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**The Strategy for integrating the logistics industry of
Yangtze River Delta of China**

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Preface

This article is our master thesis for Master of Science in logistics while we study in Molde University College. The purpose of this thesis is to explore the strategies for integrating the logistics of Yangtze River Delta, to promote the development of logistics industry. We began to write this thesis in China from December 2010, and finished it at the end of May 2011, and submitted the proposal in March 2011.

At the time of finishing the thesis, we would like to thank our supervisor Xu Guoquan who is teaching in Suzhou University of science and technology, whether in thesis topic selection, design and material collection, but also on the research methods and the final modification, we all got great and selfless help of Mr. Xu.

Meanwhile, we would like to express our deep gratitude to all the teachers in Molde University College and all kind people in Norway. In one year and a half in Norway, our teachers give us a lot of help and care for our study and life. Through the time of study, we have learned lots of knowledge of logistics management, gained knowledge of self learning and team cooperation.

At the meantime of writing thesis, we became trainees in Yabang Third-party Logistics Company, the leaders and colleagues of the company also give us a lot of help. Through the internship, we have more in-depth understanding of logistics industry especially in third-party logistics, which provide our thesis substantial contents.

Last but not least, we are grateful for our parents, without their financial support and selfless love, we cannot complete our studies in Norway.

Summary

Modern logistics is considered to be an important profit source as well as reducing material consumption and improving labor productivity. It not only plays a fundamental role to the development of regional economic, but also influences and restricts the whole region economic efficiency. Along with the development of economic globalization, make the importance of the regional logistics industry more and more prominent. Yangtze River Delta as the most developed regional of China, has realized that develop modern logistics especially integrating the regional logistics has great significance for optimizing economic structure, raising the comprehensive competitiveness. Therefore, it is important to handle the integrative developing regional logistics.

The thesis bases on the existing research results and theories, using double exponential smoothing, regression analysis methods to research topic on The Strategy for integrating the logistics of the Yangtze River Delta in China. Through collect logistics data of Yangtze River Delta, for example data of transportation infrastructure construction, logistics information facility construction, logistics policy and planning, etc, representing the status of logistics development of Yangtze River Delta. And then, By means of forecast GDP, freight ton-kilometers, freight traffic to analyze logistics demand of Yangtze River Delta. After that, the problems which affect the logistics integration are found like imperfect logistics network, unsound development environment of logistics, low socialization and specialization of logistics enterprises. In order to solve these problems, a few approaches are made to integrate the logistics of Yangtze River Delta: integration of logistics network, improvement of logistics development environment, market integration of logistics enterprises. At the end, the paper makes some countermeasures and advices to promote the logistics integration of Yangtze River Delta: optimize regional logistics network, strengthen the position and role of logistics industry associations, and train logistics talents.

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1. Introduction

1.1. Background

The paper is to explore how to integrate logistics of Yangtze River Delta. In China, the economy is developing rapidly, especially in Yangtze River Delta. On 24th may 2010, National Development and Reform Commission announced that China's State Council formally approved and implemented the "Regional Planning of Yangtze River Delta", identified that Yangtze River Delta is comprised by Jiangsu Province, Zhejiang Province and Shanghai City. The area is about 210,700 square kilometers, the planning period from 2009 to 2015. Yangtze River Delta has twenty-five cities in total, with sixteen cities as the leading cities, which are Shanghai City, Nanjing, Suzhou, Wuxi, Changzhou, Zhenjiang, Yangzhou, Taizhou, Nantong of Jiangsu Province, Hangzhou, Ningbo, Huzhou, Jiaxing, Shaoxing, Zhoushan, Taizhou of Zhejiang Province, the aim is to plan and develop one city and two provinces as a whole.

Yangtze River Delta, which is the most developed region of China, has the developed transportation and prominent location; it is the regional economy that has the biggest economical scale and the best potential in China. So it is an important economic growth pole. The unique geographical location and level of economic development laid a superior foundation to develop modern logistics.

Furthermore, in the process of regional economic integration, integration of modern logistics is an important support to promote the development of regional economic integration, and also is the main content of the regional economic cooperation. Wu Zihui (2007) considered that logistics integration of Yangtze River Delta not only helps to improve regional economy comprehensive competitiveness, but also it is the driving force of regional economic integration; without logistics integration, and there is no regional economic integration (Cao Dong, 2010). But now, almost each city of Yangtze River Delta has its own logistics planning, some cities, which have a good economic development, have set up their own logistics center. There is no denying the fact that this situation lead to a low growth of modern logistics, and affect the development of regional economy. As a result, it is important to explore some strategies to integrate the logistics of Yangtze River Delta.



Fig. 1: Map of Yangtze River Delta

Resource: <http://www.chinapage.com/map/map.html>

1.2. Research Methodology

1.2.1. Exponential Smoothing

According to Cheng Xueping (2010), exponential smoothing is a method which can be used to analyze or forecast time series data. These time series data are observations, it thinks that the older observations holds a small weight of the analysis and prediction; recent observations are given relatively more weight in forecasting than the older observations. In exponential smoothing, there may be a few coefficients to determine the weight of observations. Exponential smoothing method is often used for economic fields.

There are three kinds of exponential smoothing, single exponential smoothing, double exponential smoothing and triple exponential smoothing respectively.

The model of single exponential smoothing is shown as below:

$$S_t = \alpha y_{t-1} + (1-\alpha) S_{t-1}, 0 \leq \alpha \leq 1;$$

y_t means the raw data, S_t means the output of exponential smoothing.

Where α is the smoothing factor, and $0 < \alpha < 1$.

Values of α closes to one means have less of a smoothing effect that the recent observations accounts for larger proportion, while values of α closes to zero means that

have a greater smoothing effect. Generally speaking, α does not have a completely clear value. There is some ways to choose a suitable α , one way is to choose the value of α which results in the smallest MSE.

If there is a trend in series data, double exponential smoothing should be used. A second smoothing factor will be used, γ .

The formula of double exponential smoothing is:

$$S_t = \alpha y_t + (1-\alpha) S_{t-1}, 0 \leq \alpha \leq 1;$$

$$b_t = \gamma (S_t - S_{t-1}) + (1-\gamma) b_{t-1}, 0 \leq \gamma \leq 1;$$

The meaning of y_t, S_t are just the same as single exponential smoothing which is introduced above.

The initial value of S_1 is set to y_1 in general. And for b_1 , there are three options:

$$b_1 = y_2 - y_1$$

$$b_1 = [(y_2 - y_1) + (y_3 - y_2) + (y_4 - y_3)]/3$$

$$b_1 = (y_n - y_1) / (n-1)$$

The predicted formula for m-periods-ahead is given by:

$$F_{t+m} = S_t + mb_t$$

In this paper, double exponential smoothing will be used to forecast the gross domestic product (GDP) and freight ton-kilometers in Yangtze River Delta.

1.2.2. Regression Analysis

Based on Lu Wantao (2005), regression analysis is a statistics method that can analyze several variables. In these variables, there is one dependent variable, one or more independent variables. It is widely used in economic field which can help to find out the relationship between these variables. Regression analysis can be divided into simple regression analysis and multiple regression analysis depends on the number of independent variables; linear regression and nonlinear regression depends on the relationship between variables.

Regression analysis is usually used for forecast; the following is simple linear regression model:

$$Y = \beta_0 + \beta_1 X + \varepsilon$$

Where Y is a linear function of variable X

β_0 is a constant, β_1 is the “coefficient” of the variable X

ε represents error term

1.2.3. Data Collection

In this paper, a lot of data are needed to be collected, for example: GDP data of Yangtze river delta; length of highways; length of railways; length of navigable inland waterways; number of berths; data of air transport; cargo throughput of Yangtze River Delta; the quantity of specific logistics facilities in each area; capacities of maritime transportation, highway transportation and railway transportation and so on.

In order to collect these data, the paper uses the methods which are primary and secondary data collection. Some large-scale logistics enterprises in the delta will be visited to get logistics data of recent years. Second data collection is the main source will be collected from China statistical yearbook, CNKI, Wanfang Database, etc.

1.3. Research Framework

The main parts of the paper will further study from the following aspects: overview of economic development of Yangtze River Delta, the status of logistics development of Yangtze River Delta, logistics demand analysis of Yangtze River Delta, the problems of logistics integration of Yangtze River Delta, logistics integration approaches of Yangtze River Delta and countermeasures. Following is a brief introduction about the main contents of each part.

In the part of overview of economic development of Yangtze River Delta, the paper uses a number of charts and figures to illustrate the main economic indicators in recent years especially GDP data, the economy of Yangtze River Delta keeps a rising trend in recent ten years; strong economic development momentum spawns a large number of logistics needs.

In the part of status of logistics development of Yangtze River Delta, the paper describes the status with lots of detailed data from six aspects: transportation infrastructure construction, logistics information facility construction, logistics policy and planning, logistics park construction, third party logistics enterprises development and logistics talent requirement and training.

In the part of logistics demand analysis of Yangtze River Delta, there are many related factors involved in the logistics demand of Yangtze River Delta, the paper makes

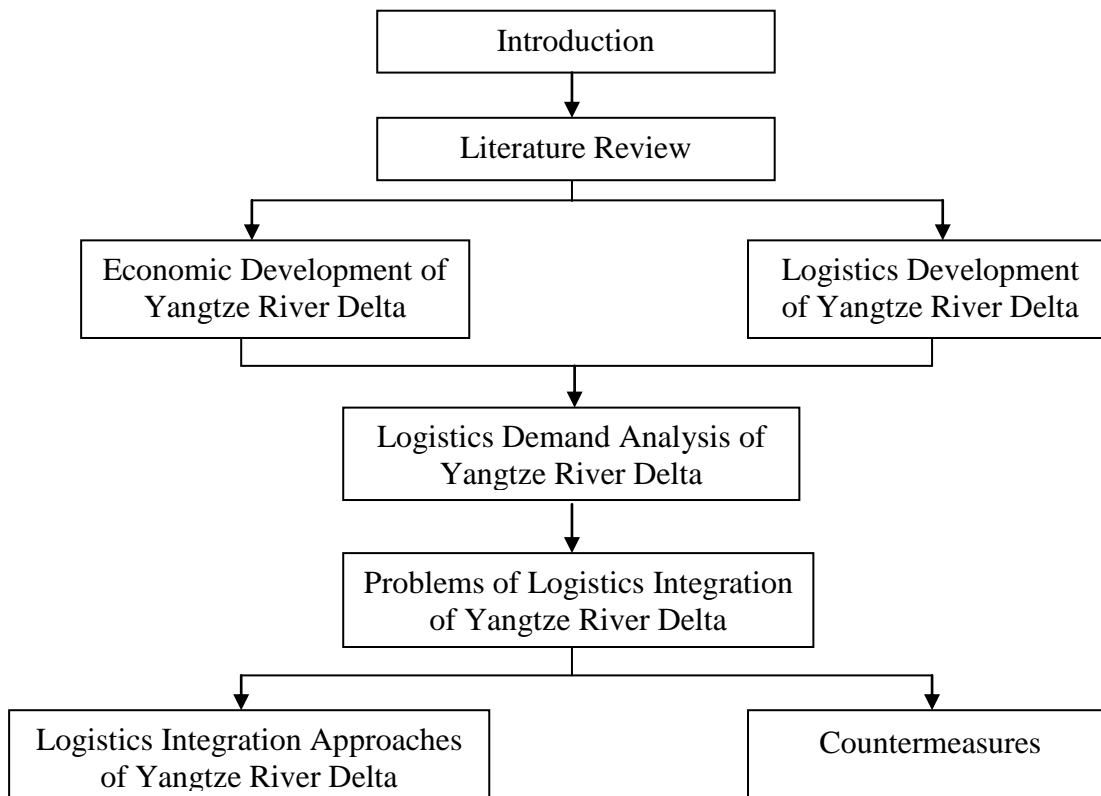
corresponding forecasts from the development trend of GDP, the freight traffic and the freight ton-kilometers, which can roughly reflect the scale of logistics demand of Yangtze River Delta, and provide some quantitative basis for its development.

In the part of the problems of logistics integration of Yangtze River Delta, on the basis of detailed study on the status of the logistics development of Yangtze River Delta, the rapid development of the logistics is also facing some problems, so the paper analyzes the problems from three fields: imperfect logistics network, unsound logistics development environment, low socialization and specialization of logistics enterprises. Under these three fields, the paper gives more detailed explanation.

In the part of logistics integration approaches of Yangtze River Delta, based on the problems, the paper also gives three ways combined with some figures to integrate the logistics: integration of logistics network, improvement of logistics development environment, market integration of logistics enterprises.

In the part of countermeasures, the paper makes some suggestions and advices to promote the logistics integration of Yangtze River Delta: optimize regional logistics network, strengthen the position and role of logistics industry associations, and train logistics talents.

Table 1: Structure of the paper



2. Literature Review

The logistics industry is a product in a new stage of social and economic development. As time goes on, traditional organization, management changes gradually to modern logistics, the research on the regional logistics integration has been quietly rising and become a hot issue. Chinese and foreign scholars have carried out relevant research and have achieved some results; however, there are some differences on emphasis.

2.1. Research Results in the World

2.1.1. Regional Integrated Logistics

Relative to China, regional logistics integration of foreign academic research is focused in the following areas: One is construction issues about the government, policies, regulations and others; Second is the factors which affect the regional logistics integration, development strategy, operating performance and other issues; Third is node function, coordination and other problems of the regional integrated logistics; Fourth is the relationship between regional logistics integration and economic development issues. The main contents are as follows.

Brian Graham, etc. (2000) discussed the integrated systems of British regional airports organizations and services based on the UK transport White Paper in 1998, proposed three key elements should be planning and considering, which are sustainable development of transport system, integration model of air transport, air transport contribution rate to regional economic.

Ursula Y. Alvarado, etc. (2001) described the importance of logistics integration in marketing management. It makes the effective customer management and supply chain management to play effectiveness maximum in the marketing. And they selected ECR working group in Europe supporting case studies and quantitative research.

Tage Skjøtt-Larsen, etc. (2003) has been studied on whether Öresund can become Scandinavia's leading logistics center. They did 47 personal interviews in different areas; one of the conclusions obtained is that the whole idea of regional logistics, Öresund regional location, and the importance of infrastructure and logistics competitiveness are the main factors.

Tae Hoon Oum, etc. (2004) analyzed that what the factors should be taken into account when multinational companies select regional distribution centers. Combined with Northeast Asia, through analyzed the logistics cooperation and competition in China,

Japan and South Korea, they explored how to establish the successful regional logistics center.

Linet Özdamar, etc. (2005) proposed a dynamic, logistics coordination model for evacuation and support in disaster response activities, they pointed that coordinated logistics includes selecting the needed medical assistance in the largest coverage area and the nearest medical personnel how to provide emergency services.

Jörg Ackermann, etc. (2007) based on the structure of the logistics network, discussed the competitive factors of the structure of regional logistics: material flow, transport operations and infrastructure. They proposed these elements should be integrated, so as to form a whole, and established a corresponding model algorithm can be optimized and simulated.

2.1.1. Study on the Logistics Park

The logistics park as a support node of modern logistics network system will play an important role in guiding, leading logistics resources to an intensive, efficient and systematic direction to advance continuously in the near future. Thus, the development and construction of logistics parks are significant. For the logistics park, effective theoretical study on development pattern is very necessary and urgent. The foreign study on the logistics park mainly related to the following aspects:

Matthew J. Roorda, etc. (2009) modeled a conceptual framework based on agent theory, analyzed the actors in the freight system that on behalf of different roles and functions and how they interact, that is how to interact through a contract between actors in the market. The framework also provides sensitive technology trends, business trends and policy scenarios.

The main purpose of Kevin O'Connor (2009) is to expand and develop the study on the links between the traffic and urban areas around. Because that transport activity located in the hub is important to the regional structure of urban, he proposed that the construction of the region framework of the global city is based on traffic and urban nodes, and such a global city region is expected to play an important role in global logistics.

Clarence Woudsma, etc. (2007) were designed to quantify the performance of urban transport systems affect on land use and logistics patterns. They use the spatial autoregressive model to analyze land use and development of local logistics as time

goes by and the impact of the web accessibility molecular (the crowded travel time). The results show that the method is very important to land development and site for logistics in the city.

Based on the trends of growing number of products and production in procurement logistics issues, G. Schuh (2007) established the research on planning and control of logistics systems on the basis of negotiation mechanisms, which involved three aspects need attention: information technology, planning and control systems, and robust infrastructure.

2.2. Research Results in China

There are many research results about the logistics integration of Yangtze River Delta in China, many scholars analyzed logistics integration from different point of view and drew a number of useful conclusions. Research of logistics integration focused on the following aspects.

