation, it also includes comprehensive services such as insurance and finance. The strength of port service capacity is reflected in the soft power of ports. The Yangtze River Delta ports cluster lags far behind other advanced ports in the world in soft power construction. Take London Port as an example, although the cargo throughput of London Port is far less than that of Shanghai Port or Ningbo- Zhoushan Port, but London is the largest shipping service market in the world. Twenty-five countries use the Lloyd's Ship Tracking Information Database of Lloyd's Information Service Company in London. The 《Lloyd's Daily》 , 《Shipping Statistics and Economics》 and other information media regularly publish information such as freight rates, ship prices, shipping policy trends of various countries and judgments of maritime cases. The value created by these shipping service industries is even greater. It surpasses the value created by port logistics entities, and shipping services have no destructive impact on the environment. The Yangtze River Delta ports cluster is still in the initial stage of resource integration. The overall planning has just started. The implementation of

port division is poor, and the cargo index is too emphasized, while the service quality is neglected. As a result, compared with other mature foreign port groups, the Yangtze River Delta ports cluster is particularly weak in soft power, and the port and shipping logistics service system needs to be improved.

### **4.3 Analysis of the Pareto improvement of resource allocation**

Pareto improvement refers to a change in the state of resource allocation that increases the interests of at least one party and does not deteriorate the interests of anyone. It fits well with the resource allocation issues discussed below. In this paper, Pareto analysis is used to reflect the improvement of resource integration efficiency of port groups, and to try to achieve better resource integration of port groups with specific institutional arrangements, so as to reduce the cost of each game to a greater extent and improve the degree of resource integration of port groups.

#### **4.3.1 Pareto Improvement Basic Model of Port Group Resource Integration in Yangtze River Delta**

The ultimate goal of resource integration of Yangtze River Delta ports cluster is based on Pareto optimum state of improvement. It needs to be explained that Pareto improvement refers to the improvement of part or all of the port interests on the basis of maintaining the original port interests at least. For example, the increase of interests in a port is based on the loss of interests of other ports in the port group, which is beyond the scope of this paper. Therefore, the integration of resources in the Yangtze River Delta ports cluster is based on the premise of enhancing the overall interests of the port group on the basis of ensuring the original interests of the port group. In order to simplify the problem analysis, taking Ningbo-Zhoushan Port and

Shanghai Port as examples, Pareto improvement analysis is carried out for these two ports, as shown in the following figure.

