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WORLD MARITIME UNIVERSITY

Shanghai, China

**COOPERATIVE DEVELOPMENT OF
INTERNATIONAL PORT IN GUANGDONG-
HONG KONG-MACAO GREATER BAY AREA**

By

DU YUNWEI

China

A dissertation submitted to the World Maritime University in partial
Fulfilment of the requirements for the award of the degree of

MASTER OF SCIENCE

In

MARITIME AFFAIRS

(INTERNATIONAL TRANSPORTATION AND LOGISTICS)

2019

DECLARATION

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

The contents of this dissertation reflect my own personal views, and are not necessary endorsed by the University.

(Signature): _____

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Supervised by: _____

Supervisor's affiliation: _____

ABSTRACT

Title of Dissertation: **Cooperative Development of International Port in Guangdong-Hong Kong-Macao Greater Bay Area**

Degree: **Master of Science**

As the result of economic globalization and the economic development of China, China has proposed the construction of Guangdong-Hong Kong-Macao Greater Bay Area which based on the "One Belt, One Road" and the overall development of the country. During the construction of the Bay Area, the overall development of the port cluster cannot be ignored. Guangdong-Hong Kong-Macao Greater Bay Area are densely populated with three world-class ports and other fast-growing small and medium-sized ports. How to avoid vicious competition among the port cluster and improve the competitiveness of the port cluster become the key point of this dissertation. In this dissertation, literature review method and comparative analysis method will be used for qualitative analysis. This dissertation takes Hong Kong, Shenzhen, Guangzhou, Zhuhai, Dongguan and Huizhou ports as the main research objects. After comparing two main production indicators of cargo and container throughput which combined with the port size, location conditions, total economic output and historical situation, three problems has been found in the current port layout. In addition, the port cluster in the region has changed from the traditional competition model to the co-opetition model, mainly including the vertical co-opetition model and the horizontal co-opetition model. In view of the existing problems, this dissertation believes that the port cluster of Guangdong-Hong Kong-Macao Greater Bay Area is more suitable for the horizontal co-opetition model of regional port cluster, and puts forward corresponding suggestions on how the port cluster could develop synergistically, hoping to promote the coordinated development of ports in the Bay Area and provide reference for the construction of other port cluster in China.

KEYWORDS: Co-opetition, Division, Layout, Port Integration, Port Positioning

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1 Introduction

1.1 Preface

Guangdong-Hong Kong-Macao Greater Bay Area (hereinafter referred to as GBA or the Bay Area) is the fourth largest Bay Area in the world (Top three are New York Bay Area, San Francisco Bay Area and Tokyo Bay Area), which include Hong Kong, Macao, Guangzhou, Shenzhen, Zhuhai, Foshan, Huizhou, Dongguan, Zhongshan, Jiangmen, Zhaoqing. The Bay Area occupy about 56,000 square kilometers of land and the population of that area is about 70 million at the end of 2017. GBA is one of the regions which have the highest degree of openness and the strongest economic vitality in China. And the country consider this area as an important strategic position in the overall development of China. The Bay Area, the Yangtze River Delta and Beijing-Tianjin-Hebei are known as three engines of regional economic development in China. Judging from the port situation. There are many good harbors in GBA, according to statistics, Shenzhen, Hong Kong and Guangzhou are listed into the top 10 ports in terms of global container throughput. The container throughput of GBA ranks first in the world, which occupy about one-fifth of the total global ocean container shipping volume. It is worth to mention that Hong Kong has developed into an important international shipping service center relying on certain historical conditions and a highly international market. Thus Hong Kong has extensive international experience in shipping, finance, trade and maritime services, which could lay a good foundation to the development of the international shipping service industry in GBA. Based on the existing literature and data, this dissertation will theoretically analyze the problems that exist in the current port layout of GBA, and then propose

the port development positioning under the overall development background of GBA and the advantages of each port, and put forward corresponding suggestions on how to realize the coordinated development of port cluster through the integration of port resources in the region.

1.2 Research Background

GBA is located at the forefront of Chinese coastal opening, with the Pan-Pearl River Delta region as a broad development hinterland, and occupies an important position in the construction of the "One Belt, One Road". GBA has strong economic strength, complete industrial system and obvious cluster advantages. GBA's total economic volume was about 10 trillion RMB in 2017. At the same time, the cities are geographically close, with close internal links and convenient transportation conditions. There have Hong Kong international shipping centers and throughputs in the world's leading ports such as Guangzhou and Shenzhen, as well as internationally influential aviation hubs such as Hong Kong, Guangzhou and Shenzhen. The convenient and efficient modern integrated transportation system is accelerating. Therefore, GBA is currently the most suitable area to form the "Bay Area Economy" in China.

However, the dense distribution of ports in the GBA has also brought a series of problems to the development of the Bay Area economy. Among them, the most critical issue is that the port's unclear positioning may lead to vicious competition among different ports in the same port cluster. This is the most intense level of port competition, mainly for the competition for supply of cargo. It will have a negative

impact on the development of the "Bay Area Economy". On the other hand, according to the Chinese government's strategic positioning of the GBA, the Bay Area will be built into a world-class Bay Area and a world-class city group. From the perspective of the coordinated development of the port and maritime industry, each port in the Bay Area should choose the appropriate level of maritime industry for the development of the port based on their own advantages and conditions, and form a reasonable and orderly division of work and cooperation system with other ports to promote the sound cooperation and sustainable development of the ports in GBA.

1.3 Research Objectives

Modern port is an important infrastructure for a country or region to participate effectively in economic globalization and maintain its leading role in international competition. Because of the interdependence and promotion between port and trade, finance and manufacturing industry, port has been regarded as the growth point of regional economy, the foundation and pioneer industry of national economic development, the important support to ensure the normal operation of national economy and the normal life of the people, and plays a huge role in economic and social development. At present, Chinese coastal cities are building ports one after another. Influenced by the trend of large-scale ships, the construction of ports tends to be deep water, and the scale of ports is also expanding rapidly. However, the disharmony within the port cluster and the unclear function orientation of each port make the competition in the port cluster increasingly fierce. Therefore, in order to promote the development of regional economy in GBA, it is necessary to face up to the rational division of work among the port clusters in the Bay Area, promote the

coordinated development of the ports, avoid the fierce competition within the port clusters and reduce the development speed of the port economy in the Bay Area.

For this reason, this dissertation will list several main ports in the GBA and their basic situation according to the existing literature. Then, through the comparative analysis of the main economic indicators of these ports, such as port throughput, as well as the geographical location of port cities and other comprehensive factors. Thereby finding the irrationality and problems existing in the current port layout. Finally, by drawing on the development experience of the three major bays in the world and combining with the actual situation of the ports in GBA, this dissertation puts forward corresponding suggestions on how to coordinate the development of the ports in the Bay Area, with a view to providing theoretical reference for future development planning.