2.2.1. Relationship between Regional Logistics and Regional Economy

Many scholars have adopted different methods to analyze the relationship between regional logistics and regional economic; they generally believe that regional economic development can drive the development of regional logistics and promote regional logistics integration.

Wang Yong (2009) considered that regional logistics is an important part of regional economy. Regional logistics propel the regional economy forward that regional economy will achieve rational allocation of regional resources, rational flow of trained, reasonable combination of the industrial structure and the development of regional trade. With the help of regional logistics system, large concentration of products within the region will be spread quickly, it will ensure the value and use value of goods can be achieved and support regional economy development. Meanwhile, the overall level and scale of regional economy development are the decisive factors of regional logistics demand, but also there are the sources for regional logistics demand. Regional economy integration can make inter-regional or regional logistics tend to be reasonable, adapt to rational distribution of the industrial structure and promote the development of regional logistics. Only establish the regional logistics system based on the regional economy cooperation, regional logistics can play role in promoting regional economy.

Zhao Jie (2010) showed that modern logistics industry plays an important role in the process of regional economy integration in Yangtze River Delta. On the one hand, the developments of regional logistics contribute significantly to regional economy development. On the other hand, regional economy development can promote the development of regional logistics industry, and ultimately determine the degree of development of regional logistics. Logistics development of Yangtze River Delta is much higher than other regions in China; there is a very important reason that the level of economic development of Yangtze River Delta is higher than other regions.

Guo Hubing (2010) used the logistic model to analyze the synergic relationship between regional logistics industry and economic development of Yangtze River Delta. He applied marginal analysis and elastic analysis to make a quantitative data analysis that development of regional logistics industry role in promoting regional economic growth. He proposed an intensive development model that regional logistics industry needs to strengthen the logistics management and modernization of logistics facilities should be implemented. At the same time, we should pay attention to coordination between different administrative areas within the region, increase collaborative degree and degree of order of cooperative system of regional logistics, so as to enhance the regional logistics industry development role in promoting regional economy development.

2.2.2. The Content and Strategy of Logistics Integration

Many scholars study on integrated logistics in different regions, and they put forward the strategy of integrated logistics combining with the regional situation of the study area.

Zhang Chuanlong (2008) pointed out that integration of the superior resources can promote the development of logistics industry in Yangtze River Delta. The development of Logistics industry in the region is a collection of various modes of transport like sea, inland waterway, road transport, rail, air and pipeline transport and so on. The development of logistics industry mainly rely on port logistics, supplemented by other modes of transport, the focus relying on road transport to achieve "door to door" service. Therefore the integration of superior resources specifically including port resources integration, road logistics resource integration, integration of rail transport and logistics information resource integration

Hui Ying, etc. (2008) indicated that regional logistics integration in Yangtze River Delta has become an important way to further promote industrial structure adjustment, reduce the total cost of products and enhance market competitiveness. Which the layout of regional coordination and development of logistics park is a crucial element to achieve optimization and integration of logistics elements within the region. The article summarized the logistics park layout planning, pointed out that the logistics park in Yangtze River Delta has been showing some characteristics of coordinated regional development in size, layout and other aspects. In order to promote the regional coordinated development of the logistics park in Yangtze River Delta, the authors give some suggestions on network layout, specialization and control of moderate scale.

Jie Yi (2008) proposed a solution to build the integrated logistics network of Yangtze River Delta. He considered that improving the basic design of modern logistics network is the primary task to develop Yangtze River Delta logistics integration network, fostering the modern logistics market system, making efforts to expand effective demand for logistics and promoting the establishment of modern logistics cooperation mechanism.

Qian Yanxian (2009) showed the obstacle to the development of logistics integration of Yangtze River Delta and proposed the corresponding measures that we should establish and improve the coordination mechanism, get ready for docking logistics planning, promote the integration of logistics customs clearance, promote the integration of logistics information, cooperative in regional logistics division.

Chen Lijuan (2009) suggested that the government of Yangtze River Delta should set goals and direction when establish logistics operation system and logistics information system. Thereby it will promote the development of Yangtze River Delta regional logistics.

Xia Huizhen (2010) studied on the development of the highway passenger transportation enterprise of Yangtze River Delta through SWOT analysis. He analyzed the opportunities and threats of modern logistics of highway passenger transportation enterprise from the standpoint of the external environment and analyzed the advantages and disadvantages from the point of view of the internal environment. Based on the analysis, he put forward the corresponding strategies and measures to develop modern logistics.

Luo Xiaoling (2010) focused on the rationalization of Yangtze River Delta Regional Logistics, based on the grid management theory, through the integration of logistics resources, the paper built the grid management system of logistics resource, established the corresponding simulation model which combined with Arena that is simulation software, and use relevant evaluation index to measure the quality of service of the system, so as to achieve resource sharing, collaborative work and other objectives of regional logistics.

Liang Chunmei (2010) pointed that developing the Fourth Party Logistics is an effective way to promote the integration of logistics. The Fourth Party Logistics has GPS, RFID and other advanced logistics information technology. With the Orientation to different cities, the Fourth Party Logistics can make the logistics division of labor and cooperation, achieve the integration and networking of logistics infrastructure, address the problem of allocating the logistics resources and promote the logistics integration of Yangtze River Delta.

3. Status of Economic and Logistics Development of Yangtze River Delta

3.1. Status of Economic Development

According to “Regional planning of Yangtze River Delta” (2010), it makes clear the strategic position of the development of Yangtze River Delta, namely the world's leading modern service industry and advanced manufacturing center, and world-class urban agglomeration with strong international competitiveness. By 2015, Yangtze River Delta will have taken the lead in achieving the objective of building a well-off society in an all-round way; by 2020, it will strive to have taken the lead in accomplishing modernization.

Zhang Jing (2010) showed that the economic potentiality of Yangtze River Delta is abundant, and has maintained a good momentum of development in recent years. From the total economic output point of view, GDP of Yangtze River Delta in 2009 exceeded seven trillion Yuan with an average increase of 12.6%, and 1.6% higher than the previous year. The proportion of its total economic output accounts for 21.2% of national output; in terms of the industrial structure, the cities within Yangtze River Delta all have relatively high dependence on industrial economy; from the contact with the world economy point of view, more than 400 corporations among the world top 500 are set branch plants in Yangtze River Delta (Feng Jingyan, 2008). Strong economic development momentum spawns a large number of logistics needs, and leads to a surge in logistics supply. The logistics market of Yangtze River Delta enjoys economic prosperity; meanwhile there are also some issues that need to be resolved.

Table 2: GDP data of Jiangsu, Shanghai and Zhejiang (hundred million Yuan) (2000-2009)

Year	Jiangsu	Shanghai	Zhejiang	GDP Total
2000	8553.69	4771.17	6141.03	19465.89
2001	9456.84	5210.12	6898.34	21565.30
2002	10606.85	5741.03	8003.67	24351.55
2003	12442.87	6694.23	9705.02	28842.12
2004	15003.60	8072.83	11648.70	34725.13
2005	18598.69	9247.66	13417.68	41264.03

2006	21742.05	10572.24	15718.47	48032.76
2007	26018.48	12494.01	18753.73	57266.22
2008	30981.98	14069.87	21462.69	66514.54
2009	34457.30	15046.45	22990.35	72494.10

Resource: China Statistical Yearbook (2000-2010)

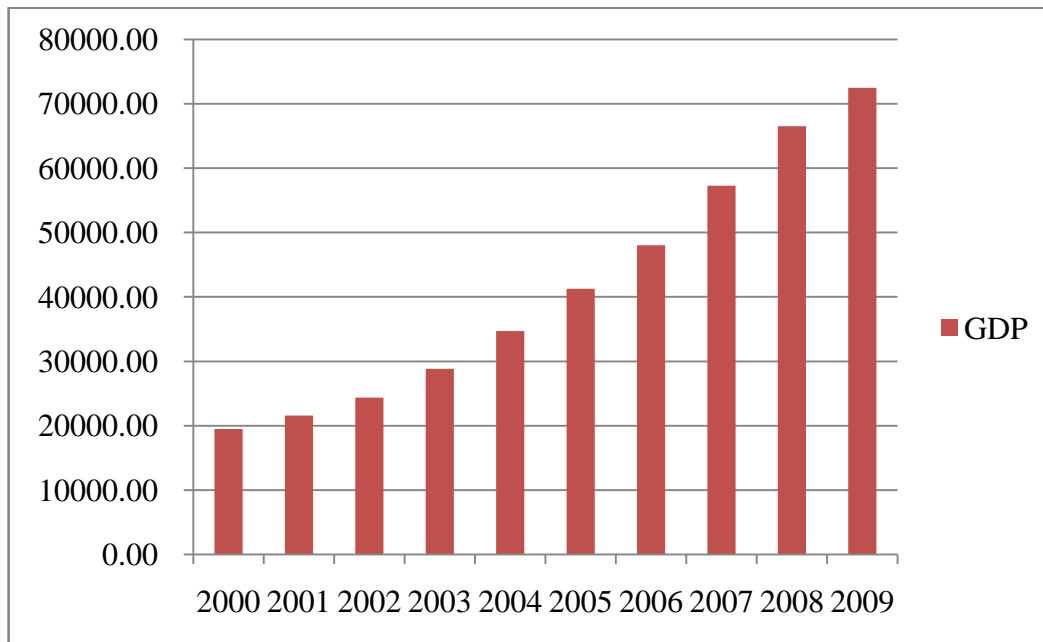


Fig. 2: Histogram of total GDP data of Yangtze River Delta (hundred million Yuan) (2000-2009)

From the histogram above, it can be seen clearly that GDP of Yangtze River Delta is raising steady in recent ten years, it also indicates that the economy is growing obviously.

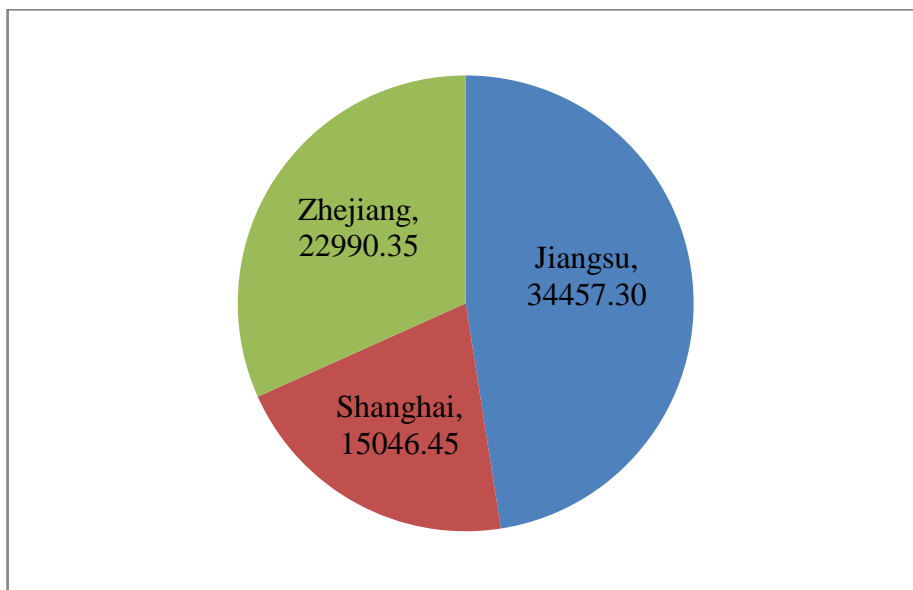


Fig. 3: Proportion of each province (city) in total GDP of Yangtze River Delta (hundred million Yuan) (2009)

The economic level of each city of Yangtze River Delta presents gradient. In 2009, the GDP of Shanghai is more than 1500 billion Yuan, much higher than other cities; the GDP of Suzhou is second highest among these cities; then the GDP of Hangzhou, Wuxi are around 500 billion Yuan, the GDP of Nanjing, Ningbo are about 420 billion Yuan; the GDP of rest cities of Yangtze River Delta are all less than 300 billion Yuan. (It can be seen from Table 3 and Fig.4)

Table 3: GDP data of each city in Yangtze River Delta (hundred million Yuan) (2009)

Shanghai	Jiangsu		Zhejiang	
15046.45	Suzhou	7740.20	Hangzhou	5098.66
	Wuxi	4991.72	Ningbo	4214.60
	Nanjing	4230.26	Wenzhou	2527.88
	Nantong	2872.80	Shaoxing	2375.46
	Changzhou	2519.93	Taizhou	2025.47
	Xuzhou	2390.16	Jiaxing	1918.03
	Yancheng	1917.00	Jinhua	1765.94

	Yangzhou	1856.39	Huzhou	1111.50
	Zhenjiang	1672.08	Quzhou	617.50
	Taizhou	1660.92	Lishui	542.02
	Huaian	1121.75	Zhoushan	533.26
	Lianyungang	941.13		
	Suqian	826.85		

Resource: Shanghai Statistical Yearbook (2000-2010), Jiangsu Statistical Yearbook (2000-2010), Zhejiang Statistical Yearbook (2000-2010)

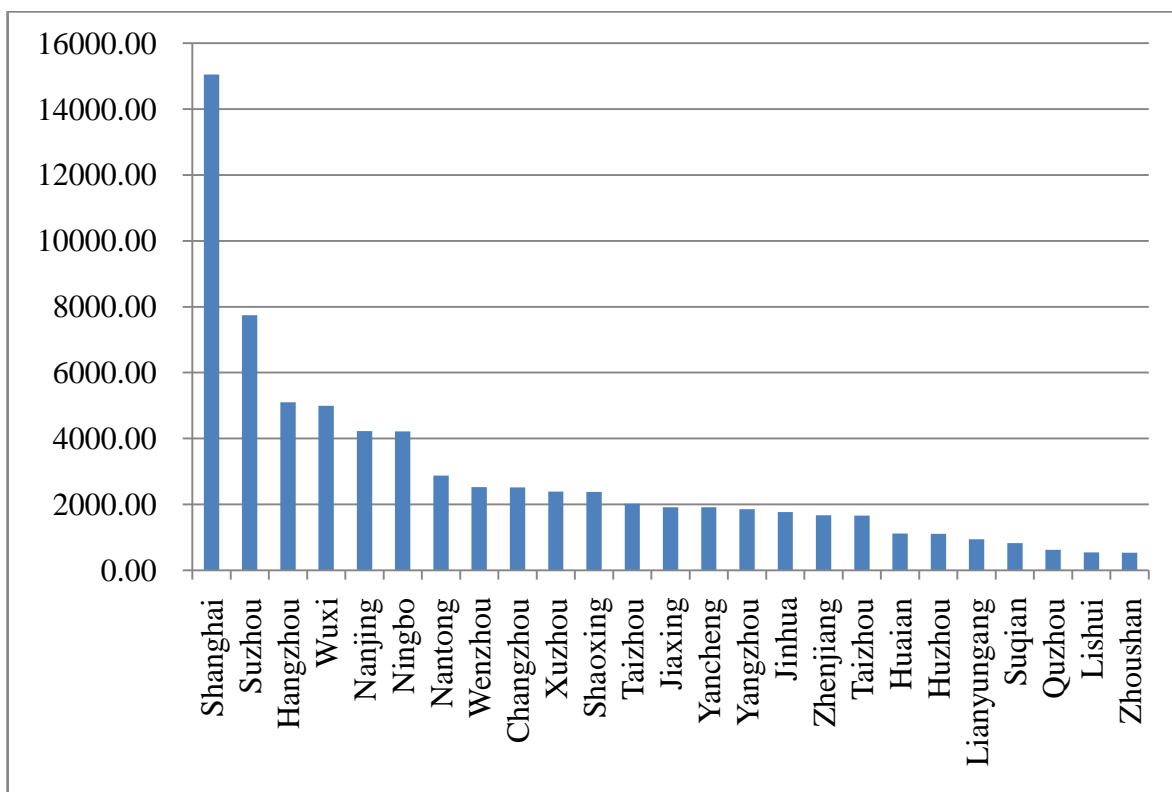


Fig. 4: Histogram of GDP data of each city in Yangtze River Delta (hundred million Yuan) (2009)

3.2. Status of Logistics Development

3.2.1. Status of Transportation Infrastructure Construction

3.2.1.1. Highway

Lu Yifei (2010) pointed out the road density and expressway density of Yangtze River Delta are respectively 3 times and 5.8 times the national average. The urban agglomeration of Yangtze River Delta adopts a positive and cooperative attitude towards regional road facility construction, and the construction progress of logistics platform is facilitated. With the constant construction of dense expressway network in Yangtze River Delta, the logistics linkage effect has already emerged, and the rapid development of logistics industry is stimulated with greater scope. By the end of 2009, the length of highways data of Yangtze River Delta is shown in Table 4.