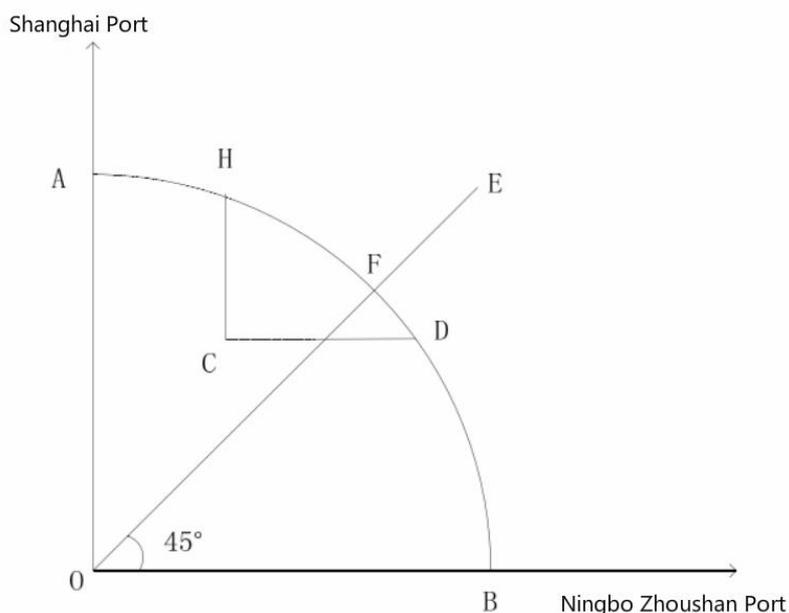


Figure 4.1 Pareto Improvement Map of Ningbo-Zhoushan Port and Shanghai Port

The OB axis represents the interests axis of Ningbo-Zhoushan Port, the OA axis represents the interests axis of Shanghai Port, and any point in the coordinate axis represents the interests combination of the two ports. AB is the profit possibility curve of Ningbo-Zhoushan Port and Shanghai Port under the existing economic and policy conditions. On OE, the benefits of the two ports are the same. Point C is any point in the interest probability curve, and any point in the area from point C to HCD represents Pareto improvement. Without prejudice to the interests of any port, the overall interests of the port group increase. In the actual economic operation, Pareto improvement of resource integration of port groups is influenced by many factors, such as port conditions, policies, hinterland economy, and various concepts. These

factors should be comprehensively analyzed. In the actual operation of ports, there is a general view or concept on the integration of resources, that is, if the strength gap between the two ports is large, the possibility of cooperation between the two ports is small. There are two main reasons: the first reason is that there is a big gap between small ports and big ports in terms of port infrastructure, personnel and management level. The big port Association believes that there is no integration of resources between small ports and small ports. It will achieve the goal of Pareto improvement, but will affect the improvement of their own production level. The second reason is that even though the integration of resources between the two ports achieves the goal of Pareto improvement, the strength gap between small and large ports still exists. At this time, the "uneven" mentality will affect the cooperation between small and large ports. These two reasons or criteria are the main basis for judging whether resource integration between two or more ports will occur.

#### **4.3.2 Port Group Resource Integration Pareto Improvement Model Analysis**

The specific model of Pareto improvement in resource integration of port group is shown in the diagram. The OB axis represents the interests axis of Ningbo-Zhoushan Port, the OA axis represents the interests axis of Shanghai Port, and any point in the coordinate axis represents the interests combination of the two ports. AB arc is the interest possibility curve of Ningbo-Zhoushan Port and Shanghai Port under the existing economic and policy conditions. On OE, the benefits of the two ports are the same. F point is the intersection of OE and AB arc. In regional AFC and regional FDB, if point a is any of them, the Pareto improvement path of point a will intersect with AF arc or BF arc through resource integration of two ports, but its Pareto improvement path will not intersect with OE line. From the above analysis, it can be

seen that the resource integration of Ningbo-Zhoushan Port and Shanghai Port will achieve the goal of Pareto improvement, but the benefits are unequal. The situation will always exist. However, if any of the ports takes the condition that the interests of the two ports are equal after Pareto improvement as the condition of cooperation with other ports, then the port will give up the opportunity of resource integration and choose not to cooperate. Therefore, as the more left-upper in the regional AFC and right-lower in the regional FDB, the greater the gap between the interests of the two ports and the smaller the possibility of resource integration. It is assumed that G and J are the profit critical points of Ningbo-Zhoushan Port and Shanghai Port respectively, and that the profit critical point represents the profit and loss critical point of the port. In regional AHJL and regional KBGL, one port is located within the profit critical point, and the port itself is poorly managed. At this time, the other port is in good condition outside the profit critical point. There are two main situations here. One is that the integration of resources in regional ACIH and regional KBDM will not happen, including the first and second reasons. The first reason is that small port associations want big port to help them get out of the predicament, while less consideration is given to "uneven". The second reason is that the integration of resources in regional CJIL and regional LGDM will not happen is that the first reason is that the integration of resources in regional CJIL and regional LGDM will not happen. Reasons for this. When the benefits of Ningbo-Zhoushan Port are less than G-point and Shanghai Port is less than J-point, that is to say, in the regional OGLJ, the interests of both ports lie within the critical point of interests at the same time, which can not guarantee normal operating profits. At this time, the possibility of cooperation between the two ports is also small, because there are some problems in their own operation, and the first problem to be solved is not the integration of resources between ports. It is how to improve the operation level of existing ports to exceed the profit threshold and obtain normal profits. Therefore,