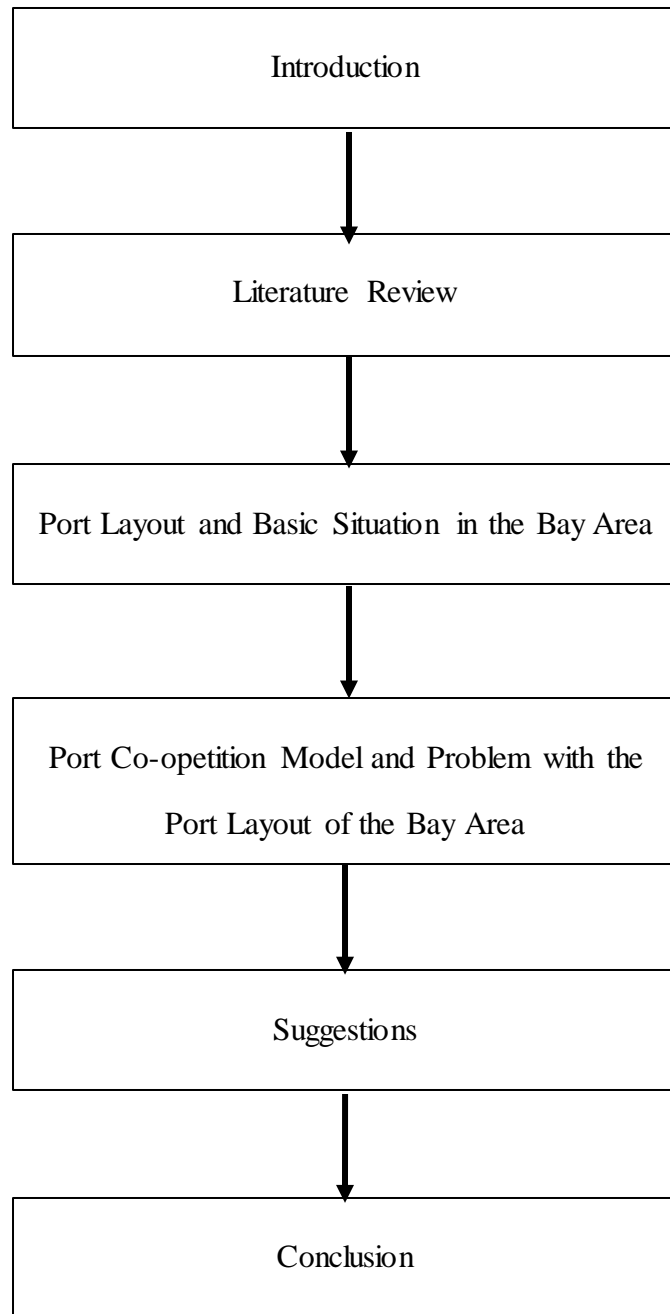
1.4 Methodology

This dissertation mainly uses the literature research method and the comparative analysis method. The literature research method, by collecting, identifying, sorting out and consulting the domestic and international relevant research materials of the port integration and the research data of GBA and the world's three Bay Areas, and drawing on the research results of scholars at home and abroad, the dissertation understands the background and development framework of GBA, obtains the information of research objects in an indirect way, and provides basic information and information for the theoretical analysis of this dissertation. At the same time, this dissertation will sort out

and summarize the existing research results of academic journals, dissertations, Internet information, and provide literature support for in-depth study of this topic.

The comparative analysis method. The basic situation of these ports is compared by collecting relevant data of major ports in GBA and related shipping industry development information. At the same time, the rationality of port positioning should be considered in the light of the specific conditions of the cities where the ports are located, such as the development of regional economy, the geographical location of the city, the historical situation of the city, the development of port and shipping industry and the changing trend of port clusters in the region. This dissertation summarizes the problems existing in the current port layout and analyses the reasons for this irrationality. According to the opportunities and challenges faced by the development of port clusters, the dissertation redefines the position of ports which are more suitable for the functions of each port, and then puts forward suggestions for the coordinated development of ports which are more suitable for GBA, so as to promote the rational division of ports in the region.

1.5 Research Framework



2 Literature Review

2.1 Theoretical Basis of Regional Port Division

With the gradual acceleration of economic globalization and regionalization, the development of everything is no longer isolated, and the development of ports is no exception. Port agglomeration and cluster development have become an irresistible trend of in the development of ports around the world. At present, many countries and regions in the world have developed a relatively complete regional port cluster system. From the practice of the development of these regional ports, breaking the boundaries of administrative divisions and integrating new market elements, strengthening cooperation and coordinated development among the ports in the region can promote the common development of the ports in the region and improve the overall competitiveness of the port cluster. At the same time, it will also boost the hinterland economic development with the prosperity of the port economy, and bring new opportunities to regional economic development.

Wu Hongtao (2008) used the evolutionary theory to study the regional port cluster, systematically explained and analyzed the history, current situation and future development trend of the regional port cluster from a brand-new perspective, summarized the evolutionary law, mode and dynamic mechanism of the regional port cluster, and made an empirical study of the port cluster around Bohai Sea in China, summarized the evolutionary trajectory of the port cluster around Bohai Sea, and analyzed it. On the basis of the internal and external conditions for the formation of such evolution, he predicted the future evolution trend, and put forward corresponding methods and suggested to promote the scientific and coordinated development of the

port cluster around the Bohai Sea.

Ji Yuanxiang and Zhang Lei (2014) put forward the idea of port dislocation development in Beijing-Tianjin-Hebei region. Taking into account the factors such as port size, cargo structure, port location, port-city relationship and shipping factor aggregation, they determined the position of each port. With capital as a link and government guidance as a means, they formed a "one-core-two-wing" northern international shipping center port cluster with complementary advantages, clear division of labor and integration of interests. At the same time, they put forward relevant countermeasures and suggestions for the dislocation development of Beijing-Tianjin-Hebei regional ports. This provides a theoretical basis for how to divide and select indicators to determine the location of each port, and provides a thinking direction for the research methods of this dissertation.

Luo Fang (2012) believed that the internal disharmony of the port cluster was mainly manifested in the prominent structural contradictions of the port, the serious duplication of port construction, the unclear positioning of port functions and the disorderly competition plan between ports, which made the huge investment inexpensive and seriously hindered the further development of the port. Therefore, it is of great theoretical and practical significance to study the coordinated development and governance mechanism of port clusters. From the perspective of regional port clusters, she focused on the analysis and design of the overall competition mechanism of the market, studied the adverse competition phenomena and harnessing measures within the port clusters, designed the reasonable competition mechanism scientifically, so as to optimize the competition environment within the port clusters, maximize the

social and economic benefits of the operation of the port clusters, and realizes the optimal allocation of social resources and the port.

2.2 Theoretical Basis of Port Resources Integration

With the upsurge of port construction in Chinese coastal cities, Chinese coastal port cities are densely distributed, and have formed the Bohai Rim Port Cluster, Yangtze River Delta Port Cluster, Southeast Coastal Port Cluster, Pearl River Delta Port Cluster and Beibu Bay Port Cluster. There is fierce competition among these ports, and there is also fierce competition among different ports within the port cluster. Therefore, Chinese scholars began to study the experience of foreign port integration, hoping to learn from the experience of foreign port integration, promote the trend of Chinese port integration, transform competition within the port cluster into cooperation, and promote the overall development of ports.

Dai Ziyang (2005) believed that in order to meet the development of international trade, especially container trade, ports in various countries have stepped up expansion and renovation, and the competition among ports has become increasingly fierce. Serious consequences caused by disorderly competition among ports, such as waste of resources and decline of efficiency of port enterprises, have been paid more and more attention by port authorities. The trend of ship enlargement and port deep water urges the port to seek cooperation with the surrounding ports. Taking the port cluster of the Yangtze River Delta as an example, she puts forward the cooperative competition mode system of the port cluster, and believes that the cooperative competition within the port cluster is the key to promote the healthy development of the port cluster.

Xie Lingfeng (2006) believes that with the acceleration of port economic development process, the research on port development should be based on the concept of sustainable development, reflecting the comprehensive and coordinated development of society. Under the principle of overall planning, the development of ports can radiate the surrounding economic and industrial belts, thus realizing the overall modernization of the whole society. At the same time, taking into account the improvement of human living environment and the improvement of quality of life, Xie Lingfeng, under the background of the change of port management system and domestic and foreign economic situation, took the scientific development concept as the guiding ideology, established port resources integration theory. Through the comprehensive application of sustainable development theory, economics, management theory and system science theory, drawing lessons from the practice of port resource integration in typical areas at home and abroad, Xie Lingfeng made an economic theoretical analysis of port resource integration. Through the diagnosis of port resource integration management in the Pearl River Delta, the framework of port resource integration was designed, and the corresponding policy guarantees were put forward.

He Xiangyang, Tang Fei (2017) summed up the development mode of port integration by combing the current situation of port resource integration in typical regions at home and abroad, and provided reference for the relevant decision-making of port resource integration in China.

Zhang Qiang, Yin Ming (2018) took the development of the Northwest Coast Port Cluster of the United States as the research object, analyzed the cooperation activities and specific development measures of the United States in promoting the coordinated

development of regional ports, and summarized the relevant beneficial development experience. In addition, Zhang Qiang and Yin Ming believe that in the process of promoting port integration in China, it is necessary to strategically choose local integration according to actual conditions instead of merely pursuing comprehensive integration between ports, and adopt a gradual integration strategy to ensure the interests of the relevant ports involved in the integration can be respected and maintained to the utmost extent. At the same time, in the process of port integration, relevant departments should regularly evaluate the results of different integration stages, so as to appropriately adjust the integration plan, which is also very necessary.

2.3 Theoretical Framework for the Development of the Bay Area

The GBA is a new geographical concept arising from the intensified cooperation of the Pearl River Delta economic circle under the initiative of "One Belt, One Road". Zhao Xiaobin, Qiang Wei, Huang Weihao and Xian Shi (2018) briefly combed the existing theories of urban agglomeration, regional growth pole, new economic geography cluster, global industrial chain network theory and combined with the current situation and advantages of the Bay Area, explored the strategic positioning and development path of the Bay Area, believing that an endogenous economic and industrial local growth model could be created through the joint efforts of Guangdong, Hong Kong and Macao. For the sake of building GBA into Chinese science and technology innovation center and global financial center.