Table 4: Length of highways of Yangtze River Delta (km) (2009)

Index Region	Total Length of Highways	Expressway and class I to IV highways			Highways below Class IV	
		Express way	First class	Second Class		
Shanghai	11671	11671	768	351	2922	-----
Jiangsu	143803	134192	3755	8469	20775	9611
Zhejiang	106952	102153	3298	4099	8882	4798
Yangtze River Delta total	262426	248016	7821	12919	32579	14409
National total	3860823	3056265	65055	59462	300686	804558
Proportion (%)	6.8%	8.1%	12%	21.7%	10.8%	1.8%

Resource: China Statistical Yearbook (2000-2010)

3.2.1.2. Navigable Inland Waterways and Ports

Yangtze River Delta has the great advantage in inland shipping. It accounts for 35% of the national inland waterways (Table 5). By the end of 2009, the length of national inland waterways was 123,683 km, while that of Yangtze River Delta amounted to

43,621 km. Crisscross inland river network extending in all directions features the transport system of Yangtze River Delta. Yangtze River Delta has advantaged coastline superiority with the structure of such excellent ports as Shanghai Port, Ningbo Port and Zhoushan Port. It currently has eight major ports along the coast and 26 inland ports. It is one of the areas with the largest port density in China (Qian Huixiong, 2010). Number of berths of the main cities in Yangtze River Delta is shown in the Table 6.

Table 5: Length of navigable inland waterways of Yangtze River Delta (km) (2005-2009)

Region \ Year	2005	2006	2007	2008	2009
Shanghai	2110	2110	2110	2138	2138
Jiangsu	24800	24796	24785	24638	31779
Zhejiang	9652	9652	9667	9695	9704
Yangtze River Delta total	36562	36558	36562	36471	43621
National total	123300	123388	123495	122763	123683
Proportion (%)	29.65%	29.63%	29.61%	29.71%	35.27%

Resource: China Statistical Yearbook (2000-2010)

Table 6: Number of berths of the main cities in Yangtze River Delta (units) (2007)

Port \ Index	Number of Berths
Shanghai Port	1155
Nanjing Port	268
Suzhou Port	199
Wuxi Port	674
Changzhou Port	526
Zhenjiang Port	242
Nantong Port	90

Yangzhou Port	317
Taizhou Port	746
Hangzhou Port	1350
Ningbo Port	309
Jiaxing Port	2430
Huzhou Port	1117
Shaoxing Port	285
Zhoushan Port	410
Taizhou Port	120

Resource: Qian Huixiong, 2010

3.2.1.3. Air Transport and Airport

By the end of 2009, the airport density per 10 thousand square kilometers of Yangtze River Delta was 0.9 (Ren Hui, 2010). Within the scope of two provinces and one city in Yangtze River Delta, the number of airports has reached 15. The passenger throughput, cargo and mail throughput and flight sorties of each airport in 2009 are shown in Table 7.

Table 7: Passenger throughput, cargo and mail throughput and flight sorties of each airport in Yangtze River Delta (2009)

Airport \ Index	Passenger Throughput (million person-time)	Cargo and Mail Throughput (million tons)	Flight Sorties (million sorties)
Shanghai Hongqiao & Pudong	5699.96	298.25	47.69
Nanjing Lukou	1083.72	20.01	10.61
Wuxi Shuofang	221.79	4.70	1.97
Nantong Xingdong	22.03	0.19	2.37
Changzhou Benniu	53.52	0.62	0.56

Xuzhou Guanyin	51.10	0.30	0.91
Yancheng Nanyang	16.17	0.12	0.22
Liangyungang Baitabu	29.11	0.09	0.37
Hangzhou Xiaoshan	1494.40	22.60	13.40
Ningbo Lishe	403.14	6.87	3.75
Wenzhou Yongqiang	482.15	4.43	4.48
Zhoushan Putuoshan	44.80	0.04	0.64
Taizhou Luqiao	52.67	0.43	0.53
Yiwu	55.97	0.33	0.53
Quzhou	12.84	0.02	0.18

Resource: Ren Hui, 2010

3.2.1.4. Railway

By the end of 2009, the length of railways in operation of Yangtze River Delta was 3616 km, and increased by 493 km compared with 2005, by about 16%. The percentage of the length of railways in operation of Yangtze River Delta to the national total increased from 4.14% in 2001 to 4.23% (Table 8). Meanwhile, the important electric railway transform project on the transportation artery Zhe-Gan railway line of eastern Yangtze River Delta, the construction of Xuancheng-Hangzhou dual railway and the construction of Pudong railway will make the railway of Yangtze River Delta more developed. Through land-and-water-air large coordinated transport, Yangtze River Delta will become an important part of the national coastal main thoroughfare.

Table 8: Length of Railways in operation of Yangtze River Delta (km) (2005-2009)

Region	Year				
	2005	2006	2007	2008	2009
Shanghai	269	269	281	307	309
Jiangsu	1599	1603	1607	1643	1643
Zhejiang	1255	1265	1306	1306	1665

Yangtze River Delta total	3123	3137	3194	3256	3616
National total	75400	77083.8	77965.9	79700	85517.9
Proportion (%)	4.14%	4.07%	4.10%	4.09%	4.23%

Resource: China Statistical Yearbook (2000-2010)

3.2.2. Status of Logistics Information Facility Construction

Jiangsu, Zhejiang and Shanghai respectively practice different customs management systems due to historical reasons. These management systems have seriously restricted the growth of foreign trade in Yangtze River Delta, and also affected the improvement of trading environment and economic development of the region. An important approach to break this bottleneck is to speed up the tempo of "customs clearance" construction simultaneously in each province within Yangtze River Delta. The so-called "customs clearance" is a project to raise the efficiency of the ports. The essence to implement "customs clearance" is to improve the efficiency of customs clearance of import and export goods, save time and monetary costs of customs clearance through recombining constructions and re-engineering business process, on the premise of ensuring the effective implementation of laws and regulations.

In 2007, Shanghai, Jiangsu and Zhejiang signed "Cooperation Memorandum of the Customs Clearance Construction in Yangtze River Delta", reaching an agreement on such aspects as the unified identification criterion and management mutual recognition mechanisms of companies in Yangtze River Delta for convenient customs clearance, and the establishment of information communication and contact system for "customs clearance" of the two provinces and one city. Chen Junjie (2010) showed that through the construction of "customs clearance", the speed of custom entry in Shanghai Port has reduced to 15 minutes, and customs clearance time has reduced from several days of the past to 50 minutes of paperless clearance. Shanghai promotes logistics information platform based on EDI (Electronic Data Interchange) system in the whole city. This will greatly improve the utilization of Shanghai Port, and speed up the speed of logistics operation in Shanghai area. The logistics information platform has the features of good openness and compatibility. It can be promoted in the entire Yangtze River Delta and even across the country. It can be convenient enough to cover other areas or integrate with other information platforms.

Pu Shuai (2009) introduced that the work of EDI system construction in Jiangsu province has begun. According to this system, among the relevant departments of international economy and trade sectors in Jiangsu province will cross-regional, cross-departmental and cross-sectoral information exchange platforms are established, to realize data exchange and information sharing for convenient information transferring. The province has formed long-distance transmission trunk cable network with fiber optic cable predominant and digital microwave subsidiary, and wireless paging system covering the whole province. The information system constructions of finance, commerce, taxation, transport, customs, inspection and quarantine that join a complete set of the national "gold" system project are roughly in shape and also widely used. Zhejiang province is also actively involved in this field, and container clearance in Ningbo Port can be completed within 24 hours. According to Yuan Jiufu (2006), the Ningbo and Hangzhou customs adopt a supervision model of "multi-point declaration port clearance", which makes use of the customs information network for public services to realize "through paperless customs clearance".

After accelerating construction in recent years, the information infrastructure of Yangtze River Delta has begun to take shape. By the end of 2009, the internet users, the capacity of local telephone exchanges and the length of long distance fiber cable of Yangtze River Delta are respectively 31,019,500 subscribers, 89,517,500 gates and 59,669 km (Table 9).

Table 9: Information construction of Yangtze River Delta (2009)

Region \ Index	Internet users (10000 subscribers)	Capacity of Local Telephone Exchanges (1000 gates)	Length of Long Distance Fiber Cable (km)
Shanghai	1250	1386.35	4297
Jiangsu	960.95	4455.4	32137
Zhejiang	891	3110	23235
Yangtze River Delta total	3101.95	8951.75	59669

Resource: China Statistical Yearbook (2000-2010)

3.2.3. Status of Logistics Policy and Planning

Modern logistics industry has become an important industry in Yangtze River Delta in recent years. The governments all attach great importance to it, and policies and documents are promulgated in succession to support it (Table 10). Most cities have announced specific policies of logistics industry development, the content of which relate to spatial distribution, financial support, tax and land preference; some cities put relevant policies within the framework of service industry to illustrate.

Table 10: Logistics policy issued by some cities in Yangtze River Delta

City	Policy
Shanghai	“Policies and advices for accelerating the modern service industry development of Shanghai city”
Zhenjiang	“Preferential policies that modern logistics enterprises can enjoy”
Changzhou	“Implementation outline for accelerating the modern service industry development of Changzhou city”
Yangzhou	“Support policies for accelerating the modern logistics development industry of Yangzhou city” “Advices for accelerating the modern logistics industry development of Yangzhou city” “Implementation outline for accelerating the modern service industry development of Yangzhou city”
Wuxi	“Advices about accelerating the cultivation of key professional market and modern logistics enterprises of Wuxi city”
Suzhou	“Layout planning of service industry of Suzhou city”
Hangzhou	“Planning for accelerating the modern service industry development of Hangzhou city” “Implementation opinions on the modern logistics development plan of Hangzhou city”
Taizhou	“Advices about the services industry development issued by municipal party committee and government of Taizhou city”

<p> </p>	<p> “Advices for promoting the services industry development of Jiaxing city” “Guidance for accelerating the logistics industry development of Binhai new area” </p>
<p> </p>	<p> “Advices for accelerating the modern logistics industry development issued by People's Government Office of Huzhou city” </p>
<p> </p>	<p> “Management approach of guiding fund for modern logistics industry development of Ningbo city” “Advices for accelerating the modern logistics industry development of Ningbo city” “ Implementing Methods for accelerating the modern logistics industry development of Ningbo city” “Temporary law of modern logistics key enterprises management of Ningbo city” </p>

Resource: Data collected from each city related website

Each province works out its own logistics development plans around the same time, such as "Modern Logistics Development Plan of Jiangsu Province (2002-2010)", "Modern Logistics Development Program of Zhejiang Province", "Modern Logistics Development "Eleventh Five-Year" Plan of Shanghai City". With China’s economy entering into the twelfth five-Year plan, logistics planning is still in the drafting process and has not been announced yet. Meanwhile, many cities have introduced their own logistics development plans within the framework of the corresponding provincial plans according to their actual situations, and pointed out regional position and development goals (as shown in Table 11) of the city's logistics industry. Except Shanghai and Ningbo that take international logistics as development objective, the rest basically aim to be a regional logistics center or secondary city of Shanghai.

Table 11: Logistics plan and development objectives issued by some cities in Yangtze River Delta

City	Logistics Plan	Logistics Development Objectives
Shanghai	"Modern logistics	Shanghai city should be initially built as an

	development "eleventh five-year" plan of Shanghai city"	important international logistics hub and one of the Asia-Pacific logistics centers by 2010.
Nanjing	"Modern logistics development plan of Nanjing city"	Nanjing city should become an international logistics node in north Yangtze River Delta, and an international logistics distributed node that integrated with Shanghai port.
Zhenjiang	"Modern logistics development plan of Zhenjiang city"	Zhenjiang city should become a logistics hub in Yangtze River Delta, which is an exchange logistics hub and a supporting logistics hub of Shanghai international shipping center.
Changzhou	"Modern logistics development plan of Changzhou city"	Changzhou city should become one of the regional logistics centers in Yangtze River Delta and a modern logistics center in Jiangsu province.
Yangzhou	"Modern logistics development "tenth five-year "and 2020 plan of Yangzhou city"	Yangzhou city should strengthen its position as a portal hub and the logistics radiation to the other cities in north Jiangsu, actively integrate with the logistics industry of south Jiangsu.
Wuxi	"Modern logistics development "tenth five-year" plan of Wuxi city"	Wuxi city should become a regional logistics center in Yangtze River Delta which adapted to Shanghai international logistics center, an important hub and node in the supply chain of national modern logistics development.
Suzhou	"Modern logistics development plan of Suzhou city"	Suzhou city should be the logistics hub of the three cities, which is Suzhou, Wuxi and Changzhou; the exchange logistics hub of the two provinces, which is Jiangsu and Zhejiang; the supporting logistics hub of Shanghai international shipping center.
Nantong	"Modern logistics	Nantong city should become a modern port

	development plan of Nantong city"	city and a regional logistics center in north Yangtze River Delta.
Taizhou	"Modern logistics development plan of Taizhou city"	Taizhou city should conform to the trend of modern logistics development, provide an advantageous space for the development of logistics enterprises, and ease the pressure of Taizhou city.
Hangzhou	"Modern logistics development plan of Hangzhou city (2006-2020)"	Hangzhou city should become an important modern logistics hub in Yangtze River Delta and an integrated logistics center in Zhejiang Province.
Zhoushan	"Basic framework and ideas on modern logistics development plan of Zhoushan city"	Zhoushan city should link up with international logistics, and build a modern logistics industry zone with the trinity of land, sea and air in south Yangtze River Delta by 2020.
Taizhou	"Modern logistics development plan of Taizhou city (2003-2020)"	Taizhou city should become an important regional logistics hub in south Yangtze River Delta.
Jiaxing	"Development plan of specialized market and modern logistics of Jiaxing city"	Jiaxing city should become a strong city with large specialized market, an important logistics node in Yangtze River Delta, and an important logistics center in north Zhejiang.
Ningbo	"Modern logistics development plan of Ningbo city"	Ningbo city should become an important logistics center in Zhejiang Province, an important part of Shanghai international shipping center, and an international logistics hub in Yangtze River Delta.

Resource: Data collected from each city related website

3.2.4. Status of Logistics Park Construction

In recent years, most cities in Yangtze River Delta are conscious of the important role of the development of logistics industry in local economy, and they all hope logistics industry can be a new economic growth point for promoting the development of local economy. So, various cities begin to construct and expand a large number of logistics parks, and make different function orientations for each logistics park. They hope to attract many outstanding logistics enterprises to immigrate in the park, so as to exert its accumulative effect and diffusive effect. The logistics parks already completed and those in building and planning of Yangtze River Delta, their function orientations are shown in Table 12.

Table 12: Logistics park and its function of the main cities in Yangtze River Delta

City	Logistics park	Function
Shanghai	Waigaoqiao logistics park	It incorporates various functions including multinational purchasing, international logistics service, international free trade, export processing, logistic distribution, warehousing and bonded commodities exhibitions and trade.
	Pudong airport logistics park	Multi-function such as source organization, transit, handling and storage, multimodal transport, express of inward and outward, declaration.
	North-west logistics park	Multimodal transport of highway, railway, waterway and aviation, city goods procurement, storage, processing, distribution, transport, trade, information.
	Lingang logistics park	International container transportation.
Suzhou	Wangting logistics park	Service the enterprise in industrial park, and as the "outpost" of Shanghai international shipping center.
Wuxi	Wuxi comprehensive logistics park	A regional material distribution center features stainless steel, metal materials, agricultural and sideline products.

Changzhou	High tech zone logistics park	The construction of storage center, freight center, business transaction center, information network center, comprehensive service center
Zhenjiang	Jinshan logistics park	With the functions of logistics information release, vehicle scheduling, member management, safety monitoring, warehousing and distribution, line express and life service, etc.
Nanjing	Longtan logistics park	International logistics business, domestic aviation goods transfer, bonded warehousing, commodity exhibition, high value-added products processing and related management office services.
Taizhou	Taizhou harbor logistics park	With the functions of large agricultural and sideline products, industrial waterway and highway transit, international container transshipment.
Nantong	Nantong harbor logistics park	Relying on Langshan port, water transit of the major bulks, processing and distribution of agricultural and sideline products, international container transshipment, highway, railway and waterway transport, etc
Yangzhou	Yangzhou harbor logistics park	Multi-function such as port, goods distribution and transfer, social warehousing, distribution function, distribution processing, logistics information service.
Hangzhou	Modern canal logistics park	Domestic container transportation, distribution and transshipment
Ningbo	Ningbo harbor logistics park	It incorporates freight forwarding, freight, storage, processing, packaging, distribution and transshipment of domestic and international airlines in an integrated logistics park.
Taizhou	Taizhou logistics park	Multi-function such as warehousing and distribution, highway and railway transport, freight loading, international logistics, information service, logistics business, distribution processing and commercial

		circulation.
Jiaxing	Jiaxing modern logistics park	Regional distribution, raw material processing distribution.