regional AHJL, regional LGBK and regional JOGL are defined as absolute non-cooperative regions. In regional HIF and regional FMK, the possibility of resource integration between ports is relatively large, but over-emphasizing the goal of resource integration with equal interests will affect the development of cooperation between the two ports. The government can adjust the interest boundaries through policy innovation and other measures to make resource integration possible. Therefore, regional HIF and regional FMK are defined as potential benefit cooperation zones. In regional ILMF, there are fewer reasons for non-cooperation. Through resource integration, we can not only improve Pareto's interests, but also narrow the gap between the two ports. Therefore, we define regional ILMF as an absolute cooperation area.

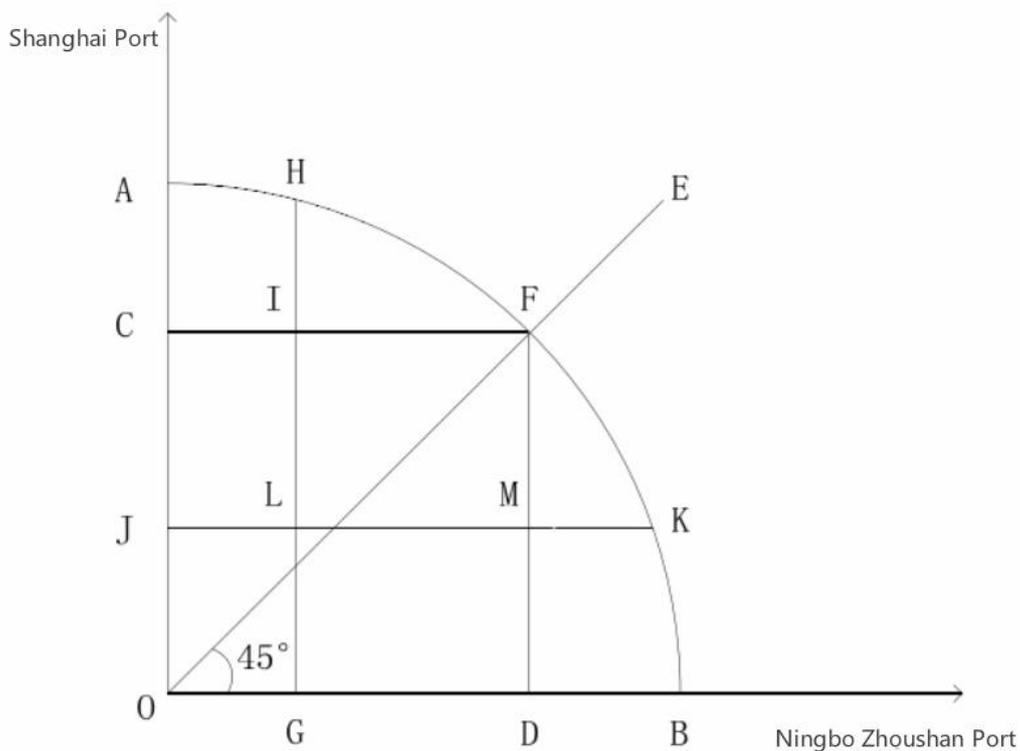


Figure 4.2 Pareto Improvement Map for Resource Integration of Ningbo-Zhoushan Port and Shanghai Port

### **4.3.3 Pareto Improvement Model for Resource Integration of Port Groups in the Yangtze River Delta**

Through the above analysis, we can draw the following conclusions: in the absolute cooperation area, the cooperation motive between the port and the port is strong, the government does not need to adjust too much, the port will take the initiative to integrate resources to achieve the goal of Pareto improvement and resource integration. In potential cooperative regions, the integration of resources between ports requires the government to make relevant adjustments, adjust interest boundaries, and make the integration of resources between ports possible. At the same time, if the gap of interests between ports is small, it should not pay too much attention to the equality of interests. Instead, the overall interests of port groups should be put in the first place to promote the Pareto improvement of port interests. At this time, the government played a full role. Significant regulatory role. In absolutely non-cooperative areas, it is difficult to achieve resource integration. At this time, the focus of the work of poorly managed ports is not on resource integration, but on how to improve their management level, improve the production efficiency of ports and improve the operation of ports. The above analysis has taken some simplified measures, only for two ports, but for multiple ports of the port group, the same is true.