Ruan Xiaobo (2018) briefly introduced the development status of Hong Kong, Guangzhou, Shen Zhen and other ports in Guangdong Province, based on the

development status of the port transport industry in GBA. Ruan Xiaobo believes that the main problems existing in the port transport industry in GBA are the insufficient development of the port and shipping industry and the unbalanced development of the modern shipping logistics industry, which cannot meet the needs of the international development of shipping. On the whole, the division of work, cooperation and differentiation in the GBA are underdeveloped and lack of resource integration.

Qin Yanhua and Cao Xiyu (2018) analyzed the development and evolution path of the three major bays in the world, compared the basic data and analyzed the gap between the three major bays in GBA and the world, and gave the enlightenment of the development of the three major bays in the world to the construction of the three major bays in GBA. They believed that in the process of developing the GBA, great importance should be attached to building the port economic belt, which is to expand the scope of economic activities from within the port to outside the port, to form a Bay Area urban agglomeration with the port city as the core, to realize transformation and upgrading relying on the financial industry and other industries, and to build a world-class urban agglomeration.

Xi Fang and Liu Jinghua (2019) conducted a study on the development status of Hong Kong's ports in the context of GBA. They found that there are three major problems in the Hong Kong's ports. First, the depth of water of Hong Kong's ports are difficult to adapt to the trend of container ship enlargement. Second, the depth of the land was insufficient to restrict the development of value-added shipping services. Third, there are contradictions between ports and cities in terms of land, environment and transportation. In view of these problems, they believe that Hong Kong should further

seek regional port cooperation, deeply integrate into the division of regional shipping industry, focus on the development of high-end shipping services, and build itself into a high-end international shipping center.

3 Port Layout and Basic Situation in the Bay Area

The Bay Area is the busiest shipping area with the densest ports in the world. In 2017, cargo throughput of this area exceeded 150 million tons. There are 5 ports which throughputs exceed 100 million tons, named Hong Kong, Shenzhen, Guangzhou, Dongguan and Zhuhai (590 million tons in Guangzhou, 282 million tons in Hong Kong, 241 million tons in Shenzhen, 157 million tons in Dongguan and 130 in Zhuhai). Container throughput of them all exceeded 70 million TEU. Every city in the Bay Area have ports with large berths, these ports have high degree of marketization and developed port economy. GBA Port Group has been developing with the process of South China becoming a world factory. Hong Kong is the earliest international shipping center in the Bay Area. It is obvious that the port functions of Shenzhen and Guangzhou are the extension of Hong Kong's port. After the reform and opening-up in the 1980s, Hong Kong, Taiwan and international capital flooded into the Mainland, and the construction of the mainland ports further developed, forming a tripartite situation of Guangzhou, Shenzhen and Hong Kong, other small ports crowding for the moon. Guangzhou Port, Shenzhen Port and Hong Kong Port have their own business priorities. Guangzhou Port is a comprehensive port with a variety of cargo handling, with the proportion of domestic trade cargo reaching about 75%. Shenzhen Port is mainly container handling, mostly import and export goods. As an international hub port, Hong Kong Port has more than half of its container throughput as international transit container.

3.1 Hong Kong

Hong Kong locate on the east side of the Pearl River Estuary, which is the heart of China and neighboring Asian countries. The port has excellent natural conditions because Hong Kong is an international financial, trade and shipping center in the Asia-Pacific region. It is characterized by large business and high operational efficiency. It is one of the busiest and most efficient international container ports in the world and important hub port in the global supply chain. Hong Kong not only has container terminals, but also has dedicated terminals such as oil, coal and cement. There are 15 port areas in Hong Kong with more than 80 international liners, which provide about 500 container liner services per week and connect more than 500 destinations around the world. The main facilities of Hong Kong port include container terminals, river trade terminals, mid-stream operation areas and public cargo handling areas. Between 1989 and 2004, Hong Kong's container throughput ranked first in the world for most of the years. With the rapid development of Chinese coastal ports and the impact of global economic fluctuations and regional competition, Hong Kong's container throughput growth is weak, and it has gradually surpassed Shanghai, Ningbo, Shenzhen and Singapore. In 2017, the total container throughput of Hong Kong was 20.77 million TEU, ranking only fifth in the world, while Shanghai, the world's top container throughput, reached 40.23 million TEUs, almost twice that of Hong Kong.

Among all harbor area of Hong Kong, Victoria Harbor Area is the largest and best natural port area, which can accommodate large ocean-going cargo ships to enter and exit the terminal and loading and unloading area at any time. The berthing area in the port area is convenient and safe. The port facilities and management are advanced, and the operation process is efficient. The container ship only needs 10 hours of turnaround

time in the port. In 2017, the throughput of the Kwai Tsing Container Terminal reached 16.2 million TEU, accounting for 78% of the port container throughput. The remaining 22% of the containers are handled in the mid-stream operation area, the river trade terminal, the public cargo handling area, and other private warehouse terminals. Therefore, the development of the Kwai Tsing Container Terminal will directly affect the development of the port and shipping industry in Hong Kong.

Hong Kong has extensive international experience in maritime, finance, trade, professional services and infrastructure construction. More than 800 companies related to maritime services provide a wide range of maritime services, including ship management, shipping agency, shipping brokerage, ship financing, maritime insurance, and maritime law and arbitration services. The merchant shipping fleet owned or managed by Hong Kong's shipowners and ship management companies accounts for 9.6% of the global merchant shipping fleet, making Hong Kong the premier international ship financing center in Asia.

3.2 Shenzhen

Since the reform and opening up, Shenzhen Port has become a container hub port in the South China, promoting Shenzhen to become an important trade gateway in the region. Shenzhen Port is located in the south of the Pearl River Delta in Guangdong Province, on the east bank of the Pearl River, adjacent to Hong Kong. There are 155 berths in Shenzhen, including 78 berths above 10,000 tons, 51 berths for containers, 19 passenger berths, and 24 petroleum and chemical berths, of which the largest is 22,000 tons of cruise berths and the total length of productive berths is 32.80 kilometers. As one of the most influential container trunk ports in the world, the

container throughput of Shenzhen Port has grown at an average annual rate of 11.9% since 2000. In 2014, it surpassed Hong Kong to become the world's third largest container port. As one of the most influential container trunk ports in the world, Shenzhen Port completed cargo throughput of 241 million tons and container throughput of 25.21 million TEU in 2017, ranking the third largest container hub in the world for five consecutive years. Shenzhen Port has opened 226 international container liner routes, covering the world's 12 largest shipping areas, reaching more than 300 ports in more than 100 countries and regions. At present, Shenzhen Port has established 11 inland port cargo terminals and dry ports, and opened 60 barge routes covering 52 Pearl River Delta feeder terminals and 14 sea-rail intermodal train lines, and operated 4 inland ports. It further strengthened the status of Shenzhen Port as the main hub port in South China.

As the most important maritime gateway in the Pan-Pearl River Delta region, Shenzhen Port not only undertakes more than 40% of the waterway foreign trade cargo transportation tasks in Guangdong Province, and also provides a large number of transshipment services for other areas in the Pan-Pearl River Delta. In the Pan-Pearl River Delta region (excluding Guangdong Province), foreign trade containers entering and leaving Shenzhen Port account for 35% of the total demand for foreign trade container transportation. Shenzhen Port mainly consists of the eastern port area and the western port area, and the east and west port areas each account for half of Shenzhen's port market share. The eastern port area mainly refers to Yantian Port Area, and the western port area mainly refers to Shekou Port Area and Chiwan Port Area. With its natural deep-water berth conditions and super-large ship service capabilities, Yantian Port has attracted 80% of the world's container ships of over 10,000 TEUs.

Although they belong to Shenzhen Port, due to the different capital operations of the eastern and western ports, the internal competition is fierce. All the port areas are expected to expand their business and attract more goods to enhance the comprehensive strength of the port.