Resource: Data collected from each city related website

As Shanghai is the leading hub of regional economic development and interface of international logistics, it not only has a relatively large scale, but also focuses on international logistics. The secondary central cities like Nanjing, Hangzhou, Ningbo and Suzhou are mainly responsible for elements transmission among a large number of hinterlands and functions of secondary central cities. And they are all secondary in scale. The average construction scale of Japanese logistics parks is 74 hm², and part of Germany logistics parks are large with the scale of more than 100 hm² (China Federation of Logistic & Purchasing, 2007). The trade and investment promotion of logistics park in Shanghai are very successful, but there appears shortage of land for logistics park. It can be seen that on one hand, large scale of logistics park is not necessarily improper, and the foresight of planning requires park distribution to leave room for later development; on the other hand, the trade and investment promotion capacity of the park is closely related to its scale. But it is undeniable that now parts of the logistics parks do have problems of relatively larger scale. And the government at province, city and county levels are also planning their own "several" logistics parks. The phenomenon of caring more about size than function and vacant park are problems that cannot be neglected.

The functions of park have reflected certain professional characteristics and need further "staggered development" (which means development in a coordinated and complementary way). It can be seen from Fig.5 that, classified by industry orientation, comprehensive type accounts for 82%; classified by regional radiation, the layout and planning of logistics park in Yangtze River Delta are primarily aging type and comprehensive type, respectively accounting for about 40% and 33%; classified by the relying object, the type of cargo service holds absolute predominance, accounting for about 49%.

Note: Blue - According to the industrial orientation classification; Red - By regional radiation classification; Yellow - Rely on object classification;

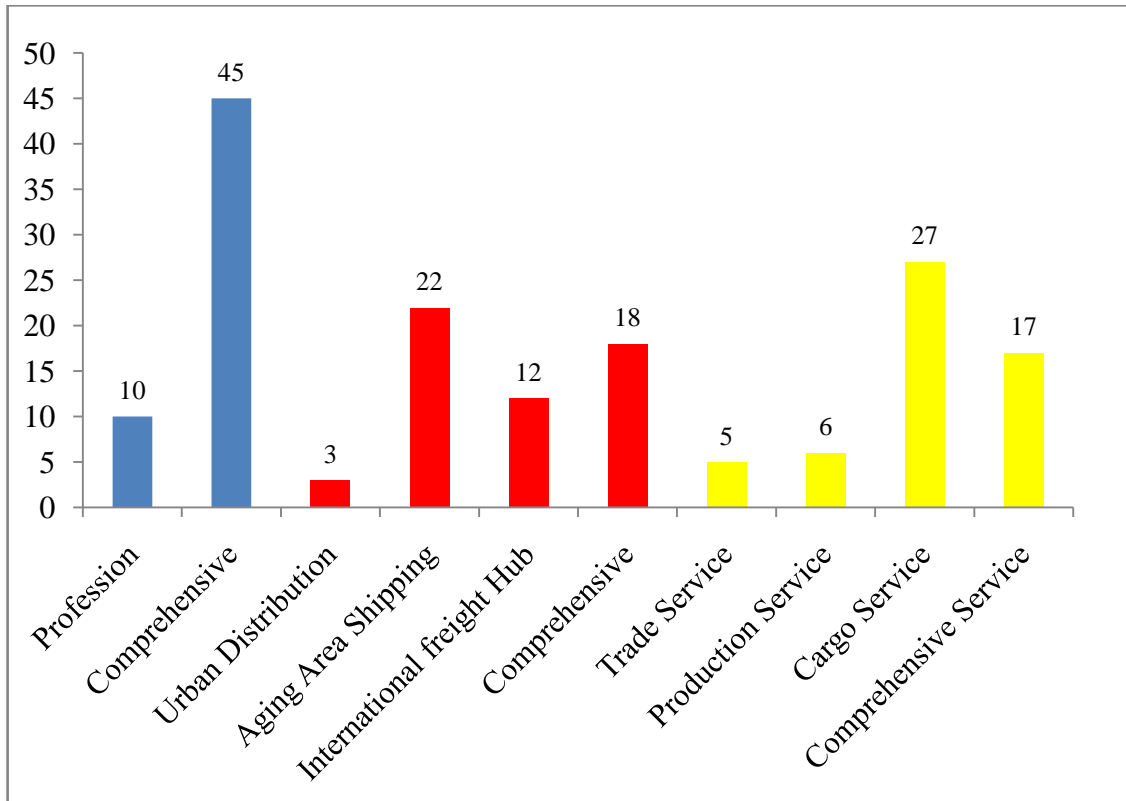


Fig. 5: Classified statistic of the main logistics parks in Yangtze River Delta

Resource: Hui Yin, Shu Huiqing (2008)

According to the survey, half of the national logistics parks are comprehensive, which shows that all cities plan and construct their logistics parks from the strategic view of regional economic development in order to achieve better service of the logistics parks for local logistics industry development, and improve regional logistics service. The development of logistics park in Yangtze River Delta also reflects this characteristic. All cities construct "integrated" logistics park one after another. Despite that the logistics parks of various cities have been staggered in planning; the parks that have already been completed and put into operation are still short of professional parks oriented towards local main industrial characteristics and industrial structure.

3.2.5. Status of Third Party Logistics Enterprises Development

At present, the distribution of third party logistics enterprises' service market in Yangtze River Delta can be analyzed from two aspects of service field and service content:

Serving the international logistics field is the main market of current third party logistics service, and accounts for over 80% of the domestic third party logistics market (Peng Rengui, 2008). The logistics providers of import and export trade service are

mainly single or joint venture enterprises invested by foreign capital. Good third party logistics enterprises also focus their service on the international logistics field. Third party logistics enterprises invested by foreign capital do not own rights of domestic transport at present. They generally joint ventures or cooperate with domestic logistics enterprises with transport right to complete the whole-process service of international logistics.

Compared with international logistics, the third party logistics service of domestic logistics field has greater disparity in many aspects, such as narrower coverage, less diversified content and lower performance of service. In terms of industry, it provides service mainly to the automotive industry, fast consumable commodity industry, electronic household appliances industry and other industries with special requirements for logistics links such as transport and warehousing due to special nature of the products; in terms of regional scope, it mainly provides the logistics services of nationwide distribution, nationwide less-than-truckload express and city distribution; in terms of supply chain, it not only has such logistics services with one or several areas as procurement and supply logistics, production logistics, distribution logistics and recycling logistics, but also provides whole-process service throughout the entire supply chain (Shanghai logistics association subject group, 2005)

3.2.6. Status of Logistics Talent Requirement and Training

The professional market and industrial cluster of the resources and products in Yangtze River Delta are relatively developed. Logistics enterprises at home and abroad have invested and built plants here one after another. So the shortage of various logistics talents is serious, particularly of senior logistics talents. Many mainland logistics talents are familiar with the process of foreign trade, transport and customs clearance, but lack of adequate understanding of technologies such as supply chain design and RFID application which are widely used in the world to enhance the logistics efficiency. High and mid-level logistics personnel are still in short supply, and logistics management talent has been listed as one of the 12 categories of talent shortage (Wang Mingyu, 2009).

Compared with developed countries, our higher logistics talent training system is not perfect; the diversity of talent demand has not been effectively met. Formal logistics education and various non-formal trainings are important means to train logistics talents. China's logistics specialized education is still in its infancy now, and current logistics

talent training and education are still relatively backward. The training of logistics talents is mainly conducted in universities, but universities with logistics major are lacked. Therefore, lack of talents has become one of the problems to obstruct the logistics integration of Yangtze River Delta.

4. Logistics Demand Analysis of Yangtze River Delta

The forecast of regional logistics demand is to make scientific analysis, estimation and inference of future logistics demand on the basis of historical data and market information by using appropriate methods and techniques, in order to study the scale of regional logistics demands, and provide the theoretical basis for regional logistics planning. The future development of logistics industry in Yangtze River Delta depends on the demand of the development of national economy of the whole Yangtze River Delta for logistics service. Therefore, to some extent, the potential logistics demand of Yangtze River Delta determines the developing space of logistics industry in Yangtze River Delta. However, there are many related factors involved in the logistics demand of Yangtze River Delta. The paper makes corresponding forecasts from the development trend of GDP, freight traffic and freight ton-kilometers, which can roughly reflect the scale of logistics demand of Yangtze River Delta, and provide some quantitative basis for its development.

Based on Cheng Xueping (2010), current prediction methods of logistics demand are mainly quantitative and qualitative methods. Quantitative methods are mainly: grey model, regression analysis, elastic coefficient method and exponential smoothing method; qualitative analysis methods mainly include expert analysis and scenario analysis. Gray model method has low requirements for sample conditions. But as the base increases, the data growth accelerates, and the predictive effect becomes worse as the year goes on, so this method cannot have good results for long-term prediction; regression analysis is to predict according to the relationship between study objects and related factors; exponential smoothing method is to predict by weighting index based on the actual and predictive values of the previous period in historical data. It has the advantage of calculating predictive value of next period with only actual and predictive values of previous period. This can save a lot of data and time to process the data, and reduce data storage. It is a practical prediction method. This paper will use exponential smoothing method to predict GDP and freight ton-kilometers of Yangtze River Delta; use regression analysis to forecast freight traffic of Yangtze River Delta, and find out the relationship between freight traffic and GDP with SPSS software.

4.1. Forecast of GDP Development

GDP reflects the final results of productive operations in a period. It is the primary integrated indicator accepted internationally to comprehensively measure the scale and

development condition of national economy. The economic growth rate of a country or region is usually represented by GDP. In light of the reality in China, the more economically developed the region is, the higher its logistics level is. According to the observation of the GDP data line chart from 2000 to 2009 of Yangtze River Delta, to adopt double exponential smoothing model is the suitable choice. Exponential smoothing method will roughly smooth the statistical data that reflect historical changes in order to analyze the evolutionary tendency of the variable. Exponential smoothing is a typical time series prediction method, which holds that recent data are of greater influential value with larger weights, and older data are of weaker influential value with smaller weights.

On the basis of the 10-year GDP data of Yangtze River Delta provided by "China Statistical Yearbook", the ensuing paragraphs forecast GDP of the next 5 years with Excel software. Specific process is as follows:

Table 13: Nominal GDP data in Yangtze River Delta (hundred million Yuan) (2000-2009):

Year	GDP data
2000	19465.89
2001	21565.3
2002	24351.55
2003	28842.12
2004	34725.13
2005	41264.03
2006	48032.76
2007	57266.22
2008	66514.54
2009	72494.1

Resource: China Statistical Yearbook (2000-2010)

First of all, a line chart is drawn to observe the trend of GDP data (Fig.6). This line chart indicates that GDP data of Yangtze River Delta is increasing steadily year by year.

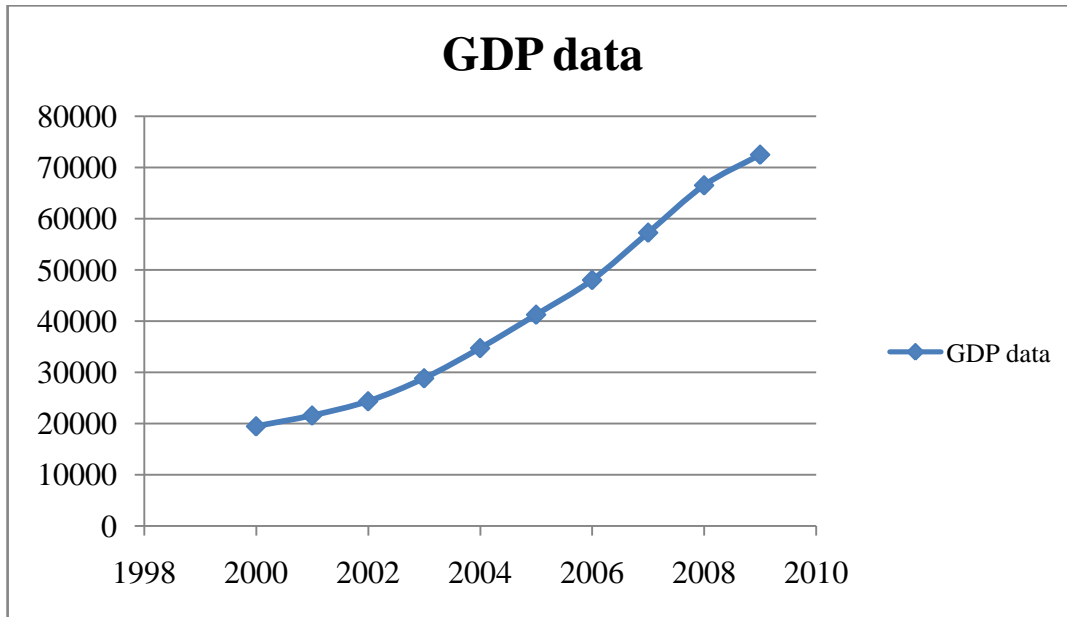


Fig. 6: Line chart of GDP data of Yangtze River Delta (hundred million Yuan) (2000-2009)

Second, initial values need be set:

$$S_1 = y_1 = 19465.9$$

$$b_1 = [(y_2 - y_1) + (y_3 - y_2) + (y_4 - y_3)]/3 = 3125.4$$

Then according to the two equations associated with double exponential smoothing:

$$S_t = \alpha y_t + (1-\alpha) S_{t-1}, \quad 0 \leq \alpha \leq 1;$$

$$b_t = \gamma (S_t - S_{t-1}) + (1-\gamma) b_{t-1}, \quad 0 \leq \gamma \leq 1;$$

The optimal value of smoothing constant α and γ are unknown right now, they just be set to 0.5.

Table 14: Smoothed results (hundred million Yuan) (2000-2009)

	y_t	S_t	b_t
2000	19465.9	19465.9	3125.4
2001	21565.3	22488.7	3115.1
2002	24351.6	25478.6	3102.6
2003	28842.1	28607.3	3105.2
2004	34725.1	32013.8	3135.4

2005	41264.0	35760.7	3196.5
2006	48032.8	39864.7	3287.3
2007	57266.2	44563.4	3428.4
2008	66514.5	49844.1	3613.6
2009	72494.1	55361.4	3804.0

With the formula of forecast: $F_{t+m} = S_t + mb_t$, GDP forecast is shown below:

Table 15: Original and forecast data of GDP (hundred million Yuan) (2000-2014)

Year	Data	Forecast
2000	19465.9	none
2001	21565.3	22591.3
2002	24351.6	24947.2
2003	28842.1	27369.4
2004	34725.1	31193.9
2005	41264.0	36930.5
2006	48032.8	44151.6
2007	57266.2	52116.8
2008	66514.5	62003.5
2009	72494.1	72698.8
2010		80985.0
2011		89373.6
2012		97762.2
2013		106150.7
2014		114539.3

The MSE for double smoothing is 10,755,079.5.

With the help of EXCEL software, the optimal values of α and γ can be calculated in order to minimize the value of MSE.

Next, the optimal forecast is able to be calculated where MSE is 2,623,436.3:

Table 16: Original and optimal forecast data of GDP (hundred million Yuan) (2000-2014)

Year	Data	Forecast
2000	19465.9	none
2001	21565.3	22591.3
2002	24351.6	23664.7
2003	28842.1	27137.8
2004	34725.1	33332.7
2005	41264.0	40608.1
2006	48032.8	47802.9
2007	57266.2	54801.5
2008	66514.5	66499.7
2009	72494.1	75762.9
2010		78473.7
2011		84453.2
2012		90432.8
2013		96412.3
2014		102391.9

Using the optimal original and predicted GDP data, a line chart is drawn (figure 7), it can be seen, the forecast is reasonable.