According to the Pareto analysis, how to improve the resource integration of port groups in the Yangtze River Delta depends first on the location of the port groups, whether they are located in absolute cooperation region, potential cooperation region or non-cooperation region. Obviously, the Yangtze River Delta ports cluster is generally well operated and can not be located in the non-cooperative area. The problem is to determine whether it is located in the absolute cooperation area or the

potential cooperation area. Then, in view of the status of the Yangtze River Delta ports cluster, this paper puts forward the Countermeasures of resource integration that conform to the actual situation of the Yangtze River Delta ports cluster.

Through the empirical analysis of port group resource integration evaluation, before 2006, the degree of resource integration of Yangtze River Delta ports cluster declined. During this period, the national and local governments have less policies on port group resource integration and lack of awareness of cooperation among ports, which proves that the Yangtze River Delta ports cluster is not in an absolute cooperation region. From 2006 to 2009, the degree of resource integration of port groups in the Yangtze River Delta has been increasing. This phenomenon is caused by many factors, but mainly attributed to two aspects. On the one hand, the national and local governments where the port groups are located have promulgated many resource integration plans for port groups that were not previously available and targeted. On the other hand, the port groups in the Yangtze River Delta are gradually aware of resource integration. The importance of cooperation should be strengthened step by step. In China, a country that concentrates its efforts on major affairs, the government has a strong dominance. The first aspect is the main reason for the deepening integration of port resources in the Yangtze River Delta, which is also determined by China's national conditions. An important conclusion can be drawn from the above analysis: before 2006, the degree of resource integration of port groups in the Yangtze River Delta declined, mainly due to the lack of awareness of resource integration of the government and port groups; after 2006, with the continuous advancement of relevant policies of the state and local governments, the degree of resource integration of port groups in the Yangtze River Delta has been deepening, which can prove that the port groups in the Yangtze River Delta are located in Pareto. In the potential cooperation area of the improved model, the government's policies

have played a positive role in promoting the deepening of the integration of port resources in the Yangtze River Delta. In addition, from the point of view of the comprehensive competitive strength structure of the port group in the Yangtze River Delta, Shanghai Port and Ningbo-Zhoushan Port rank first in terms of comprehensive strength, while Jiangsu Port ranks second. In recent years, Jiangsu Port has more resources integration with Shanghai Port and Ningbo-Zhoushan Port, and the spontaneity of cooperation is stronger. It can be inferred that Jiangsu Port cooperates with Shanghai Port and Ningbo-Zhoushan Port. In the absolute cooperation region, however, because the cooperation between Shanghai Port and Ningbo-Zhoushan Port is located in the potential cooperation region, and the two ports account for a large proportion, the integration of port resources in the Yangtze River Delta is still located in the potential cooperation region in general.

#### **4.3.4 Pareto Improvement Model for Resource Integration of Port Groups in the Yangtze River Delta**

Through the above analysis, we can draw the following conclusions: in the absolute cooperation area, the cooperation motive between the port and the port is strong, the government does not need to adjust too much, the port will take the initiative to integrate resources to achieve the goal of Pareto improvement and resource integration. In potential cooperative regions, the integration of resources between ports requires the government to make relevant adjustments, adjust interest boundaries, and make the integration of resources between ports possible. At the same time, if the gap of interests between ports is small, it should not pay too much attention to the equality of interests. Instead, the overall interests of port groups should be put in the first place to promote the Pareto improvement of port interests.

At this time, the government played a full role. Significant regulatory role. In absolutely non-cooperative areas, it is difficult to achieve resource integration. At this time, the focus of the work of poorly managed ports is not on resource integration, but on how to improve their management level, improve the production efficiency of ports and improve the operation of ports. The above analysis has taken some simplified measures, only for two ports, but for multiple ports of the port group, the same is true.