3.3 Guangzhou

At present, Guangzhou Port has developed into an important hub for Chinese comprehensive transportation system and an important port for foreign trade in South China. Guangzhou Port is located at the Pearl River Estuary and the center of the Pan-Pearl River Delta region and runs through the water network of the whole region. It has a unique geographical advantage. As the transportation hub of South China, Guangzhou connects Chinese inland areas of Hunan, Guangxi, Jiangxi and other places, and has a vast economic hinterland, which provides good conditions for the development of Guangzhou Port. With the development of the city, the development focus of Guangzhou Port has gradually shifted to Nansha Port Area. In recent years, cargo throughput and container throughput have been ranked among the top ten ports in the world. It is the largest integrated main hub port in GBA and also is the largest domestic trade container hub port of China. In 2017, Guangzhou Port completed cargo throughput of 590 million tons, ranking fifth in the world; container throughput exceeded 20 million TEU, reaching 20.37 million TEU, ranking seventh in the world; commodity vehicle transportation exceeded 1 million, ranking second in China. The home port of international cruise has developed rapidly, and the passenger throughput of cruise ships has exceeded 400,000, ranking third in the country. In 2017, Nansha Port Area completed a container throughput of 13.95 million TEUs, ranking it in the forefront of the world's single port area. At the end of 2017, there were 197 container

routes in Guangzhou Port, of which 91 were international liner routes, covering most of the world. The world's major liner companies all opened routes in Guangzhou Port. There are more than 160 barge routes on the rivers and seas, and 33 inland dry port offices covering 30 cities in China. There is also opened up the Sino-European sea-rail combined freight transport channel in Guangzhou Port. Meanwhile, Guangzhou Port has become a core hub port for the African and Mediterranean routes, and the status of the international container trunk port has been strengthened.

Among the foreign trade import and export goods in the Pearl River Delta region and the whole Guangdong Province, Guangzhou Port mainly serves the west bank of the Pearl River. With the cooperation with Zhongshan and Foshan, the construction of Nansha Port Area will be further strengthened, making the container business of Guangzhou Port more completed. The overall transportation capacity will be enhanced to promote the overall comprehensive strength of Guangzhou Port and will be highly competitive in the port competition in the Bay Area.

In the process of developing new shipping formats, whether the port can play the allocation capacity, and the accumulated shipping resources are also one of the important factors. Therefore, Guangzhou Port is currently actively developing various types of shipping services related to ports. Guangzhou International Shipping Arbitration Court, Guangzhou Maritime Court Guangdong Free Trade Zone Circuit Court, and Guangzhou International Shipping Research Center were established one by one. The shipping service industry such as shipping finance, shipping insurance, legal arbitration and ship management in Guangzhou is actively developing. Guangzhou Shipping Exchange has actively expanded its ship trading service network

and has developed into the largest ship asset trading service platform in South China.

3.4 Other Ports

Located on the east bank of the Pearl River Estuary, Zhuhai Port is one of the 25 major coastal ports in China. Its main source of goods in South China is the Pearl River Delta region. Long-term imports of dry bulk products such as coal, iron ore and oil and gas chemicals are the main sources of imports. The industrial and economic situation of Zhuhai local and surrounding areas is not developed like Shenzhen and Guangzhou. Therefore, the import and export container utilization rate of Zhuhai Port is relatively low. In 2017, Zhuhai Port completed cargo throughput of 125 million tons and container throughput of 2.27 million TEU. At present, there are 74 container liner routes in Zhuhai Port, including 24 international routes and 25 coastal trunk lines. In addition, the main collection and distribution methods of Zhuhai Port mainly use traditional highways, waterways, highway-waterway intermodal transport, and river-sea coordinated transport, and less on sea-rail combined transport.

Dongguan Port is a national first-class port in China. It is located in the Pearl River waterway and has a 53-kilometer deep-water coastline that can be developed on a scale. It has unique geographical advantages and economic agglomeration advantages, and has the space resource conditions for development of port-based industries and warehousing logistics. Dongguan Port is an extension and supplement of the main hub ports of Guangzhou Port and Shenzhen Port, and is also a regional important port on the coast of Guangdong Province. In 2017, Dongguan Port completed a total of 157 million tons of cargo throughput and a total container throughput of 3.91 million TEU.

Huizhou Port is a first-class port in China. It is a rare natural harbor in South China and has an annual handling capacity of 100 million tons. Since the official launch of the Nanhai petrochemical project, a large amount of materials have been docked or transported in Huizhou Port, so the logistics traffic of Huizhou Port is increasingly important. Huizhou Port is an important port supported by Guangdong's export-oriented economic development and large-scale coastal industrial development. It has gradually developed into a multi-functional integrated port with petrochemicals and containers as the mainstay, taking into account the transportation of bulk goods and bulk cargo. In 2017, Huizhou Port completed cargo throughput of 72.14 million tons and container throughput of 210,000 TEU. At present, Huizhou Port Quanwan Port Coal Terminal has been opened, with a designed capacity of 23 million tons of coal to be unloaded, aiming to become an important coal terminal in South China.

4 Port Co-opetition Model and Problem with Port Layout of the Bay Area

4.1 Port Co-opetition Model

During the process of economic globalization progresses, it is necessary to build a global distribution network of reliable multimodal transport systems. The port has changed from a traditional cargo transportation node to a significant link in the logistics chain, the status of the port has been slightly improved. With the changes in the international and domestic environment, the port has gradually moved toward co-opetition instead of traditional competition, which set new requirements on the port logistics network system in the region. Therefore, in the future development, the overall optimization and coordination of the port logistics system in the region is likely to be achieved through long-term cooperation and reasonable competition between ports.

In the increasingly fierce competition environment, port operators would choose to take new competition and cooperation strategies to achieve a double win situation. Based on the traditional concept, many port operators believe that the relationship with competitors is a pure win-lose relationship. However, in the long run, pure competition will only lead to lose-lose result. In the long-term operations, it is most important for port operators to seek a strategy which allow their ports and competitors to achieve a win-win situation. Co-opetition refers to competition in cooperation, which could avoid adverse consequences of vicious competition of both parties. Relying on port competition, the ports are able to achieve scale advantage and share investment risks.

In addition, port co-opetition is conducive to port operators to explore the international market through the smooth entry into new markets. The port alliance could also promote the unanimity of both ports to enhance the port competitiveness. Through cooperation with other ports, the capacity and service level of the port gradually increase, therefore these ports would have strong bargaining power in the face of government-controlled trade, investment barriers and shipping alliances. In conclusion, the ultimate goal of port co-opetition is to increase port throughput and operating profit. There are many joint strategies between ports, and the competition modes of regional ports mainly include vertical and horizontal modes.

4.1.1 Vertical Co-opetition Model

The regional port vertical co-opetition model refers to the co-opetition model formed by the ports which aims to build a complete logistics transportation network. For example, the port invests in the construction of its feeder port and forms a joint venture with other modes of transportation. In order to build a multimodal transport network and become the center, a trunk port or hub port needs to form a joint between the transit port and the feeder port with other ports. Yantian Port Area of Shenzhen Port not only made full use of local shoreline resources to build an international container port, but has also implemented strategic investment strategies to other Pearl River Delta ports. At present, apart from participating in the investment construction and daily port operation of Yantian Port Area, Yantian Port Co., Ltd. also take part in the investment construction and daily operation of Huizhou Port Quanwan Port Coal Terminal and Huiyan Expressway. In addition, cooperation at different levels with Haikou and Caofeidian has been initiated in Yantian port.

The vertical co-opetition model between ports has played an important role in ensuring the improvement of Shenzhen Port's logistics and transportation network, the increase of transit supply and the expansion of business channels. However, in the port vertical co-opetition model, the investment in the trunk port or hub port also has certain risks. In the initial stage of investment, when the supply of goods is insufficient in small ports, small ports act as feeding ports for trunk ports or hub ports. However, when the supply of small ports increases with the development of Port Hinterland Economy, these small ports are more likely to open up offshore route to become a feeder port. As a result, the resources of the original offshore routes may not transfer through trunk ports or hub ports (large ports that invest in small ports), and it is possible to divert some of the offshore sources of cargo from the trunk ports. When the supply of small ports increases to a sufficient quantity to open up ocean-going routes, the port may even become a new trunk port, which will not only affect the supply of the original trunk port, but also may form a competitive relationship with the original trunk port.

4.1.2 Horizontal Co-opetition Model

The regional port horizontal co-opetition model refers to the co-opetition model formed between ports that is to maximize the common interests. The port horizontal co-opetition model is benefit to the development of regional port clusters, and it also could improve the overall competitiveness of the port clusters. Under this model, market positioning of each port should be determined by the location conditions of the port, the economic development of the city and the characteristics of the industry, so that the integration of regional ports could be promoted effectively. In addition, port deep-water coastline is a scarce and non-renewable resource. Therefore, how to realize

resource sharing and efficiency maximization of port deep-water coastline has become the focus of regional port horizontal co-opetition model.