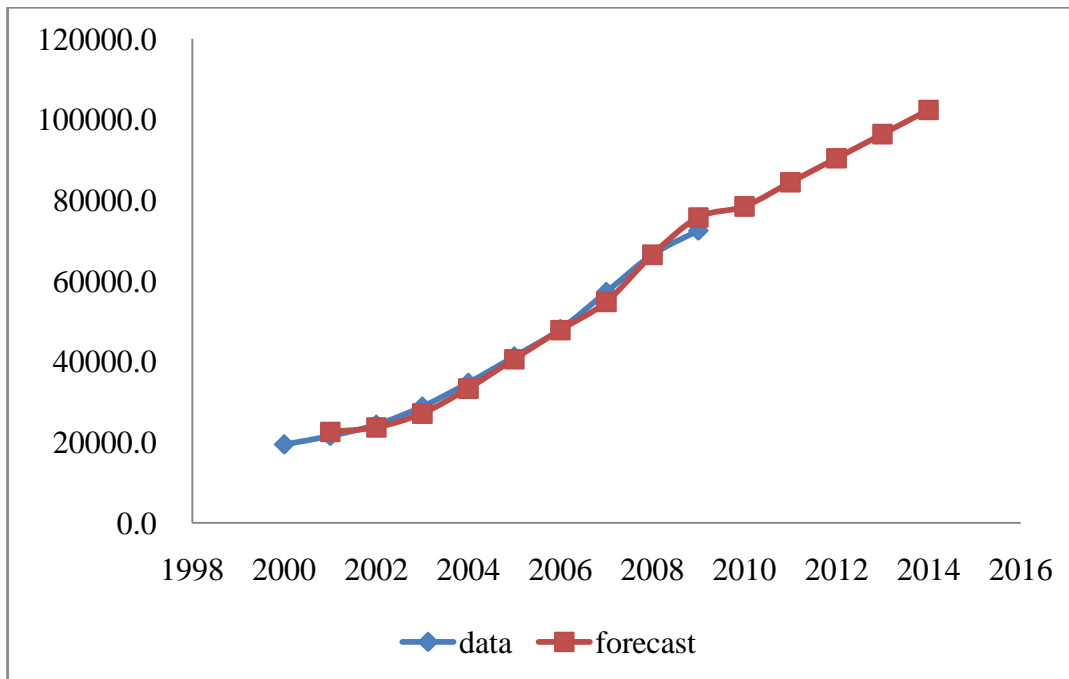


Fig. 7: Line chart of original GDP and predicted GDP (hundred million Yuan) (2009-2014)

According to the predictive analysis of this section, the economy of Yangtze River Delta in the next five years will still maintain a steady and sustained growth, which has a positive influence on the national economy. Stable economic growth increases the demand of terminal consumer products and the demand of non-terminal consumer products; primary raw material is further increased, so as to drive the continued growth of the total freight traffic.

"The Outline of the Twelfth Five-Year Plan for National Economic and Social Development" is a new phase of economic development in Yangtze River Delta. With the further development of economic globalization, the international investment and trade within Yangtze River Delta will increase more rapidly, and the fluxion of production factors and industrial diversion will significantly be accelerated. Wang Fei (2010) described that in the period of the "Eleventh Five-Year", the whole Yangtze River Delta has generally entered the industrialization medium term and begins to advance forward the later term. It will present new features of common development of manufacturing and service industries, rapid development of high-tech industries, and significant improvement of economic growth quality and efficiency, which will be practiced concretely in the primary, secondary and tertiary industries:

According to Xu Hongqiang (2010), by 2012, Yangtze River Delta will vigorously develop modern high-efficiency agriculture, and actively develop advanced manufacturing with high technology and added value; focus on automobile, shipping, engineering machinery, numerically controlled machine, instrument and other complete sets of equipment and special equipment, and promote the application of advanced design and manufacturing, mechanical and electrical integration technology and information technology; consolidate and improve the manufacturing industry of electronic and information products, and give priorities to the development of Suzhou, Nanjing, Wuxi, Shanghai, Hangzhou and other information industry bases; accelerate the application of biotechnology, and then the gross industrial product will increase substantially.

Zhou Rongrong (2010) pointed out that Yangtze River Delta will also comprehensively transform and upgrade traditional service industries, establish service industry brand, build a concentration area of modern service industries, intensify efforts to develop modern logistics industry with an average annual logistics added value of about 20%, and control logistics cost at about 15% of the regional gross product; focus on the development of industry application software and predominant software like animation; encourage financial innovation and improve the structure of the financial industry, and the average annual growth of added value is predicted to be more than 10%; energetically develop the wholesale and retail trades by using modern information technology and management idea; build tourism brand of Yangtze River Delta, and then the role of tertiary industries in promoting development and providing employment opportunities will be particularly evident. To sum up the above arguments, rapid economic development of Yangtze River Delta in the next five years is entirely convincing.

4.2. Forecast of Freight Ton-Kilometers

Freight ton-kilometers is the product of freight tonnage of the actual delivery of the transport department and the transport distance in a given period, including not only the number of transport objects, but also the factors of transport distance, which can fully reflect the transportation and production results. It is also the basic data for working out and checking transport production plan, calculating transport efficiency, labor productivity and accounting the unit cost of transportation.

Table 17: Data of freight ton-kilometers in Yangtze River Delta (hundred million Ton-Kilometers) (2000-2008)

Year	Freight Ton-Kilometers
2000	9325.31
2001	9888.56
2002	10637.73
2003	12451.92
2004	15135.61
2005	18617.2
2006	21844.85
2007	25010.12
2008	26214.45

Resource: China Statistical Yearbook (2000-2010)

According to the data, a line chart can be made to observe the trend. It shows from 2000 to 2008, freight ton-kilometers of Yangtze River Delta increases all the time.

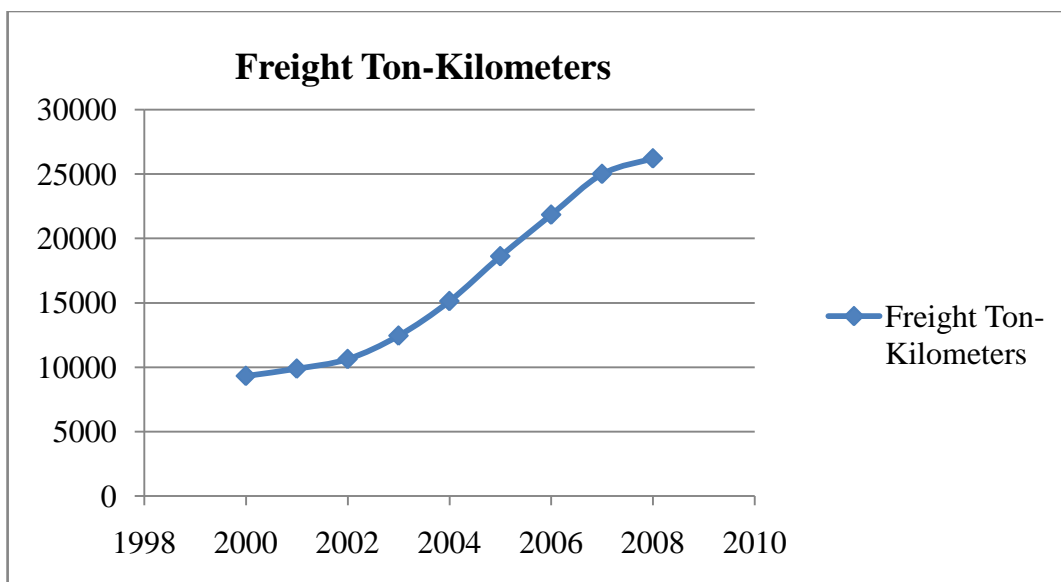


Fig. 8: Line chart of freight ton-kilometers of Yangtze River Delta (hundred million ton-kilometers) (2000-2008)

Then double exponential smoothing method will be used to forecast freight ton-kilometers of Yangtze River Delta in next five years.

The optimal value of smoothing constant α and γ are unknown right now, they just be set to 0.5.

Table 18: Smoothed results (hundred million ton-kilometers) (2000-2009)

	y_t	S_t	b_t
2000	9325.31	9325.31	1042.20
2001	9888.56	10128.04	922.47
2002	10637.73	10844.12	819.27
2003	12451.92	12057.65	1016.41
2004	15135.61	14104.83	1531.79
2005	18617.20	17126.91	2276.94
2006	21844.85	20624.35	2887.19
2007	25010.12	24260.83	3261.83
2008	26214.45	26868.56	2934.78
2009	25250.24	27526.79	1796.51

After that forecast data can be calculated with MSE 2674557.3.

Table 19: Original and forecast data of freight ton-kilometers (hundred million ton-kilometers) (2000-2013)

Year	Data	Forecast
2000	9325.3	
2001	9888.6	10367.5
2002	10637.7	11050.5
2003	12451.9	11663.4
2004	15135.6	13074.1

2005	18617.2	15636.6
2006	21844.9	19403.8
2007	25010.1	23511.5
2008	26214.5	27522.7
2009		29803.3
2010		32738.1
2011		35672.9
2012		38607.7
2013		41542.5

Finally the optimal value of forecast could be found by using Excel software:

Table 20: Original and optimal forecast data of freight ton-kilometers (hundred million ton-kilometers) (2000-2013)

Year	Data	Forecast
2000	9325.31	
2001	9888.56	10367.5133
2002	10637.73	10451.81
2003	12451.92	11386.9
2004	15135.61	14266.11
2005	18617.2	17819.3
2006	21844.85	22098.79
2007	25010.12	25072.5
2008	26214.45	28175.39
2009		27418.78
2010		28623.11
2011		29827.44
2012		31031.77

2013		32236.1
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Using the optimal original and predicted freight ton-kilometers data, a line chart is drawn (Fig.9), it can be seen, the forecast is reasonable.

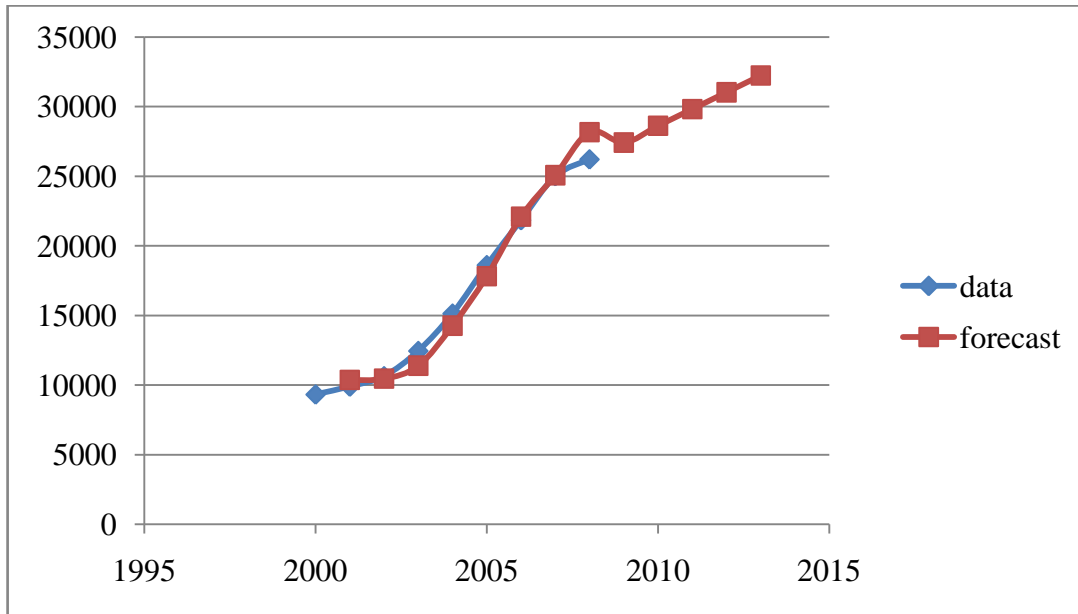


Fig. 9: Line chart of original freight ton-kilometers and predicted freight ton-kilometers in Yangtze River Delta (hundred million ton-kilometers) (2000-2013).

In the past five years, the Nanjing Port, Suzhou Port and Nantong Port of Jiangsu province have become hundred million ton port, which makes Yangtze River Delta with the most hundred million ton ports (Qian Huixiong, 2010). The local ports have become important infrastructure to support national economy and foreign trade development of the province.

In the past five years, Yangtze River Delta paid more attention to the railways. The railway construction of northern Jiangsu made a historic breakthrough, and intercity high-speed railway is also fully completed. Base on Shanghai Statistical Yearbook 2000-2010 (2010), the average transport density of Shanghai-Nanjing line in 2006 was 133.36 million tons. It is the busiest railway section in China; whereas the average passenger transport density reached 67.53 million people, 5.75 times higher than the average of the whole railway passenger transport density; the average freight transport density reached 65.83 million tons, twice the average of the whole railway freight

transport density. In July 2010, Shanghai-Nanjing intercity high-speed railway officially began to operate; in October 2010, Shanghai-Hangzhou intercity high-speed railway also started operation. Thus, a more efficient railway transport passage is formed. It fundamentally eases the tension of the traffic corridor between Nanjing, Shanghai and Hangzhou, and provides a more convenient condition for economic exchanges, personnel visits and promoting the complementary advantages of Yangtze River Delta. Also, a modern fast passenger network is built, which helps to achieve the urban agglomeration effect of all the major cities, accelerates the rapid flow of people, logistics, funds and information, and puts forward the integration process of Yangtze River Delta.

During the period of the "Eleventh Five-Year", 76 comprehensive logistics parks and a group of professional logistics centers were built through the integration of social logistics resources (Liu Shufen, 2010). Yangtze River Delta will continue to focus its investment on logistics park, network logistics center and park will have a great pushing effect on the freight ton-kilometers.

In summary, with large investment of Yangtze River Delta in its ports, railways and logistics parks, it is not difficult to achieve the above objectives.

4.3. Forecast of Freight traffic

Freight traffic is the central link of the logistics process to achieve the goods transferring. It is the subject of logistics activity with the largest proportion. The variation trend of logistics scale measured by the variation trend of freight traffic is the most approximate to the actual condition.

Table 21: Data of freight traffic in Yangtze River Delta (hundred million ton) (2000-2009)

Year	Freight traffic
2000	215274
2001	216883
2002	235293
2003	257346
2004	282575

2005	309831
2006	339832
2007	377237
2008	399314
2009	391181

Resource: China Statistical Yearbook (2000-2010)

In order to validate the relationship between GDP and freight traffic, a scatter plot is drawn.

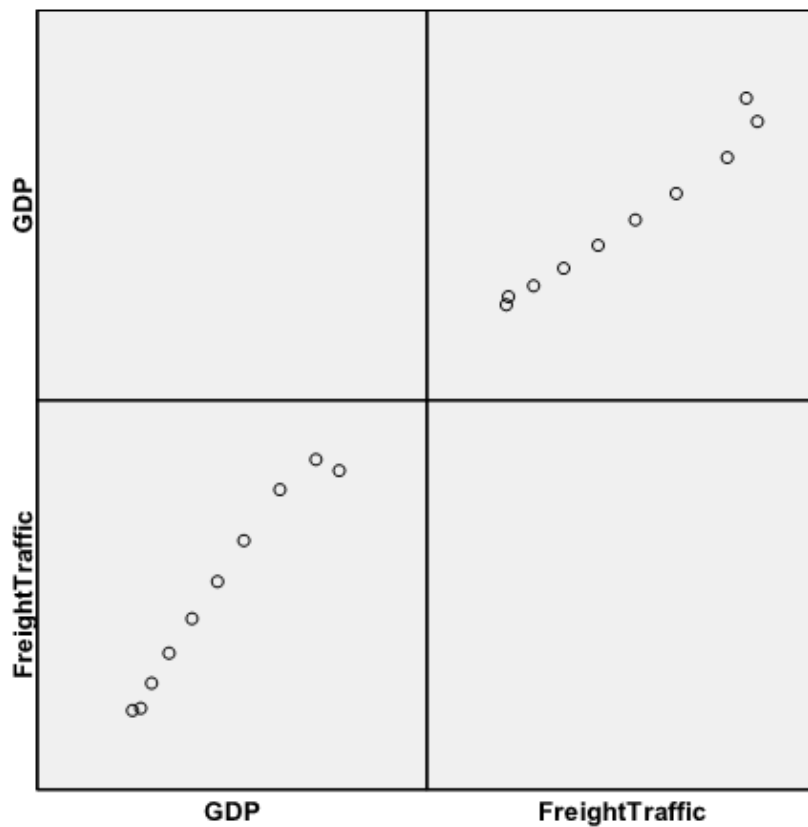


Fig. 10: Scatter plot of the relationship between GDP and freight traffic (2000-2009)

The scatter plot indicates both two curves are raising trend except 2009, next using regression analysis to see whether there exist relation between them.

Table 22 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.985a	.969	.965	13321.568

a. Predictors: (Constant), GDP

Table 23 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	148927.658	10548.140		14.119	.000	124603.603	173251.713
	GDP	3.704	.233	.985	15.878	.000	3.166	4.242

a. Dependent Variable: Freight Traffic

“R square” = 0.985, while the estimated standard deviation S is 13,321.568

The constant is estimated to 148,927.66, the slope to 3.70. The low P-values show that both estimates are significant.

The estimated model is: freight traffic=148927.66+3.70* GDP+ error term

In the above section, the GDP data of next five years has been predicted out, they will be used to predict freight traffic in the future years.