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integration plans for port groups that were not previously available and targeted. On the other hand, the port groups in the Yangtze River Delta are gradually aware of resource integration. The importance of cooperation should be strengthened step by step. In China, a country that concentrates its efforts on major affairs, the government has a strong dominance. The first aspect is the main reason for the deepening integration of port resources in the Yangtze River Delta, which is also determined by China's national conditions. An important conclusion can be drawn from the above analysis: before 2006, the degree of resource integration of port groups in the Yangtze River Delta declined, mainly due to the lack of awareness of resource integration of the government and port groups; after 2006, with the continuous advancement of relevant policies of the state and local governments, the degree of resource integration of port groups in the Yangtze River Delta has been deepening, which can prove that the port groups in the Yangtze River Delta are located in Pareto. In the potential cooperation area of the improved model, the government's policies have played a positive role in promoting the deepening of the integration of port resources in the Yangtze River Delta. In addition, from the point of view of the comprehensive competitive strength structure of the port group in the Yangtze River Delta, Shanghai Port and Ningbo-Zhoushan Port rank first in terms of comprehensive strength, while Jiangsu Port ranks second. In recent years, Jiangsu Port has more resources integration with Shanghai Port and Ningbo-Zhoushan Port, and the spontaneity of cooperation is stronger. It can be inferred that Jiangsu Port cooperates with Shanghai Port and Ningbo-Zhoushan Port. In the absolute cooperation region, however, because the cooperation between Shanghai Port and Ningbo-Zhoushan Port is located in the potential cooperation region, and the two ports account for a large proportion, the integration of port resources in the Yangtze River Delta is still located in the potential cooperation region in general.

## **4.4 Development proposals**

### **4.4.1 Constructing a Joint Port Authority to Break through Administrative Restrictions**

In order to break through the problem that the Yangtze River Delta ports cluster is divided into three administrative regions: Shanghai, Zhejiang and Jiangsu, we can learn from the experience of the United States in building the New York-New Jersey Port Group Joint Port Authority and the highly consistent resource integration experience of the local governments in Tokyo Bay, Japan, and jointly form the Yangtze River Delta ports cluster Joint Port Authority across administrative regions, which can be formed under the leadership of the Ministry of Communications. It has the ultimate power to manage the planning and construction of ports in the Yangtze River Delta, and stipulates that local governments shall not interfere in the planning and construction of ports in the Yangtze River Delta to prevent conflicts between the overall and local interests of ports in the Yangtze River Delta, while actively cooperating with the work of the Joint Port Authority. In addition, considering that the main contradiction of resource integration of Yangtze River Delta ports cluster is not between Jiangsu Port and Shanghai Port, Ningbo-Zhoushan Port, but between Shanghai Port and Ningbo-Zhoushan Port, and that the cooperation between the two ports is in the potential cooperation area, the motive force of resource integration needs the promotion of external factors such as the government, therefore, the focus of the management of the Yangtze River Delta ports cluster Joint Port Authority is on Shanghai Port and Ningbo-Zhoushan Port, in the process of establishing the joint port authority, can build the joint port authority on the basis of the former Shanghai Port Management Committee. It can first establish the Shanghai-Ningbo joint port authority and further develop to the joint port authority of the Yangtze River Delta

ports cluster. Through the construction of the joint port authority, the port group of the Yangtze River Delta can break through the constraints of the administrative region, better plan and construct the port group, reduce unnecessary competition, avoid planning confusion and other problems, greatly liberate and develop the productivity of the port group, which is the most fundamental way to integrate the resources of the port group of the Yangtze River Delta.