This type of co-opetition model is mainly embodied in three forms: port construction, port integration and port alliance. First of all, port construction refers to the large port invests to build its own port area in its adjacent small port in the regional port cluster. This is because the large ports may have problems such as limited port resources, insufficient shoreline, and insufficient water depth in the port area or navigation channel. In order to further develop, to build its own operating port area, they need to joint with adjacent ports. Secondly, with the implementation of port management system reform in China, the local government integrates several previously independently operated ports within its jurisdiction into a unified port based on the principle of "one city, one port". Third, the port alliance is an alliance organization formed by the ports of different administrative regions within the regional port cluster without changing their property rights. The port alliance is to allocate traffic effectively, then to maximize the utilization of port capacity and port service capacity, after that, Harmonious development, complementary advantages, avoidance of vicious competition and repeated construction can be achieved. The port alliance is not limited to a group of ports or terminals, but also includes regional ports and logistics and transportation networks as well as inland stations, that is to build regional land and sea interchange systems.

4.2 Problem with the Current Port Layout of the Bay Area

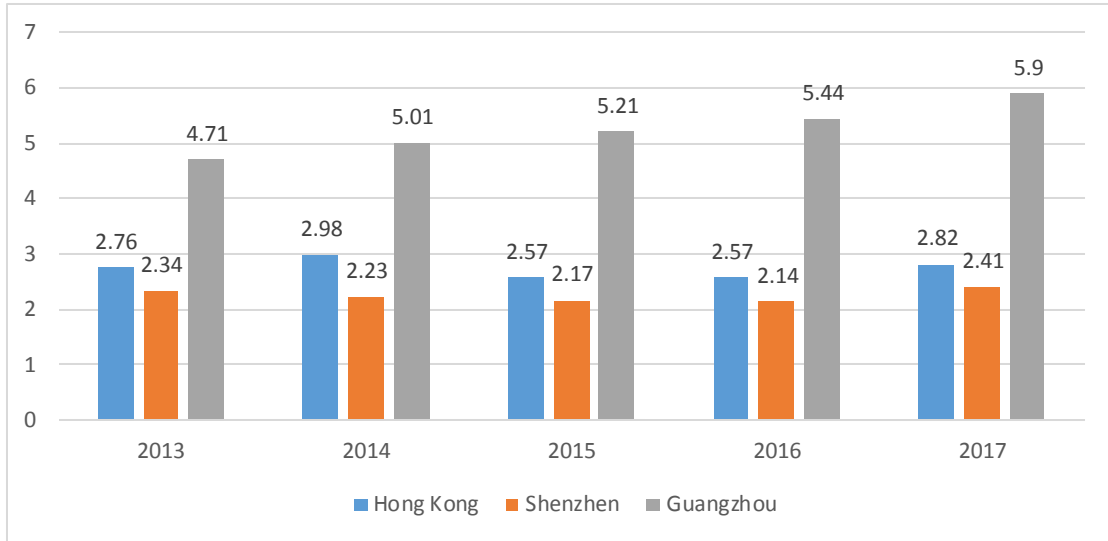
At present, the port potential in the GBA has not been fully released, which should be

blamed to the inadequate integration of port resources, the low concentration of industry and the similar functions of ports under the current “one city, one port” management system. In addition to the geographical proximity, the homogeneity of port industry is serious, and the competition between ports is increasingly fierce. There are bottlenecks in the development of some ports, so it is urgent to upgrade the industry or transform the function.

4.2.1 Port Function Overlap and Lack of Scientific Positioning

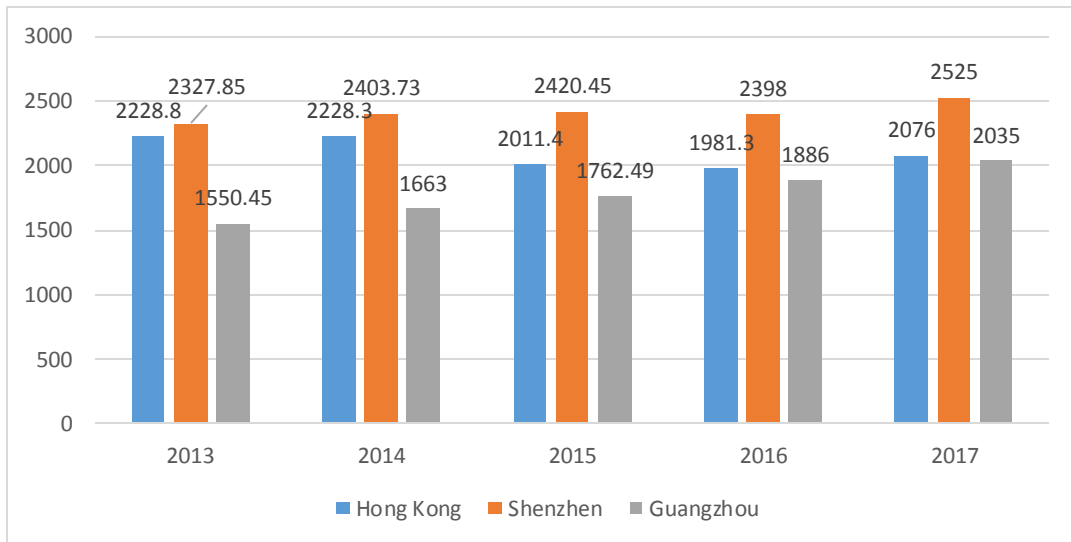
In the GBA port cluster, the formation of each port is complex, and each city or region is guided by its own interests. As a result, the division of functions of ports in the port cluster is not clear, and there is a lack of reasonable cooperation, which is basically in a state of war. This has formed a situation in which the port within the GBA is large and not strong.

Figure 1 Three world-class port cargo throughputs in 2013-2017



Source: China Port Yearbook (2014-2018 Edition)

Figure 2 Three world-class port container throughput in 2013-2017



Source: China Port Yearbook (2014-2018 Edition)

It is obvious from Figure 1 and Figure 2 that the container throughput of Hong Kong, Shenzhen and Guangzhou, three world-class ports with a throughput of 100 million tons, has exceeded 10 million TEUs in successive years. The cargo throughput of Guangzhou Port is far more than that of Hong Kong Port and Shenzhen Port, almost twice as much as the other two ports. However, when it comes to container throughput, the quantity of Guangzhou Port was lower than that of Hong Kong Port and Shenzhen Port in five consecutive years. Therefore it can be concluded that the port functions of Hong Kong and Shenzhen overlap significantly, foreign trade goods account for a high proportion of cargo throughput, and the types of transported cargo are similar. The difference is that Hong Kong is a free port, the amount of manufacturing industry in Hong Kong is small and the container business of Hong Kong mainly is international transit cargo. With the strengthening of Shenzhen Port Free Trade Zone construction, Shenzhen Port has attracted a large number of containers for international trunk transportation by virtue of its policy advantages. Even though Guangzhou's foreign trade throughput accounts for only a quarter of the total cargo throughput, the foreign trade throughput is absolutely large. At the beginning, Guangzhou Port was mainly engaged in bulk business, such as refined oil, coal and grain, less in container business. In recent years, relying on the status of the provincial capital city, Guangzhou Port has vigorously developed container transportation business in Nansha Port Area. This port function overlaps with the existence of Hong Kong Port and Shenzhen Port. Therefore the container throughput of these three ports has become closer and closer, but there is still a significant gap in cargo throughput.