Table 24: Forecast GDP data with exponential smoothing (hundred million Yuan) (2010-2014)

Year	GDP
2010	78474
2011	84453

2012	90433
2013	96412
2014	102392

With the estimated model above, here is the predicted value of freight traffic and error term is 13321.568.

Table 25: Predicted value of freight traffic (hundred million ton) (2010-2014)

Year	Freight traffic
2010	439280
2011	461405
2012	483529
2013	505653
2014	527778

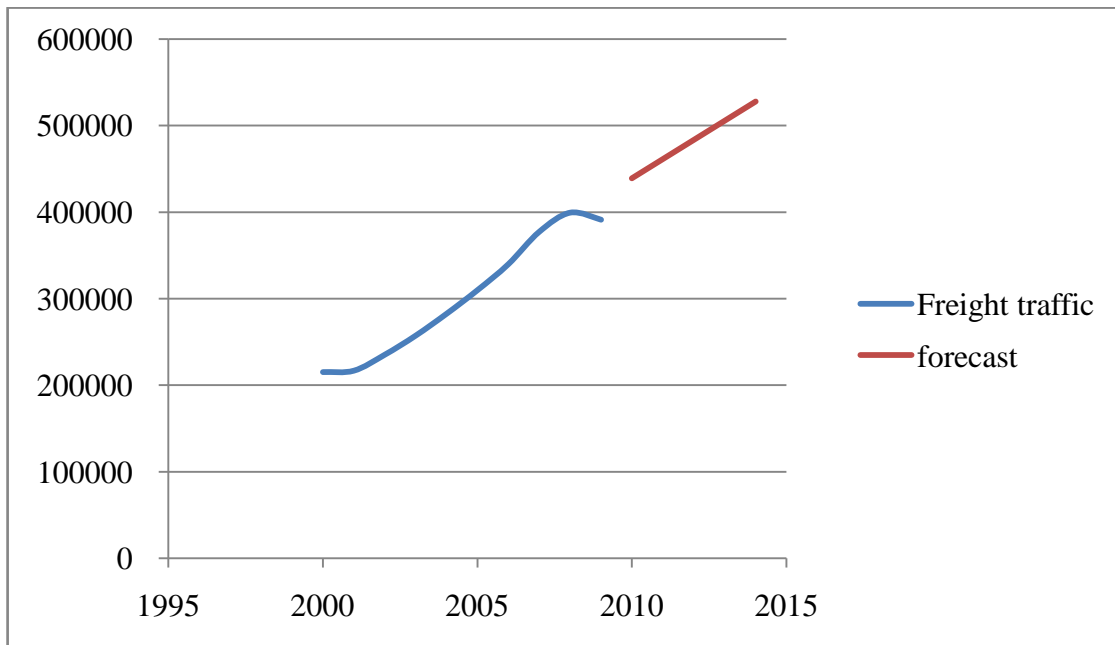


Fig. 11: Line chart of the freight traffic data and the forecast value (hundred million ton) (2000-2014)

According to the predictive results, the freight traffic is closely related to GDP. In the next several years after the "Eleventh Five-Year", the predictive values increase rapidly. As the predictive value here is from the predictive GDP, the predictive freight traffic may be slightly different from the actual value. However, the fact of the rapid growth of freight traffic of Yangtze River Delta in the next five years is affirmative.

The correlation analysis of regional logistics industry and regional economic development can be expanded through the inspection of freight traffic or freight ton-kilometers and GDP. In general, the larger the total amount of regional economic development and the faster the development, the higher is the requirement for circulation of means of production, semi-manufactured products and manufactured goods, and the more rapid is the development of logistics industry. According to the statistics of Yangtze River Delta from 2000 to 2009, there is a positive correlation between freight traffic and GDP. Logistics industry has close relationship with the development of national economy, there is a strong correlation between economy and logistics demand. Relying on the sound economic growth of Yangtze River Delta, its logistics demand will increase greatly, and its freight traffic and freight ton-kilometers will also have significant improvement, all of which provide a bright prospect for the development of logistics in Yangtze River Delta, and also create favorable conditions for the development of logistics integration of Yangtze River Delta.

4.4. Necessity of Integrated Logistics

It can be seen from the above predictive GDP that: the economy of Yangtze River Delta in the few ears will still maintain a steady and sustained growth. The economic circle of Yangtze River Delta is the most rapidly developing region in China. This region has solid economic basis, well-developed manufacturing industry and quite high export-oriented economy. Currently, more than 400 enterprises among the world top 500 invest in Yangtze River Delta, and a number of regional headquarters, research and development centers, procurement centers also settle here. In recent years, with the rapid expansion of international trade in Yangtze River Delta, the efforts for economic cooperation and coordination are intensified and transport integration is further developed, further raising the level of regional economic integration. Regional overall economic efficiency grows steadily and has become a powerful magnetic field to attract foreign capital and technology. The manufacturing industries of many developed countries are rapidly gathering toward Yangtze River Delta. This not only greatly

promotes the economic integration process of Yangtze River Delta, and brings unprecedented opportunities for its economic development, but also plays an active promoting role in building an international manufacturing base in Yangtze River Delta, comprehensively enhancing the regional economic development level of Yangtze River Delta and further implementing national regional development strategies.

It is also confirmed from the above predictions of freight ton-kilometers and freight traffic that the logistics of Yangtze River Delta will continue to develop within the next five years, and the freight ton-kilometers and freight traffic are closely related to the growth of GDP. With the growth of GDP and the promoting effect of regional economic growth on regional logistics, the logistics industry will certainly continue to develop. However, Xia Yanjiu (2008) considered that with the arrival of a new round of development opportunities, the cities in Yangtze River Delta are faced with severe challenges of how to further enhance regional competitiveness, how to play linkage effect, and how to provide power and safeguard for the rapid development of regional economic integration, the development of regional logistics is an important restrictive factor.

According to the economic development experience of foreign developed countries, regional logistics integration is a key means to break through the bottleneck of economic development, improve investment environment, improve regional comprehensive competitiveness and support regional economic integration. Jiang Guoping (2009) researched that after years of development, although the cities of Yangtze River Delta have solid foundation for the development of modern logistics industry, but review all the cities, almost every city has its own logistics development plan and a number of logistics bases and logistics centers that have problems such as: the space layout is unreasonable; the links among departments and regions are severely cut up; information cannot be shared; unified planning is lacked; the waste of redundant projects is terrible; the logistics network system lacks coordination; logistics resource is not used effectively; they cannot meet the requirements of the rapid development of regional economic integration. Therefore, to enhance the integration of logistics resource in Yangtze River Delta, promote regional logistics integration, and build as soon as possible a unified, comprehensive, fast and efficient modern logistics service system are necessary requirements for promoting the economic integration of Yangtze

River Delta, and also strategic initiatives to enhance regional competitiveness of Yangtze River Delta and to meet new development opportunities.

5. Problems of Logistics Integration of Yangtze River Delta

5.1. Imperfect logistics network

5.1.1. Poor Connection of Transport Infrastructure

Zhang Menglu (2009) investigated that in aspect of hardware infrastructure, such problems as the poor connection between railways, highway yards of central cities and port independent construction have not been settled for a long time. Too many links of cargo transshipment not only increase the transportation time and costs, but also increase the pressure of urban traffic. Many ports are not directly connected with highways, railways and inland waterways. Inland container depot has not yet formed a system. Large quantities of goods are transported to the surrounding inland container depots of the port by means of less-than-truckload transportation. The advantages of consolidation transshipment and door to door container transport have not been brought into full play.

Yangtze River Delta is one of the areas with the densest population and industry in China. To achieve the common development of integration must have a fast inter-city traffic system to meet the demands of intensive and frequent personnel and material movement between the cities. There have been sharp contrasts between Yangtze River Delta and international metropolitan areas in the number and density of railway between the cities of the urban agglomeration. And its fast road connection passageways cannot meet the requirements for integration development.

5.1.2. Backward Logistics Information Construction

There appears unbalanced information development among places within the region. Logistics information resources cannot be shared, and information resources are allocated improperly. The phenomenon of information island is serious and a universal standard is lacked. All these problems have restricted the regional logistics integration and further economic integration.

Information platform is lacked. An important drawback of the logistics integration development of Yangtze River Delta is not having a uniform and open information platform. The construction of logistics information system is still based mainly on special lines, which makes it not convenient for the connection of information network. It is not that a single high-quality logistics park will make the whole logistics system efficient. Customers have many requirements for logistics, so several ways should be

combined together. If there appears breakpoint when two means of transportation are combined, logistics distribution will bring up uncertainty in such factors as time cost and time value. In addition, the information system of logistics industry in Yangtze River Delta lacks a unified interface, which also makes logistics information system of the enterprises become information island. Specifically, the information system between freight forwarding enterprises and the production and purchasing departments of the shippers, between freight forwarding enterprises and carrier enterprises, airports and seaports, and between freight forwarding enterprises and customs lack unified interfaces. Therefore, it is difficult to achieve real-time and seamless information sharing.

Information technology is not yet widely used. For logistics service providers, information technology is a major factor to strengthen its logistics capacity. Foreign logistics information processing technology can handle various requirements of most information that is needed, such as order processing, forecasting, inventory control, cargo tracking and so on, various functions of logistics can be integrated. The integration of trade flow, goods flow, fund flow, information flow and document flow through information technology is to increase the overall performance of the logistics and its service level. However, the current logistics information technology in China has failed to meet the booming logistics development of Yangtze River Delta. Jiang Guoping (2009) found that, at present, most logistics enterprises in Yangtze River Delta adopt traditional operation modes, the advanced logistics information management systems, electronic data interchange technology and cargo tracking systems have not been widely used. The speed and accuracy of information transmission are not greatly improved, and the bill processing cost, inventory cost and labor cost cannot be controlled effectively. The means of communication in some enterprises even stay in telephone and fax, which affects the improvement of logistics management level and service quality. All these factors will restrict the logistics integration development of Yangtze River Delta.

5.1.3. Disorder Development of Logistics Park

Some foreign countries have drawn up strategic planning for the development of logistics. For example, the first overall planning of German logistics park includes 28 logistics parks (Liu Shufen, 2010), and the contents of these programs localize the

details to the analysis of such aspects as traffic, site selection and benefits, so general analysis must be combined with park analysis.

At present, the planning of logistics parks in Yangtze River Delta lacks precisely the wholeness co-ordination. According to the information collected by authors, the amount of logistics parks and logistics centers already completed and those in building and planning in Yangtze River Delta has reached 76; and among them, except few logistics park with obvious characteristics, an overwhelming majority are alike with minor differences. As there are no uniform organizations of logistics park construction and management, and there are many approval conditions of local government leading the land use of logistics parks, the total construction of logistics park in Yangtze River Delta is great in number and land scale. However, with the tendency of laying particular stress on local development, local government will introduce various preferential policies to attract investment, regardless of whether having the support of actual demand for logistics market scale. This leads to the current duplication of domestic logistics park, and excessive competition arises between the logistics parks, resulting in tremendous waste of resources.

5.2. Unsound Development Environment of Logistics

5.2.1. The Obstacle of Administrative Barriers

Yangtze River Delta has solid foundation, condition and opportunity for the development of modern logistics industry. But the two provinces and one city of Yangtze River Delta generally lack unified planning, and the spatial distribution and network system construction of logistics industry lack coordination. Almost every city has its own independent logistics development plan and a number of logistics bases and logistics centers, which cause man-made confusion and redundant construction. This indicates the obstacle of administrative barriers is very serious. The phenomenon of each going its own way, internal friction and inefficiency is very common; As the administrations of railway, highway, waterway, aviation and pipeline transportation belong to different departments, it is difficult to make overall planning, which causes non-uniform standards of sea freight, railway, highway, shipping and concerned tax cost and customs clearance procedures; As the evaluation criteria of administrative district management index system of each city are different, in aspects of administrative execution, market management and policy system, including the approval of all types of licenses for market access of various logistics enterprises, each city goes its own way,

and it's difficult to coordinate, forming fragmental barriers of regional management. These institutional barriers are not conducive to the cross-regional operation of logistics enterprises.

Wang Juan (2010) studied that logistics enterprises generally reflect that: many places make a difference between local enterprises and nonlocal enterprises with local protectionism. Logistics enterprises are facing many difficulties in setting up branches in different places and contracting for business and vehicles. The off-site branches of large-scale logistics enterprises can still not pay income tax all together. Yangtze River Delta as a region of multiple logistics center should accelerate the integration of logistics resources, foster regional integration in logistics development planning and logistics network construction, and build up overall and systematic concepts, to ensure its comprehensive competitiveness of sustainable development.

5.2.2. Lag of Logistics Standardization Construction

Logistics system links production and reproduction, production and consumption. The operation of logistics system needs multi-regional, multi-departmental and multi-industrial cooperation and division of labor and coordination of work of multiple facilities and operating systems. Thus, it requires a uniform standard system, but the logistics relevant standards in China consider less about their consistency with international standards during the formulation process. In recent years, along with the rise of modern logistics in China and the successful entry into the WTO, China has also begun to focus its attention on the importance of international standards, participated in a few international organizations for standardization, and adopted the international standards in such aspects as packaging, labeling, transport and warehousing. However, as China's modern logistics industry is still in its infancy, the logistics standardization gets behind developed countries. Therefore, the proportion of current logistics standards in line with the international ones is still very low.

The basic facilities lack unified standards. As the manufacturers of making logistics facilities belong to different departments, the facilities now used by each department, region and each joint of logistics activity still do not form standardized systems that are conducive to logistics activities, including various means of transport, packaging containers, pallets, containers, warehouses and other logistics facilities. For example, as the standard of pallet is not unified, the improvement of mechanization and automation

levels of such processes as freight transport, storage and handling is thus delayed, which also seriously affects the operational efficiency of logistics distribution system. Data exchange and information sharing are lag. Many departments and enterprises are building their own information database. However, there is no interface industry and national coding standards for public data in the field of logistics, this causes the incompatibility of electronic logistics networks, the data cannot be freely exchanged and information cannot be shared. Liu Hui (2008) showed that some of Shanghai modern logistics enterprises adopt European standards, some use Japanese and Korean standards, and some even define their own standards. The formulation work of basic standards such as logistics terminology, measurement standard, technical standard, data transmission standard, logistics activity and service standards is not fully started off, and in particular, has not yet formed a standard system in line with international standards. This situation leads to the increase of logistics costs and the decrease of service quality, and also affects the improvement of the quality, efficiency and effectiveness of logistics activities in Yangtze River Delta as well as the smoothness of international logistics activities.

5.3. Low Socialization and Specialization of Logistics Enterprises

5.3.1. Backward Management System and Specialization

Each of the logistics management systems goes its own way. Logistics is a cross-departmental and cross-industrial compound industry, and its development relates to national macro-economy, foreign trade and various means of transport such as railway, highway, waterway and aerial transportation. It also involves port supervision, business, land, taxation, information and other relevant departments. But at present, effective communication and coordination are lacked between departments, and it's difficult for cross-regional logistics services to get good development often under the influence of regional partial interests.

Logistics enterprises have low level of specialization and their quality of services is not high. Although there have been some specialized logistics enterprises in Yangtze River Delta, the level and efficiency of logistics services are still relatively low. At present, most enterprises engaged in logistics services can simply provide transportation and warehousing services, but in aspects of such value-added services as distribution processing, logistics information service, inventory management and logistics cost

control, especially the higher level services like logistics plan design and whole-process logistics service, those services have not yet been in full swing. Logistics has low level of socialization, specialization and organization, resulting in inefficient logistics, inadequate use of existing resources, and social logistics is still extensive (Wang Jian, 2008).

5.3.2. Lagging Development of Third Party Logistics Enterprises

As an important subject of the logistics market ---- third party logistics enterprises, the main problems in develop process are:

The number and size of the enterprises are small. According to the report of study on third-party logistics development of Shanghai, there are only hundreds of third-party logistics enterprises in the whole Yangtze River Delta, which seems incompatible with the region's economic status. Except several enterprises with more than one billion receipts, few are at around 500 million Yuan, most at one hundred million Yuan or so, and some only get tens of millions of Yuan with smaller management scale (Zhou Yunxia, 2010).

More enterprises in the field of third party logistics service are engaged in international logistics service, and fewer in domestic logistics service; more in foreign owned or jointed venture enterprises logistics service, and less in domestic enterprises logistics services; more in sales logistics service, and less in supply and production logistics services. This situation indicates that third-party logistics enterprises are not mature with narrow coverage of service and market.