#### **4.4.2 Reasonable development of shoreline resources to solve structural contradictions**

In terms of wharf construction, the Yangtze River Delta ports cluster Joint Port Authority should make overall planning, develop and utilize wharfs according to the actual needs of the region, rationally develop and utilize regional port shoreline resources, integrate the "excess" port processing capacity, especially large crude oil terminals, increase processing capacity to meet port demand, and strengthen the construction of bulk dry bulk cargo wharfs. Wharf and container terminal should focus on solving the structural problem of unbalanced utilization of wharf and take the road of intensive development. When dealing with "surplus" wharfs, appropriate and flexible strategies can be adopted. For example, these wharfs can be reconstructed and transformed into port wharfs whose supply capacity needs to be improved. These wharfs can also be leased to logistics or production and processing enterprises, allowing them to operate freely, collect rents and invest profits in accordance with the division of port labor. On the one hand, it provides good location production conditions for enterprises, on the other hand, it is also a good policy for the port to activate the "excess" port handling capacity. In order to increase the number of wharfs with insufficient handling capacity, it is suggested to use the way

of joint capital between ports, which can not only play the role of financing, risk sharing, but also promote a more rational division of labor, benefit sharing and avoid the problem of duplicate construction.

#### **4.4.3 Strengthen Planning Strictness and Improve Planning Implementation Efficiency**

For the function orientation of the main ports in the Yangtze River Delta ports cluster, the relevant planning of the state and local governments has been clearly stated and all of them are reasonable. At present, the focus of our work should be to strengthen the rigor of the planning and improve the efficiency of the implementation of the planning. Their premise must be under the leadership of the joint port authority of the Yangtze River Delta ports cluster, because the integration of port group resources is a system. The Yangtze River Delta ports cluster should fully communicate with the resource integration projects to be constructed, rationally divide the planned projects, conform to the local construction capacity, and keep pace with the progress of other projects. At the same time, the planning should make clear the starting time and completion time of the key port projects to be constructed in the form of annexes. It requires all units participating in the resource integration project of the port group to actively cooperate, express their opinions and suggestions, and jointly make suggestions for the resource integration of the Yangtze River Delta Group. At the same time, the Yangtze River Delta ports cluster Joint Port Authority should strengthen the supervision and management of resource integration projects. It can give certain incentives to those units that have fulfilled the set goals ahead or on time, and punish those construction units that have not completed the projects with quality and quantity. In the process of the project and after the completion of the project,

timely feedback should be given to the existing problems periodically or irregularly, exchange and discuss with other ports, share relevant experience, solve the existing problems accurately and efficiently, and provide experience for other resource integration projects and future project construction.

#### **4.4.4 Joint cross-shareholding of capital to deepen exchanges and cooperation among port groups**

Cross-shareholding is one of the better ways to establish a long-term cooperation mechanism between ports. Through the joint use of resources, the port and the port can achieve the state of benefit sharing and risk sharing, effectively avoid such problems as duplication of port division, duplication of infrastructure construction, vicious price competition and so on. At the same time, it can promote the free flow of production factors among the ports and give full play to their maximum value. Considering that the port groups in the Yangtze River Delta belong to Jiangsu, Zhejiang and Shanghai respectively, and are easily interfered by local governments, it is difficult to dominate the development direction of the port groups by relying on cross-shareholding. The construction of the joint port Bureau in the Yangtze River Delta must be taken as the premise. Therefore, only under the premise of the construction of the joint port bureau, can the joint capital of the port groups play the most effective role. The former is the relationship between the management system and the management strategy. Here we need to point out that there are two main purposes of capital pooling: one is to maximize the value of limited capital, the other is to avoid vicious competition within the port group while creating the maximum value. Therefore, it does not mean that cooperation between ports must use the way of capital pooling, it is only an effective method of resource integration, but if it

reaches the goal of maximum value, the other is to avoid vicious competition within the port group. Without these two purposes, there is no need for capital consolidation.