Table 1 Production of major ports in GBA, 2017

Port	Hong Kong	Shenzhen	Guangzhou	Zhuhai	Dongguan	Huizhou
Cargo throughput (billion tons)	2.81	2.41	5.9	1.36	1.57	0.72
Container throughput (10,000 TEU)	2076	2521	2037	227	391	21
Refined oil (10,000 tons)	-	-	2132	1555	828	1091
Coal (10,000 tons)	-	410	8115	5375	4930	792
Metal ore (10,000tons)	-	24	755	1866	-	-
Petroleum gas (10,000 tons)	-	1293.9	-	4901	346	-

Source: China Port Yearbook (2018 edition)

Table 2 Container throughput of major ports in GBA, 2008-2017

Year	Hong Kong	Shenzhen	Guangzhou	Zhuhai	Dongguan	Huizhou
2008	2449	2142	1100	66	-	23
2009	2092	1825	1120	56	37	14
2010	2369	2251	1270	70	15	27
2011	2440	2257	1442	81	27	40
2012	2309	2294	1474	81	172	36
2013	2229	2328	1550	88	151	16
2014	2228	2404	1663	116	229	22
2015	2011	2420	1762	134	276	18
2016	1981	2398	1886	165	364	17
2017	2076	2525	2035	227	391	21

Source: China Port Yearbook (2009-2018 Edition)

By comparing the production situation of the main ports in GBA and the changes in container throughput of ports in the past decade, it can be found that there is no differentiated functional positioning between ports in GBA. Zhuhai Port and Dongguan Port continue to carry out strategic adjustments and asset restructuring, and invest huge amount of money to expand the port. As a result, the ability to pass through of these ports has been improved, which has attracted some of the cargo from the three major ports. By following the example of Guangzhou Port which consider bulk cargo transportation as its main business and container transportation as its concurrent business, Zhuhai Port has developed rapidly. After the completion of the equity restructuring in Dongguan Port in 2012, its container transportation business has developed rapidly, the target of doubling container throughput in two years has been achieved. Since Dongguan Port completed asset restructuring and equity restructuring in 2016, it has formulated a new development strategy to promote the transformation of Dongguan Port from a national feeder to a feeder port. In 2017, the growth of cargo and container throughput in Zhuhai and Dongguan ports is faster than that in ports of China. The development of Huizhou Port has been improved with the promotion of oil and gas projects such as CNOOC. Even though the container throughput of Huizhou Port is not high, its oil and gas and coal throughput are relatively large. Once the construction of the Huizhou Port Quanwan Coal Terminal is completed, the annual cargo handling throughput of Huizhou Port will be greatly improved.

GBA has initially formed a group of ports with three world-class ports as the main body and rapid development of small and medium-sized ports. The scale of the ports has been expanding and the overall level has been continuously improved. However, the division of functions between ports is not clear, and the structural contradictions of

port clusters are increasingly apparent. The port has the misunderstanding of considering the development of containers as the top priority, which lead to a situation that many container terminals in the Bay Area find it difficult to exert the effectiveness because of insufficient local economic development, supply shortage in the hinterland and other factors. Moreover, large-scale investment and expansion of ports in the Bay Area is not only the waste of throughput, but more importantly, it is difficult for each port to form a port layout with complementary advantages and reasonable division of labor, which seriously affects the overall development of GBA port group.

4.2.2 Intense Competition among Ports and Lack of Coordination Mechanism

The competition among ports can be divided into three levels from the perspective of main competitors of ports. The competition among different ports in the same port cluster is the most intense field of port competition and the competition among ports in GBA belongs to this level. Due to the densely populated ports in GBA and the geographical proximity, the land-oriented hinterland served by each port is basically the same or partially intersected. The cargo owners choose which port in the port cluster, and the difference is not significant or very small on basis of cost, which makes each port lack the geographical advantage when faced with the choice of cargo owners. In order to increase the hinterland supply and accelerate transit cargo flow, the port could only rely on improving service quality and decreasing service price of the port to achieve. In addition, the local government will participate in port investment or port management for the benefit of the region, thus making the port competition at this level more intense.

According to the real condition in the GBA, the competition among these three major ports (Hong Kong, Guangzhou and Shenzhen) is taken as an example. At present, the land-oriented hinterland served by Hong Kong, Guangzhou and Shenzhen port is mainly South China Area. These three ports are all the top ten container ports around the world, they are known as excellent port conditions and high port comprehensive service capabilities. Therefore, many shipping companies prefer to consider these three ports as basic ports, and their maritime transportation costs are almost the same. At the same time, the three ports belong to the Hong Kong Special Administrative Region, Guangzhou and Shenzhen respectively. The local governments have issued policies to support local ports or directly invest in them for the benefit. In terms of various factors, the competition among these three ports is increasingly fierce, which is not only corporate behavior.

In addition, there is a situation that most ports in the world allow a number of port companies to operate in the same port. These companies may be different companies under the same port and shipping enterprise group, or they may belong to different enterprise groups. For example, different port areas in Shenzhen Port belong to different enterprises. That is, Yantian Port Area is operated by Yantian Port Group, and Shekou Port Area is operated by China Merchants Shekou. In this situation, in order to maximize profits, port enterprises will adopt various strategies to compete for cargo resources, which makes the competition between different enterprises in the same port very fierce. With the establishment of socialist market economic system in China, the reform system of "separating politics from enterprises" has been carried out in ports, and the production organization of ports has been carried out in an all-round way. Nowadays, all port enterprises in GBA have the right of production and operation.

Such as Yantian Port, Merchants Shekou Port and Guangzhou Port are all listed port enterprises within GBA. With the increasing scale of enterprises, in order to complete the profit indicators of business operations, the competition among port companies is becoming increasingly fierce.

Combined with the real situation of the ports in GBA, the main reason for the fierce competition among the ports is that there is no effective coordination mechanism between the ports in GBA. These local ports are independent, which is what we know as the management system of “one city one port”. Every port operator regards its own interests as its primary business objective, and only pays attention to the operational indicators such as cargo throughput, container throughput and port fee income of the port, which leads to the dense distribution of ports in GBA, overlapping hinterlands and duplicate construction of ports with the same functions, resulting in waste of resources and vicious competition within the port cluster. From an individual perspective, the development strategies adopted by each port meet the actual situation of the port. However, the port cluster within GBA lacks unified and reasonable resource integration on the whole, and the division of work and differentiation between ports is insufficient. The port cluster cannot achieve the greatest competitiveness and cannot produce the greatest economic benefits.

4.2.3 Mismatch between Port Service Function and Development Scale

At present, the ports in GBA are developing rapidly, the overall scale of the port is expanding, and the cargo throughput has increased year after year. The three world-

class ports Hong Kong, Shenzhen and Guangzhou are developing stably. The growth rate of three major regional ports Zhuhai, Dongguan and Huizhou are all at the top of ports in China. However, the service functions of the ports do not match the development scale of the ports on the whole. Even though the port service level of some ports is relatively high, and some high-end shipping services have been developed, there is still difference in the development of shipping services in the port group, which leads to the gap between GBA port clusters and the world's first-class port clusters. From an individual perspective, the high-end shipping services industry in Zhuhai, Dongguan and Huizhou are almost blank.

Hong Kong is currently the only port with a negative container growth in the top 20 ports, and its status as an international shipping center is gradually declining. Hong Kong has fallen from the world's largest container port to the fifth place, and there is still a tendency to continue to decline. The future development between ports and urban areas cannot be well integrated. The Kwai Tsing Container Terminal is the main port area for container handling in Hong Kong, once problems arise in this terminal, it will directly affect the development of Hong Kong's port and shipping industry. At present, there are three main problems in the Kwai Tsing Container Terminal. First, the existing water depth conditions are difficult to meet the development trend of large-scale container ships. Second, the shortage of land space of the terminal limits the development of shipping value-added services such as dismantling boxes. Third, contradictions between ports and cities in land, environment and transportation have gradually become prominent. As a result, Hong Kong's port service capabilities have been partially restricted.

After decades of development, Shenzhen already grew into a world-class port. However, due to the lack of knowledge-intensive shipping service industry, the port service radiation function of Shenzhen is limited. At present, the shipping service industry of Shenzhen Port, including ship management, freight services, and shipping agency, is still mainly providing traditional port services or low-end industry services. The scale of the relevant enterprises is small, the added value of port services is lower than that of other world-class ports, and the port comprehensive service function is poor. In addition, as a result of lacking a shipping trading platform, the high-end shipping service industry in Shenzhen such as ship financing, maritime insurance, maritime law, shipping consulting and shipping information platform is still in its infancy.

Depending on the economic hinterland foundation and good port conditions, Guangzhou Port has developed its basic port service functions fully. However, the existing shipping service industry is dominated by basic industries, and the development of high-end shipping service industry is relatively backward. The shipping service industry of Guangzhou Port mainly concentrated in the downstream industry chain with low added value, which is low-tech port services such as loading, unloading, warehousing, inspection and transportation, while the capital-intensive, high value-added mid-upstream industry has just start off. At present, the ship management and shipping agency in Guangzhou has just started, and the shipping financial service market is still in the stage of construction. The development of port logistics industry is still in a backward position in world-class ports.