The function of third-party logistics services focuses on traditional business with few value-added services and shortage of professional and personalized logistics services. The logistics function of most enterprises still remains in traditional logistics links like storage, transportation and distribution. They fall far short in aspect of value-added services such as processing, JIT distribution, zero inventory management, logistics consulting and training and logistics information service. Particularly the third party logistics enterprises with the capacity of plotting and planning logistics programs and operations, inventory control and management decision-making and logistics supply chain management are still rare; their market positioning are not clear, and lack professionalism and concentration areas, and they are in disorderly competitions.

5.3.3. Lack of High-quality Logistics Talents

Logistics academic education and vocational training do not keep up with the change of market demands, and the talents fail to meet the social needs. Modern logistics is a whole of socialization service consisting of business, materials, storage, transportation and many other industries, departments and enterprises, which require ideology of supply chain management and supply chain operation experience. Much higher logistics education is just a link of modern logistics theory, so the training of talents has greatly been restricted. From the current market demands of Yangtze River Delta point of view, the talent demand of logistics mainly focuses on high-end professionals at the management level. Logistics management talents are the actual operators, which require the service-providers to have a wide range of knowledge and good strategy judging and planning capacity. However, the current logistics service-providers with professional training cannot meet the market demands often because of recent graduation, and lack of experience and practice sectors.

The quality of in-service logistics employees cannot meet the actual needs. Most employees' qualities are relatively not high, and many cannot keep up with the needs of modern logistics industry development. According to Zhang Xiaoyan (2008), the qualities of person in professional logistics companies are generally lower than those of logistics administrators of the demand side of logistics services (commercial enterprises). The middle-level above person who engaged in logistics work (department managers or above) of medium-sized or above commercial enterprises are mostly tertiary educated or above; while the middle-level above person who works in logistics enterprises are mostly under college degree. So the service providers cannot keep up with the service demanders. This situation restricts the improvement of the overall level of logistics services, and the expansion of value-added services.

6. Logistics Integration Approaches of Yangtze River Delta

6.1. Logistics Network Integration

6.1.1. Integration of Logistics Infrastructure

First of all, enhance the integration construction of transportation infrastructure facilities, as a fast and unified transport network system is an important prerequisite to ensure the logistics development of Yangtze River Delta. In March 2005, the Ministry of Communications specifically formulated the "Outline of Modern Highway and Waterway Traffic Planning of Yangtze River Delta". The outline points out that: highway network of Yangtze River Delta will have formed a "half-day traffic circle" covering the whole Yangtze River delta with Shanghai being the center by 2020. The introduction of the planning will help to achieve the convergence and cooperation of inter-provincial highway and waterway infrastructure in such aspects as spatial distribution, construction sequence and function of the facilities, which is conducive to promoting the integration of transportation management and logistics of Yangtze River Delta.

Secondly, accelerate the construction of seven state level comprehensive transport hubs. According to the planning outline formulated by the Ministry of Communications in March 2005, Yangtze River Delta will plan and construct seven state level comprehensive transport hubs in Shanghai, Nanjing, Hangzhou, Ningbo, Wenzhou, Xuzhou and Lianyungang. Shanghai, Nanjing, Ningbo, Wenzhou and Lianyungang are coastal comprehensive transport hubs that play important supporting and driving roles in opening to the outside world in the area of upper reaches in the Yangtze River; Hangzhou and Xuzhou are inland comprehensive transport hubs which are located at the junction of main roads, inland main channels and railway main lines. They are the cargo and passenger distributing centers in the inland areas. The construction of state level comprehensive transport hubs of Shanghai mainly "focus on the function of international shipping", which highlights the development of international container transport, speeds up the construction of large specialized container terminals of Yangshan port and Waigaoqiao port, and road, railway, inland collection and distribution channels, and develops modern logistics park supported by port stations. Highways connect the major ports and are interconnected with the highways of other provinces and cities. Nanjing constructs its state level comprehensive transport hub with Jianghai transshipment port being the core radiating the surrounding areas and

areas along the Yangtze River. It will develop in the future bulk commodity transfer and container branch line port, and achieve accessible 50,000 ton ships through navigation channel regulation; highways will connect the major ports. Hangzhou focuses on building inland comprehensive transport hub that radiates to Zhejiang and connects Shanghai and Jiangsu, and consummating the main channels smoothly linked with Shanghai, Nanjing and Ningbo, speeding up inland port construction and navigation channel regulation, and forming a container shipping channel to Shanghai. Ningbo plans and constructs multi-functional comprehensive transport hub. It is responsible for container transport of Shanghai international shipping and has shared responsibility with Zhoushan for transfer transport at the estuary of Yangtze River Delta.

Thirdly, actively develop the logistics equipment industry. The mechanization and automation degree of logistics operation in Yangtze River Delta is not high, which has a close bearing on the backwardness of logistics equipment industry in Yangtze River Delta. From a point of view in the scope of the world, in countries with rapid development of modern logistics industry, the logistics equipment manufacturing industry started early, and the development is relatively mature. A group of logistics equipment manufacturing enterprises in Europe, United States and Japan have had considerable level in both size and output value. They manage to use advanced vehicles in the equipment of logistics industry, realizing transport specialization, network and automation, and effective convergence of various means of transport. The transformation of storage facilities should be speeded up. Use modern logistics technologies such as automatic three-dimensional storehouse, automatic sorting device and uniform pallet and container, to improve storage efficiency, and gradually realize mechanization of loading and unloading, warehouse automation, distribution integration, packaging standardization and information management network etc., which can lay a firm foundation for logistics integration of Yangtze River Delta.

6.1.2. Integration of Logistics Information Network

The construction of logistics information network is mainly to conduct real-time tracking, effective control and integrative management of every step of logistics through information technologies such as internet, management information system and data exchange, to achieve resource sharing between logistics enterprises and customers. As shown in Fig. 12:

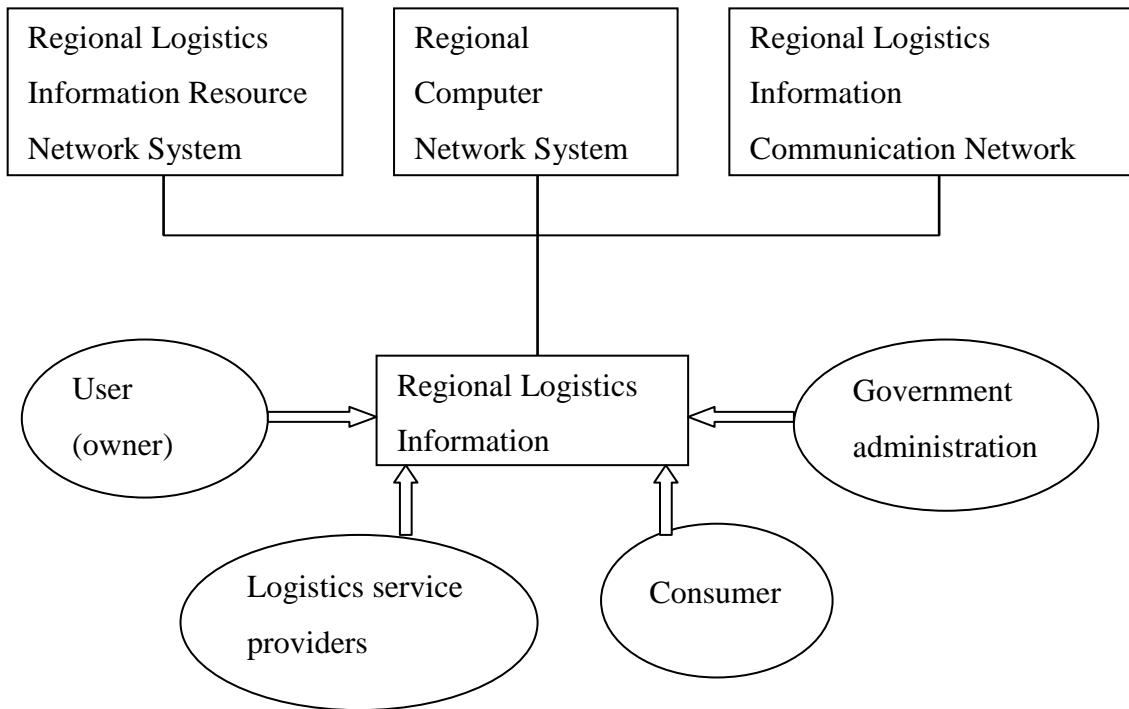


Fig. 12: Regional Logistics Information Network

Resource: Liu Hui (2008)

On the basis of Liu Hui (2008), regional logistics information network system is the integration of various regional logistics entities and core competitiveness of resources, mainly including three subsystems of regional logistics information resources network system (various logistics information bases and information application system achieve operation on the network, so that the information subsystems such as transport, storage and processing converge into the whole regional logistics information network system in order to achieve regional logistics information resource sharing), regional logistics information communication network system (to establish high-speed public communication network that can undertake the transmission and exchange of logistics information) and regional computer network system (interconnect computers located in different places and particular peripheral equipment communication lines, to form a large and powerful network system). Through the optimization and integration of system resources, it provides a carrier of information exchange and sharing for regional logistics network, which meets the market demand of regional logistics and achieve the optimal operation of regional logistics network system.

The construction of logistics information network in Yangtze River Delta is to establish efficient logistics information platforms between cities, and achieve logistics

information management in every city, so as to reasonably allocate the logistics resources to promote the combination of information network and physical distribution network. Specific measures include: Firstly, accelerate the information network construction in the field of logistics. Adopt the ways of government promotion and market operation to invest in the construction of logistics information superhighway in Yangtze River Delta. Apply logistics technology with digital technology and network technology, to promote EDI project construction; Establish transport and communication service system in Yangtze River Delta, use advanced coding, modulation and TDMA (time division multiple address) technologies, and integrate modern mobile communication, computer network and digital communication technology to interconnect with intelligent application system. Secondly, promote logistics commercialized transformation and build a group of large networking logistics enterprises. First of all, internal networks of logistics enterprises should be built, which make use of electronic data interchange technology and internet to speed up the information transformation of logistics enterprises themselves, and achieve the information management of all processes from commodity ordering, production and sales to after-sales service. Another is that, achieve digitalization and network construction of logistics enterprise for external links. Form a relatively perfect logistics network in Yangtze River Delta through making partnership with foreign logistics enterprises, and achieve seamless connection with global logistics network. Make use of internet-based information platform to conduct real-time management, so as to provide global integration logistics solutions to enterprises and e-commerce web sites from logistics system planning, consulting, and integration to third-party logistics services.

6.1.3. Integration of Logistics Park

The logistics park in Yangtze River Delta should consider regional coordination layout. Logistics park should have sufficient influence and radiation on each economic sector within the scope of its services, so that the sectors within the economic region can hold together and connect with each other through the service function of logistics park, so as to make logistics activities efficient and convenient. Each of the logistics parks should have reasonable division of work, scientific orientation and balanced distribution within the economic region, according to the principle that regional logistics demand

should be in accordance with production and consumption ability, to ensure the radiation and influence sphere of adjacent logistics parks do not overlap and cross. The logistics parks of Yangtze River Delta should compete with each other in cooperation, build multi-level logistics park system, and establish appropriate linkages based on the standard of business correlation of logistics parks and business volume planning, so as to form multi-level logistics park network. While producing network effect, they can obtain their own development space. The gradient principle should be embodied in aspects of function positioning and scale. A typical gradient division is shown as Fig.13.

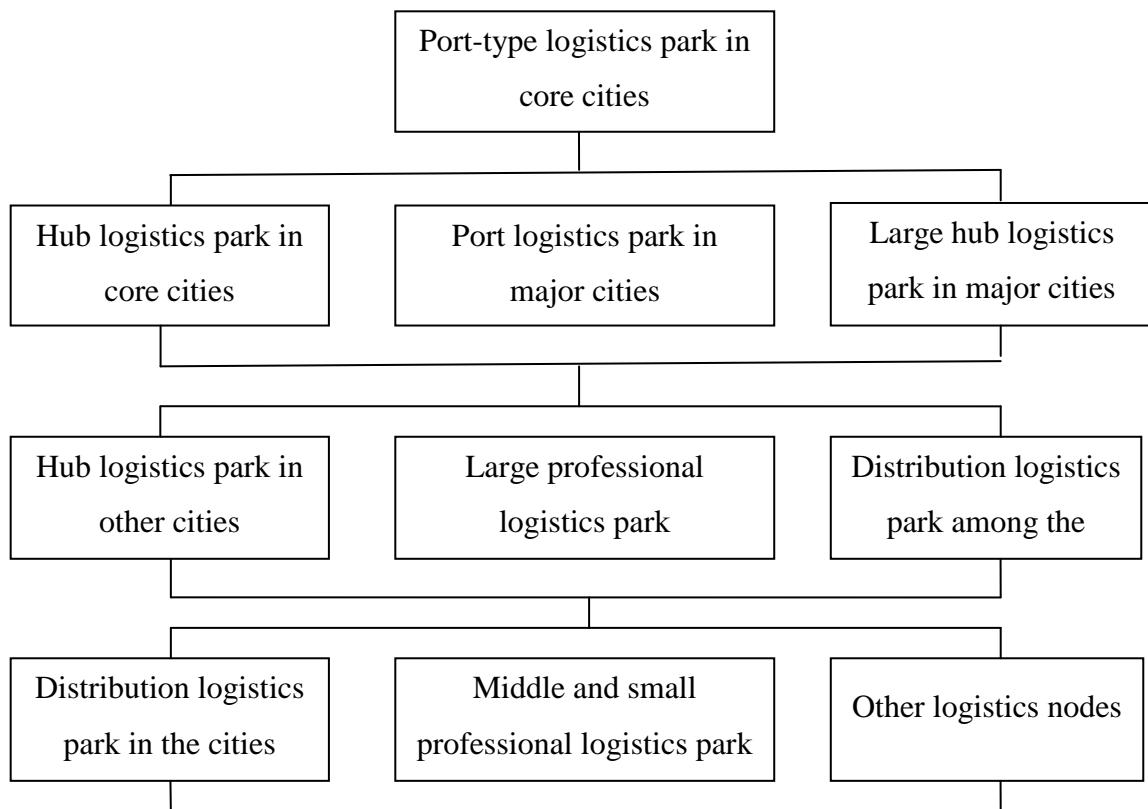


Fig. 13: A typical gradient division of integrated logistics park planning (Four gradients division)

Resource: Peng Rengui (2008)

According to the gradient division principle shown above, the logistics park under planning and construction in Yangtze River Delta can make a rough gradient division: the international logistics park of Shanghai - Waigaoqiao logistics park and Pudong airport logistics park, as the first logistics gradient groups of Yangtze River Delta;

Northwest logistics park of Shanghai, Longtan port logistics park and Lukou airport logistics park of Nanjing, Ningbo Beilun logistics main park, Hangzhou canal modern logistics park and Suzhou logistics park are the second logistics gradient groups; Other types of logistics parks through the integration can be classified respectively as the third and fourth logistics gradient groups, thus forming a level-clear and positioning-accurate development mode of logistics park integration of Yangtze River Delta with Shanghai as the leader, Nanjing and Suzhou as the north limb, and Hangzhou and Ningbo as the south limb (Chen Junjie, 2007).

On the basis of service object and scope of the logistics park, focus on creating the overall functional features, and highlight the specialization service capabilities. According to the industrial characteristics of park relying on economic hinterland, decide on the target market and pay attention to the coordination with neighboring cities, and try to achieve staggered development. On the whole, logistics parks of different gradient assume different functions: the first gradient serves the whole world; the second gradient serves Yangtze River Delta; the third gradient serves various cities. Logistics parks of the same gradient should highlight their characteristic orientation; logistics park at the third gradient should focus on the development of professional logistics that provides certain industry with comprehensive and professional logistics services.

6.2. Improvement of Logistics Development Environment

6.2.1. Specify Government Functions and Solve System Obstacles

In the process of promoting logistics integration of Yangtze River Delta, barriers such as the existing sector monopolies should be addressed. Improve the logistics development environment, and clarify the functions of the government. Sheng Kunrong (2010) pointed out that the government should do something in the following aspects: Promote the interface of logistics planning in Yangtze River Delta. Although various regions of Yangtze River Delta have their own logistics development plans, but to avoid each region going its own way and redundant development, the regional governments need to communicate and coordinate with division of labor, particularly in the planning and interface of logistics infrastructure. The government should fully consider the needs of regional economic cooperation, systematically make rational planning of regional logistics network, and make effective convergence of sea, land and

air transport facility channels to form an integrative transport system; Also, integrate important nodes of logistics network, including port and logistics park, so as to form a logistics node system within the region with reasonable layout and clear divisions. In addition to road traffic, logistics park and other hardware infrastructure, the government should conduct construction of appropriate software facilities, such as interface of logistics policies and regulations, and cooperation mechanisms between different governments and departments, to promote logistics integration of Yangtze River Delta. Promote the interface of logistics policies and regulations and create system unified environment. Government needs to provide basic institutional environment for logistics integration of Yangtze River Delta. It must first set up a unified logistics management organization, specializing in research, development and coordination of logistics development policies. Make rational adjustment of industrial structure, and improve the government planning and forecasting function and coordination efficiency. The government should formulate unified management system in accordance with the requirements of logistics development, to standardize the logistics market with unified legislations. In addition, actively implement logistics standardization and promote the standardization of logistics system.