#### **4.4.5 Speed up R&D and application of science and technology and strengthen information interconnection among port groups**

Making full use of the practical new technology and technology of port logistics, relying on the port EDI platform, the intelligent technologies such as Internet of Things, RFID and GPS are popularized and applied in the port cluster. The information management systems such as container operation management system and collaborative management and control of scattered and miscellaneous business are constructed and perfected to realize the integration, intellectualization and automation of port cluster logistics and port operation services, and to upgrade the fourth party goods. Stream market level, promote the fourth party logistics market and port logistics information platform, and ultimately realize data docking and sharing between ports and ports, port and port inspection units, cargo owners and logistics operators within the port group, forming a comprehensive information network covering the entire port group supply chain to provide a series of information integration, such as online booking, warehousing management, transportation scheme consultation, etc. In addition, we should give full play to the intellectual support of universities, research institutes and other departments, integrate the resources of the Yangtze River Delta ports cluster with the reality, timely transform scientific research results into practical policies, technologies and products, and provide effective conditions for information communication for all kinds of logistics production and service participants in the Yangtze River Delta ports

cluster.

#### **4.4.6 Construct the "Trinity" System and Improve the Soft Power of Port Group**

On March 25, 2009, the Standing Meeting of the State Council adopted the "Opinions on Promoting Shanghai to Accelerate the Development of Modern Service Industry and Advanced Manufacturing Industry, Construct International Financial Center and International Shipping Center" in principle, and Shanghai completed the positioning of international shipping center and international financial center. On the basis of this orientation, the Yangtze River Delta ports cluster should actively construct a "three-in-one" port and shipping service system, which includes: first, building a national commodity trading platform, including commodity trading center and strategic material storage and transportation base, which is the core task; second, optimizing and improving the modern logistics network of collection and distribution, including logistics parks and infrastructure construction of collection and distribution, etc. Thirdly, strengthen the construction of financial and information service system, including the establishment of port and shipping service financing institutions, the establishment of port financial cooperation mechanism, the trial implementation of offshore finance, the establishment of data exchange public service platform, and the unification of information transmission standards of various departments, which is the software support. Through the construction of the "Trinity" port and shipping service system, it can make up for the shortage that the port groups in the Yangtze River Delta paid too much attention to the quantity of cargo and neglected the quality of cargo. It is conducive to the development of marine economy, the acceleration of economic transformation in the Yangtze River Delta, the acceleration of the

construction of Shanghai International Shipping Center, the strengthening of the integration of Ningbo-Zhoushan Port, and the integration of resources of the port groups in the Implementation and software support provide production support, enhance the soft power of port groups, and promote faster and better resource integration of port groups.

## **5 Conclusion**

From the linkage frequency and depth of three provinces and one city in the Yangtze River Delta, whether from the government level of ministries and provinces, or from the substantive business and equity cooperation among port groups, the integration and development of ports in the Yangtze River Delta, the general trend, is also constantly going deep.

At present, the cargo and container throughput of the Yangtze River Delta ports cluster has occupied the leading position in the world. The region has Ningbo Zhoushan Port with the largest cargo throughput in the world and Shanghai Port with the largest container throughput in the world. Promoting the integration of ports in the Yangtze River Delta region will promote the upgrading of port quality and efficiency, optimize the allocation of resources, eliminate excess terminal capacity and improve business synergy. As the integration of the Yangtze River Delta develops and becomes a national strategy, it is time for the ports of the Yangtze River Delta to take the lead in realizing integration and become pioneers.

At present, the core subject of port integration in the Yangtze River Delta region has been basically completed, and the interest coordinators will be reduced from dozens

to four parts of three provinces and one city, so it is relatively less difficult to promote regional integration. By taking advantage of the integration of the Yangtze River Delta and rising to the east wind of the national strategy, we should abandon the idea of regional portal, promote cross-provincial and municipal port strategic cooperation, speed up landing, encourage mutual participation and benefit sharing among ports, and realize the overall layout and business coordination of regional ports. Promoting port integration in the Yangtze River Delta region will make new breakthroughs in the construction of Shanghai International Shipping Center, and bring into full play the prominent role of Yangtze River Delta ports as world-class ports in the growth pole of the national economic belt strategy.

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