5 Suggestions

According to the overall development plan of GBA, GBA will be built into a world-class Bay Area, and the port cluster within GBA will also become a world-class port cluster. Therefore, the layout of GBA port cluster should be more hierarchical and rational in function. Based on factors such as the development of ports and the characteristics of the cities in which they are located, GBA should put Hong Kong in a core position of the port cluster, with three world-class ports Hong Kong, Shenzhen and Guangzhou as the main body and other regional important ports as the east and west wings in the development of port clusters. In order to promote the development of port clusters within GBA, an effective cross-city coordination mechanism should be established and the development of high-end shipping services should be promoted to improve the international competitiveness of port clusters within GBA.

5.1 Optimize Port Layout and Promote Port Differentiation Development

As a regional port system, port cluster of GBA must re-determine the port level, ensure the division of functions and development direction reasonable and deal with the relationship between the hub port and the feeder port according to the inherent evolution of the port cluster, the economic development of the city, the port conditions and the collection and distribution system. So as to optimize the port layout and realize the differentiated development of the port. Based on the development trend of the port, port conditions and its own characteristics, the port of GBA can be divided into three levels from the center. The first level is Hong Kong, Shenzhen and Guangzhou, which

is world-class hub port; the second level is Zhuhai, Dongguan and Huizhou, which is important port in South China and a feeder port; the third level is the small and medium-sized ports not included in this study, which is general port.

Even though the container throughput of Hong Kong has declined in successive years, as a free port, Hong Kong still has its unparalleled advantages in terms of port facilities, loading and unloading efficiency, port service levels and policy systems. When it comes to information exchange, currency settlement and many other aspects, Hong Kong show greater strength than Shenzhen and Guangzhou. Therefore, it is necessary to consolidate the status of Hong Kong international shipping center, further strengthen its international transit business, and gradually transfer the low value-added labor-intensive port service industry from Hong Kong to other ports of GBA. With the comprehensive advantages of Hong Kong international financial center and international trade center, the development of the port shipping industry should give priority to the high-end shipping service industry, thus Hong Kong will be built into an international container transit hub.

Shenzhen Port has basically achieved comprehensive navigation with international trunk ports. It is an important seaport for the current Pearl River system, and it is also the port with the largest and most extensive international container liner routes in the region. As result of the limitation of port service level and geographical location, the port service charges of Shenzhen Port are relatively low, which can be developed into an alternative port for cheap industrial product manufacturers. With the advantage of low charges, start from low value-added labor-intensive industries, Shenzhen port

could gradually develop into high value-added port-related industries. In addition, the inland hinterland could be expanded and the sea-rail intermodal transport business could be extended from coastal areas to inland areas. As for the advantage of Guangzhou Port, it provides domestic trade services. The supporting facilities of the newly built Nansha Port Area are designed to provide services for domestic trade goods. Guangzhou Port also has a relatively complete inland waterway and road transport network system in the region. Comparing with Hong Kong and Shenzhen, the development of container business of Guangzhou Port is limited due to its location which located in the rear edge of the Pearl River Estuary. However, in the transportation of dry bulk cargo such as coal and steel, Guangzhou Port has comprehensive transportation advantages such as river-sea combined transportation and sea-rail combined transportation. Therefore, Shenzhen Port should be built into an ocean container hub port, to undertake low value-added labor-intensive industries transferred from Hong Kong, while providing coastal and near-ocean services. Guangzhou Port should be built into an integrated hub port for domestic trade and river transport, and a hub-type hub port for container transportation. Relying on the advantages of Guangzhou as a national railway center city, it has established strategic cooperative relations with railway transportation companies and actively expanded Sea-Rail Intermodal Transport between Pan-Pearl River Delta Region and Guangzhou. Making full use of the advantages of perfect transportation infrastructure and developed highways, container public water transport in Guangzhou Port has been carried out actively. Meanwhile, Shenzhen and Guangzhou should gradually enhance their comprehensive international shipping service functions, further enhance their infrastructure service capabilities such as ports and waterways, and form a mutually beneficial and win-win situation with Hong Kong in port, shipping, logistics and

supporting service system. In addition, the construction of international cruise terminals in Shenzhen and Guangzhou should be accelerated, thus to improve the fast customs clearance efficiency of international tourists and the collection and distribution capacity of cruise ports, then to enhance the status of the international cruise port of these two ports.

Zhuhai is a national special economic zone. Whether in the national planning or in the planning of Guangdong Province, it has been positioned as a hub city in the West Bank of the Pearl River Delta. The expressways and railways connecting Zhuhai with Beijing, Guangzhou and Jiangsu are under rapid construction. Once completed, the multimodal transport capacity of Zhuhai Port will be significantly improved. Therefore, Zhuhai Port can be built into a comprehensive feeder port, regional coastal passenger transport and international cruise passenger port, which mainly undertakes the functions of sea-rail combined transport and inland river transport for coal, oil and gas, dry bulk, containers and other cargo, and also provides services for a large-scale coastal industrial industry. Dongguan is located in the prime location of the Guangzhou-Shenzhen Economic Corridor and is an important transportation hub and material distribution center. Dongguan is building an integrated transportation system to forming a multi-level integrated transportation hub. In this way, Dongguan Port can develop a rapid collection and distribution system based on the expressway so that the port's service capacity can be improved. Therefore, relying on the advantages of roads and railways, Dongguan Port can build a complete port cargo passage and collection and distribution system, and become a regional feeder port and feed port. Huizhou has already completed the construction of the expressways across Guangdong Province, its expressway network has been laid out and the railway network is under construction.

In addition, Huizhou Port will be used as material transfer base for CNOOC and other oil and gas projects. Therefore, Huizhou Port can take advantage of its network layout advantages of expressways and railways to build into a regional logistics center and branch port, which is mainly responsible for the transportation of oil, gas and coal.

5.2 Establish a Coordination Mechanism to Achieve the Scale Effect of the Port Cluster

Hong Kong, Shenzhen and Guangzhou are the three world-class ports within GBA, and these three ports are currently in a relationship of competition and cooperation. From the perspective of the overall development trend of the port cluster, cooperation will become a more important part of this relationship, the key lies in the mutual allocation of resources and the complementarity of advantageous resources. Due to the special historical background of Hong Kong, the integration of port resources in GBA involves the integration, distribution and exchange of resources between different administrative regions of a country, between different cities in the same administrative region and under different social systems. How to ensure the fairness of cooperation in practice and how to establish a reliable and trusting relationship between ports, it is necessary to establish an effective communication and coordination mechanism. In order to break the current stalemate caused by the "one city, one port" management system, this coordination mechanism needs to be higher than the administrative division of urban management, thus to coordinate the overall development of the port cluster of GBA from a higher level, and to reduce vicious competition between ports.

Collaboration is the key to the future development of the port cluster of GBA, common development is the ultimate goal. The fierce competition between ports will inhibit the overall advantages of the port cluster and bring negative economic impact to the overall development of the port cluster. The establishment of a regional coordination mechanism is to guide, promote and supervise the coordinated development of the port cluster of GBA. Therefore, it is necessary to build a “port community” composed of enterprises in the port and related shipping service industry, government departments at all levels, and non-governmental organizations, thus to make GBA an internal and external link portal between port and shipping service industry. In the process of cooperation across cities and regions, the key role of the market in the allocation of port resources and the main role of shipping companies should be brought into full play. Taking asset securitization and port resource integration as an opportunity, market-oriented, expanding cooperation areas between ports. Strengthen cooperation among ports and promote integration of shipping between GBA ports through benefit-sharing and Cost-Sharing Mechanism. For example, the port cluster on the northwest coast of the United States was completed with the establishment of a communication and coordination platform, which is considered to be the biggest change in the US port governance system. Coordinated development of the port in this region was achieved by the Port of West Port Alliance (NWSA), a port development agency jointly established by the Seattle Port Authority and the Tacoma Port Authority. NWSA is a third-party organization jointly established by the two major port authorities. It only grants the respective port business to the organization for centralized and unified management in the form of authorization. Both parties enjoy equal rights and obligations in NWSA. In addition, the NWSA was established in the form of an inter-regional agreement within the Port Authority, and the agreement has the nature of

periodic repeal. After the agreement expires, both parties would need to re-evaluate past cooperation and develop a new cooperation plan.