Generally speaking, the government is the exponent and promoter of logistics integration of Yangtze River Delta. In the regional logistics integration process, local governments need to strengthen coordination and cooperation to address the bottlenecks in the joint development of regional logistics, and provide a good development environment to the subject of the logistics market.

6.2.2. Formulate Logistics Standard System

Logistics standardization is the basis for the integration of logistics and premise to achieve efficient and economical logistics system. The logistics standards are not unified, which has become a major obstacle to restrict the standardization and efficient development of Yangtze River Delta and its integration with the world. Therefore, it must accelerate the process of logistics standardization. At present, the main work is to establish and improve logistics organization for standardization and coordination responsible for unifying logistics standardization.

At present, Yangtze River Delta requires to conduct the logistics standard system construction from two levels of both hardware and software (Wang Haiping, 2010). Hardware standard means the standard of relevant tools in the process of logistics

operation, the standard of convergence from one operational procedure to another, specification and construction standards of logistics warehouse, yard and shelf, and configuration standards of information system hardware and so on. Software standard means the standard of code and file format of logistics information system and logistics management and operation standards. On the one hand, basic work should be done well in aspects of logistics terms, measurement standards, logistics operations and service standards; on the other hand, strengthen the coordination and organization of standardization work, and study in depth a variety of logistics industry standards enacted by the country; revise and improve the logistics facility standards with stronger commonality such as standards of the pallets, containers, various kinds of logistics handling, loading and unloading facilities and bar codes to make the standards of various techniques coordinate and harmonize with each other.

Pay attention to the development trend of international logistics standards, to make domestic standards gradually identical with international ones. Unified standard is very important to make best international logistics flow. International standardization organizations and some Europe and America formulate and implement a series of general international logistics standards in order to promote the development of international logistics. The government of Yangtze River Delta should try its best to adopt international standards in promoting and facilitating the process of building the logistics standardization system, which can not only speed up the construction of logistics standardization in Yangtze River Delta, but is also an effective means to keep in line with the international logistics standards.

6.3. Market Integration of Logistics Enterprises

Enterprise self-manage logistics integration based on the concept of supply chain is an important means of logistics integration in Yangtze River Delta. With economic development, enterprises must meet the competitive situation, develop in group with upstream and downstream enterprises, and participate in supply chain management. Wang Jun (2009) suggested that different types of enterprises within the region should be integrated into a supply chain, completing at the same time from raw material procurement, processing and producing of semi-finished and finished products, to products supply and sales, and constantly enhance the management consciousness of supply chain. The larger groups participate in it, the higher is the circulation efficiency, the lower the circulation cost, and the stronger the enterprise competitiveness will be.

From this perspective, the integration of logistics enterprises based on the supply chain concept supports cross-regional flow of the resources, and promotes the logistics integration of Yangtze River Delta in microcosmic aspects.

Xie Yanbo (2010) proposed that the manufacturing enterprises of Yangtze River Delta should make partnership with logistics enterprises by adopting the form of logistics alliance, and implement logistics outsourcing, which can not only help use advantageous resources of the other party, but will also not lose control of the original core business. After establishing strategic alliances, the third-party logistics enterprises will provide customers with integrative services covering goods storage, sorting, distribution, processing, packaging, order processing, inventory management and information processing in accordance with the needs of the partners, while the manufacturing enterprises will focus on their core businesses. Meanwhile, if the third-party logistics enterprises pursue the road of localization development, they must carry out the optimization and reorganization of their existing resources, and expand the scale of operation. They can reduce costs and improve service quality by controlling entity resources such as storage facilities and vehicles; they can also merge and conglomerate small-scale logistics enterprises of the same or similar types, which can increase industry concentration, and bring economy of scale effect. Enterprise logistics outsourcing and the optimization and reorganization of third-party logistics enterprises will be important means to promote the logistics integration of Yangtze River Delta.

7. Countermeasures and Suggestions

7.1. Optimize Regional Logistics Network

Integrate resources and optimize regional logistics network. Under the conditions of existing transport infrastructure, continue to optimize the construction of logistics transport network of port, road and railway. In particular, strive to achieve break-free transport within the region, accelerate port cluster integration of Yangtze River Delta, and actively enhance the transport capacity of the port; focus on the development of railway transport capacity between regions; strengthen transverse connection of the roads within the region, and reduce the costs of inter-regional goods lateral transport. In addition, logistics management departments, municipal construction and traffic management departments should cooperate with each other and accelerate the development of regional logistics with resource integration as the breakthrough.

Implement diversified modes of transport and highlight the advantages of water transportation (Yang Hanyi, 2010). With the advantage of navigation channels at the estuary of Yangtze River Delta and many excellent harbors, focus on the development of diversified means of transport such as container sea-and-rail coordinated transport and inland container transport, and highlight the water transport advantages of Yangtze River Delta, while taking advantages of other means of transportation, and strengthening effective link between various means of transport. In short, integrate customer resources within the region, transport resources, storage resources and information resources, implement diversified means of transport, and make them compete and collaborate with each other, and form a transport system of balanced freight, so as to improve the overall efficiency of transport.

7.2. Strengthen the Position and Role of Logistics Industry Associations

Give active play to the role of bridge and link of logistics industry associations, such as contact and exchange and formulation of industry standards (Huang Hu, 2008).

Promote communication and cooperation within the logistics industry through holding seminars and organizing special research activities; reflect industry requirements, and actively seek government support for the development of the logistics industry by establishing communication channels with local governments of Yangtze River Delta; provide environment for the logistics integration of Yangtze River Delta by participating in or formulating the basic and universal standards of logistics

infrastructure and equipment, the implementation standards of safety and environment, and the standards of logistics operations and service terms; actively promote the market integration of third-party logistics enterprises by collecting industry information, forecasting industry market outlook, centralizing transaction publicity, and restricting vicious competition within the industry. In short, actively promote the logistics integration of various fields in Yangtze River Delta by giving full play to the different functional roles of intermediary organizations such as industry associations.

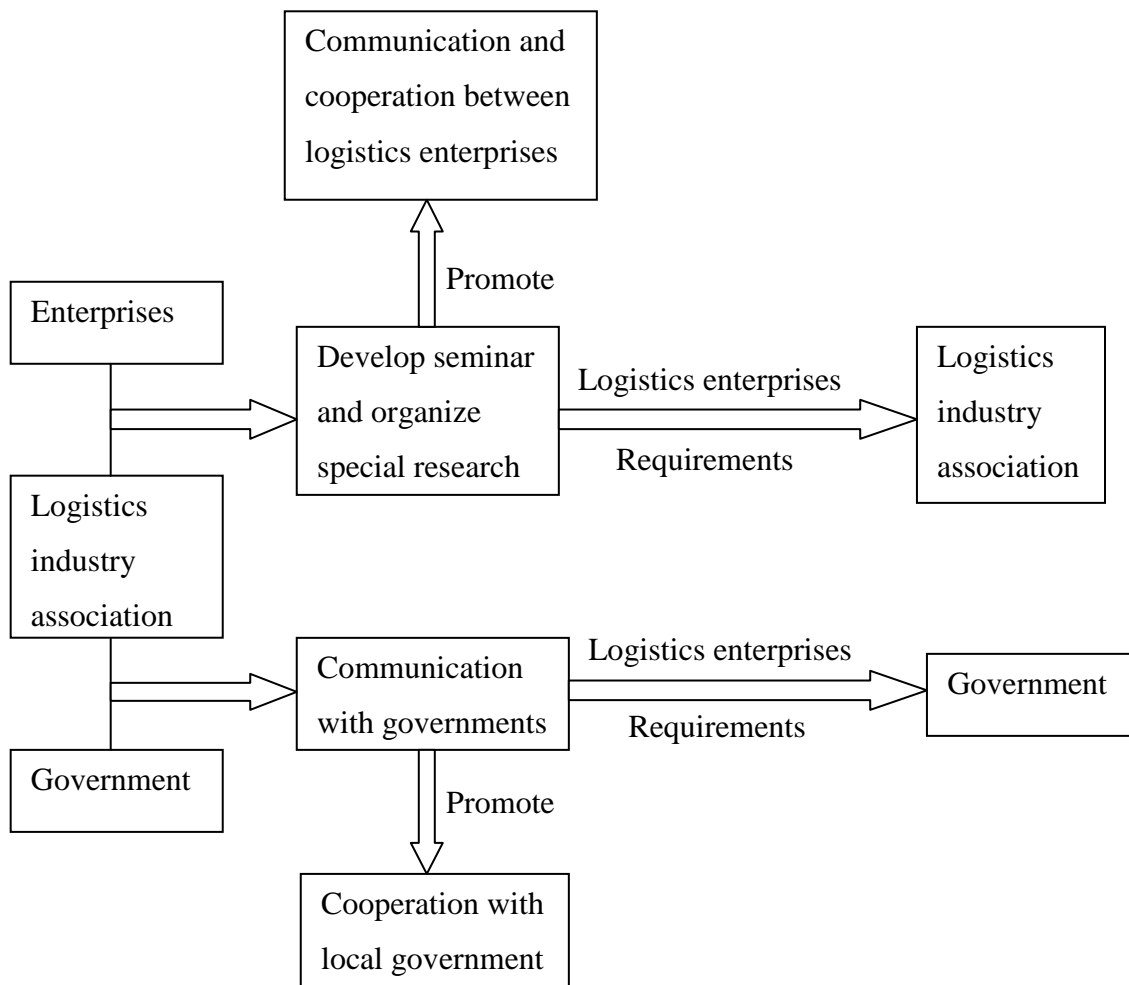


Fig. 14: The role of logistics industry association

Resource: Xie Yanbo (2010)

7.3. Train Logistics Talents

Ding Jun (2009) proposed that the key of developing logistics industry is to have an excellent logistics management team. One important reason for the rapid development

of logistics enterprises in Europe, America, Japan and other developed countries is that these countries attach great importance to talent education. Logistics practitioners in many countries must accept vocational education, and can only engage in logistics work after obtaining professional qualifications. Market competition is actually competition of talents. Lack of talents also leads to the lack of innovation and development momentum. Yangtze River Delta can implement the three-dimensional and multi-system logistics talent training pattern.

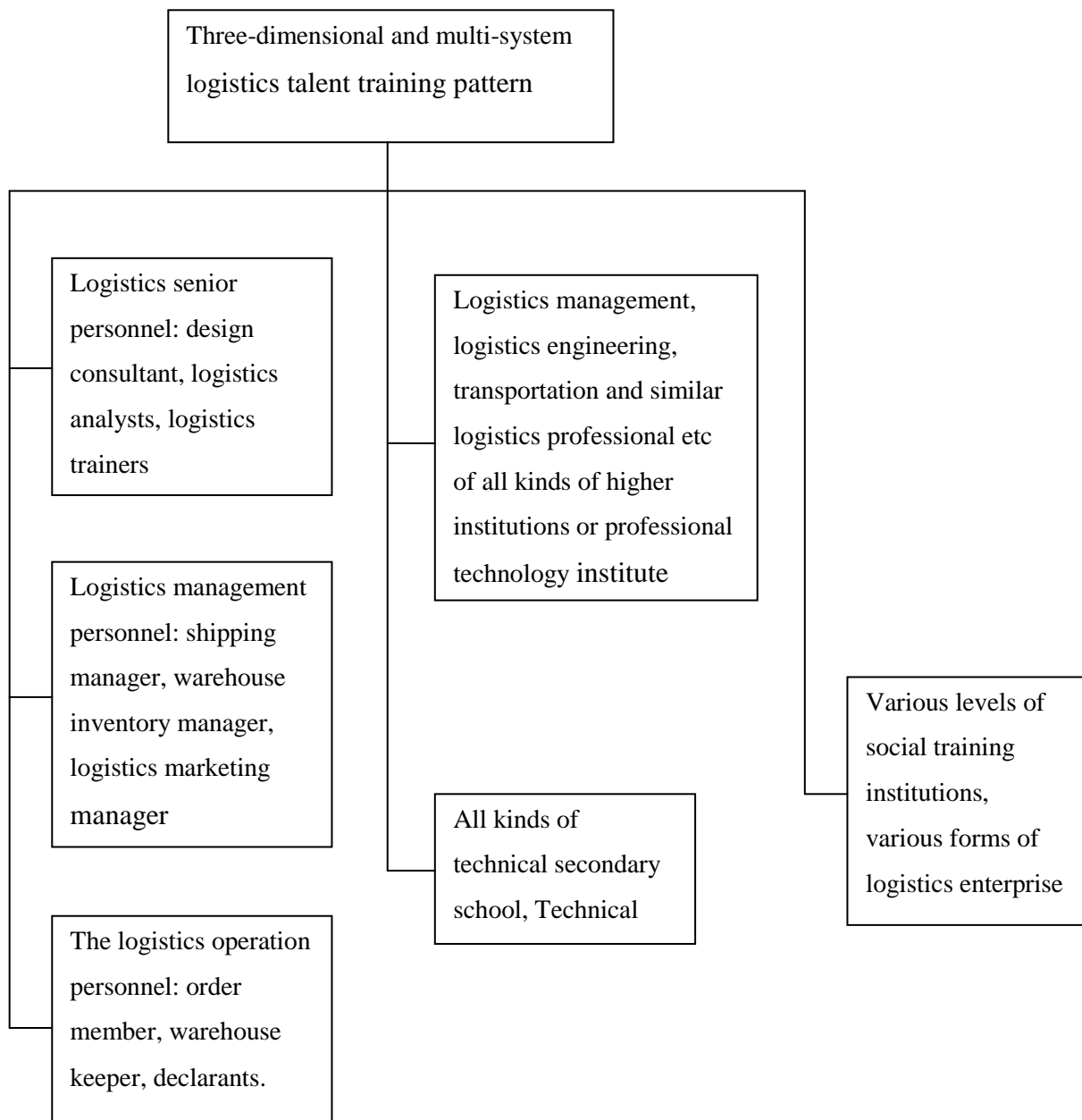


Fig. 15: Three-dimensional and multi-system logistics talent training pattern

Resource: Zhang Xiaoyan (2008)

8. Conclusion

Modern logistics industry in China is still in its infancy and growing phase. It is of great significance to develop modern logistics for the promotion of national and local economic development. The logistics integration of Yangtze River Delta is to integrate the existing logistics resources of the region, which is not only the need of the development of the logistics industry itself, but also a necessary requirement of regional economic integration. At the same time, it can help to enhance the overall strength and international competitiveness of Yangtze River Delta, and promote comprehensive, coordinated and sustainable development of regional economy of Yangtze River Delta.

Based on the relative theories of regional economy and logistics, the paper first analyzes the status of logistics development of the cities in Yangtze River Delta. Then it analyzes the logistics market of Yangtze River Delta, predicts the growth of GDP, freight ton-kilometers and freight traffic by exponential smoothing method and regression analysis, and analyzes the scale of logistics demands in Yangtze River Delta; then, the paper points out the problems that hold back the logistics integration development of Yangtze River Delta: Due to the lack of a unified logistics planning, the cities of Yangtze River Delta all proceed from their own interests, so the spatial distribution and network system construction of logistics industry lack coordination.

Almost every city has its own independent logistics development plan and a number of logistics bases and logistics centers, many logistics parks are built without considering the logistics needs of the region, resulting in artificial chaos and duplicate constructions with vicious competitions between each other. The existing logistics resources in Yangtze River Delta are large in scale, but are not used effectively, and there are many other problems like imperfect logistics network, unsound development environment of logistics, and low socialization and specialization of logistics enterprises. Finally, based on the analysis presented above, the paper presents some developmental countermeasures for logistics integration of Yangtze River Delta, and points out that Yangtze River Delta should accelerate the pace of construction of logistics parks, integrate the existing logistics resources and build modern logistics base platform, information platform and policy platform through promoting the abutting joint of logistics planning, clearance, information and policies and regulations within the region. Yangtze River Delta should also nurture and establish large modern third-party logistics groups, enhance the level of core talents training of regional logistics, promote the

complementary sharing of resources within the region, and enhance the overall strength and international competitiveness through strengthening corporate restructuring, so as to provide strong logistics support for regional economic development and promote comprehensive, coordinated and sustainable development of the regional economy.

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