Therefore, considering the basic national conditions of China and the actual condition of the port cluster within GBA, the coordination mechanism of the port cluster of GBA can be played by the government, industry organizations and enterprises. At the government level, it is mainly the government departments responsible for formulating and implementing macro policies related to port cooperation and policies that benefit to the overall development of the port cluster. At the level of industry organization, it is mainly through the organization of port-related industry organizations such as port associations to coordinate the construction and development of ports-related industries in various ports, and promote the cooperation of ports in related industries. At the enterprise level, it is mainly through the exchange of information in the information platform and technology to achieve micro-level cooperation, such as the sharing of information of cargo sources, the convenient transfer of containers, and the complementarity of other businesses such as routes and target markets. By establishing a port cooperation platform within GBA, an effective coordination mechanism will be established to promote coordinated development and resource integration among ports, then to reduce vicious competition among ports and promote the sound development of the port cluster as a whole. At the same time, it can also stimulate the synergy effect of “1+1+1>3” in the three world-class ports, achieve the scale effect of the port cluster, reduce the management cost, improve the efficiency of ports, thereby enhancing the overall international competitiveness of the port cluster of GBA.

5.3 Develop High-end Shipping Service Industry and Extend Port Service Scope

The port transportation industry is not a high value-added industry, but it has a strong driving force on related industries. The downstream of the port industry chain, such as logistics services, ship management, ship financing and maritime insurance, has a high added value and contributes a lot to the port economy and the urban economy. Under the New Normal Background of China's Economy, in order to develop the port cluster of GBA into a world-class port cluster, the port industry and related industries are facing transformation and upgrading. It does not mean to abandon the original industry, but to improve the level of the entire industry and eliminate backward production capacity. Therefore, developing a high-end shipping service industry in the port cluster of GBA, upgrading existing port industry clusters, and extending the service scope of the port must be kindly considered.

At present, most world-class shipping centers, like Singapore Port, not only have container ports, but also gradually develop shipping industry clusters by taking advantage of the role of container ports in the back-end industries. There are also cases of becoming a global shipping center by vigorously developing the shipping service industry, like London. London is one of the most vital hub ports in Europe, and the accumulation and concentration of ports and shipping activities has created its status as an international shipping center. With the rise of emerging international ports such as New York, Rotterdam, Shanghai, Hong Kong and Singapore, the status of the London International Shipping Center has been challenged. Even so, the UK is still rated as the most directly maritime cluster with high added value. This is inseparable

from the continuous innovation and development of derivative ship financing, bulk dry bulk forward trading, maritime insurance, maritime law and other shipping services industry clusters based on the London International Shipping Center, and the leading formulation of international standards and market rules for international shipping services. It can be seen that the development of the port can quickly promote the development of the shipping service industry cluster, and the development of the shipping service industry can also contribute to the improvement of port competitiveness.

The rapid development of Hong Kong's ports has benefited from the vast hinterland of China and the huge transport demand brought about by the rise of China's economy. However, with the continuous improvement of port conditions in the region and the high cost of land, manpower and other aspects, the advantage of Hong Kong port has been weakened. In the future, when the contradiction between Hong Kong port and urban development is further intensified, it may be beneficial for Hong Kong to follow the example of London port development model and shift the center of development of the port shipping industry to the high-end shipping service industry. Making full use of Hong Kong's advantages as an international financial center and an international trade center, high-end shipping services such as ship management and leasing, ship financing, and maritime insurance could be developed in Hong Kong. With the help of Hong Kong's special social system and legal system, shipping services such as maritime law and maritime arbitration could also be developed in Hong Kong. Through the development of the high value-added shipping service industry, Hong Kong port competitiveness will be enhanced, Hong Kong's international shipping center will be consolidated and upgraded, and services will be provided to mainland

and Macao enterprises.

Shenzhen is an innovative and open city. Under the current situation, only by considering the actual effective demand of the market and good social and economic benefits can provide the impetus for the development of the port shipping industry. Therefore, Shenzhen Port should take the lead in institutional innovation and first-in-first-trial trials, making full use of its financial policy advantages and the convenience of Hong Kong foreign exchange transactions, and introducing international shipping financial enterprises by relevant shipping financial incentive policies, or promoting local financial enterprises to jointly carry out ship financing, dry bulk forward trading and shipping derivatives trading with Hong Kong, then to promote the development of the shipping finance industry. Taking advantage of the policy of Qianhai Service Demonstration Zone, Shenzhen Port should actively cooperate with Hong Kong to develop shipping service industries such as ship brokerage and maritime insurance, and carry out high-end talent training for the shipping service industry.

Guangzhou Port can rely on the policy advantages of the Guangdong Pilot Free Trade Zone to promote the development of the port logistics industry, such as bonded logistics, cold chain logistics, automotive logistics, food logistics and cross-border e-commerce logistics. Meanwhile, relying on the development advantages of Guangzhou shipbuilding and maintenance industry, the shipping service industry related to ship transportation, such as ship maintenance, ship leasing, ship management, and ship insurance could be promoted. In addition, learning from the development experience of Singapore and London, it is necessary for Guangzhou to improve the

basic functions of the Guangzhou Shipping Exchange as an information platform and shipping trading platform, and develop shipping information consulting services.

The cruise industry is an emerging shipping service industry for the Chinese market. In terms of cruise economy, Shenzhen and Guangzhou should take the construction of cruise home port as the foundation, develop the industry chain of cruise and wharf in depth, expand the cruise service industry horizontally, imitate the well-known cruise home port in the world, and build a comprehensive business system of cruise home port with commercial and tourism supporting services.

Zhuhai Port, Dongguan Port and Huizhou Port are all ports that are under construction and development. The ports have great potential for development, but there are currently no condition for developing high-end shipping services. Therefore, the low-value labor-intensive shipping service industries in Hong Kong and Shenzhen can be transferred to these three ports at first, by gradually cultivating their shipping service capabilities and improving their port conditions and related facilities, they will be provided an auxiliary role to the development of high-end shipping services in world-class ports.

6 Conclusion

The port cluster in Guangdong-Hong Kong-Macao Greater Bay Area is a port group system consisting of several individual ports with the same or similar hinterland, which can substitute and complement each other in function and scale, and have competition and cooperation relationship with each other within the same economic region. Various effective measures need to be taken to accelerate the process of building GBA into a world-class Bay area.

This dissertation focuses on the three world-class ports (Hong Kong Port, Shenzhen Port, and Guangzhou Port) and three regional ports (Zhuhai Port, Dongguan Port, and Huizhou Port) in the port cluster of Guangdong-Hong Kong-Macao Greater Bay Area. Through qualitative analysis of the development of the main ports of the Bay Area, it can be found that there are mainly three problems existing in the current port layout of Guangdong-Hong Kong-Macao Greater Bay Area. First, the port functions of the ports in the port cluster of GBA overlap, as a result of lacking scientific positioning, the structural contradictions arising from the development of the port cluster have caused the phenomenon of “large ports but not strong” in the port cluster, which seriously hindered the overall development of port cluster. Secondly, the vicious competition among the ports in the port cluster of GBA is fierce and there is no coordination mechanism. The management system of “one city one port” leads to the lack of scale effect of the overall development of the port cluster, which bring about some problems such as idle resources and waste of resources. Third, the port service functions of ports in the port cluster of GBA do not match the scale of the development of port. As a

result, the service level among ports is quite different, the development of the shipping service industry is not balanced, and the role of complementary advantages of port cluster has not been brought into full play.

According to the characteristics of the port and the economic development of the city, three suggestions for the future function of the port of Guangdong-Hong Kong-Macao Greater Bay Area and how to cooperate are put forward. First, it is necessary to optimize the port layout, re-determining the port level within the port cluster, clarify the functional division and development direction of each port, handle the relationship between the hub port and the feeder port, and promote the differential development between the ports within the GBA. Secondly, relevant authorities should establish a coordination mechanism, which should be a joint organization of enterprises in the port and related shipping service industry, government departments at all levels and non-governmental organizations, then make it an internal and external link between the port and shipping service industry, so that achieving the scale effect of the port cluster in GBA. Finally, some ports could develop the high-end shipping services, upgrade existing port industry clusters, extend the scope of port services, then fully promote the development of the port and provide assistance for the development of the port cluster in GBA ports into a first-class ports cluster.

With the advancement of the GBA construction process and the increasing emphasis on the development of the GBA port industry, the development of the GBA port cluster will be faster, and the development of the relevant shipping service industry will become more and more mature. By considering the suggestions of foreign port cluster

and shipping service industry development experience, the analysis of the problems existing in the port layout of the port cluster in GBA is not only benefit to the development of the port cluster, but also to the other port clusters which may be built in China in the future. Limiting by my knowledge level and insufficient understanding of many data and related policies, there will certainly be parts of this article that need to amend. It is hoped that it can provide some insights for the development of the port cluster of GBA and provide some positive help for the construction of Guangdong-Hong Kong-Macao Greater Bay Area.

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