

World Maritime University

# The Maritime Commons: Digital Repository of the World Maritime University

---

World Maritime University Dissertations

Dissertations

---

8-22-2015

## Research on the logistics development of Dalian port and how to develop Dalian harbor city based on Dalian port

Yichen Shi

Follow this and additional works at: [https://commons.wmu.se/all\\_dissertations](https://commons.wmu.se/all_dissertations)



Part of the [Economic Policy Commons](#), [Regional Economics Commons](#), [Strategic Management Policy Commons](#), and the [Transportation Commons](#)

---

This Dissertation is brought to you courtesy of Maritime Commons. Open Access items may be downloaded for non-commercial, fair use academic purposes. No items may be hosted on another server or web site without express written permission from the World Maritime University. For more information, please contact [library@wmu.se](mailto:library@wmu.se).

**WORLD MARITIME UNIVERSITY**

**Shanghai, China**

**Research on the logistics development of Dalian port  
and how to develop Dalian harbor city based on  
Dalian port**

By

**Shi Yichen**

**China**

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

**MASTER OF SCIENCE**

**(INTERNATIONAL TRANSPORTATION AND LOGISTICS)**

**2015**

### **FORMAT OF THE DECLARATON**

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

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

(Signature): Shi Yichen

(Date): 2015 7 1

# **Abstract**

With the global transportation services enter the era of integrated logistics, profound changes have taken place in the social and economic development. Port is a link in the global transportation network and its function changes from loading, unloading, warehousing to the integrated logistics center. It is a trend to develop logistics services in ports.

Port has the effect on the development of the city economy, the industry, the infrastructure construction and the social, so port can promote the development of the city. City can support the port on resource, economy and policy, so city can promote the development of the port. In a word, it is a win-win strategy to develop Dalian harbor city.

**Key word: link, logistics service, Dalian harbor city**

## LIST OF TABLES:

Table 1 Economic Index of Three Provinces in the Northeast of China (Source: National Bureau of Statistics of China) .....	10
Table 2 Product Yield of Industry and Agriculture in Northeast China Region (Source: National Bureau of Statistics of China) .....	11
Table 3 Transportation demand in Dalian (10 thousand tons) (Source: National Bureau of Statistics of China) .....	15
Table 4 $R^2$ .....	19
Table 5 The regression of transportation demand of Goods in Dalian (10 thousand tons) ..	21
Table 6 Logistics volume and proportion of Dalian port (Source: National Bureau of Statistics of China) .....	22
Table 7 Forecast of freight volume and proportion .....	24
Table 8 GDP, port throughput and container throughput (Source: Clarkson and National Bureau of Statistics of China) .....	31
Table 9 Regression analysis result comparison .....	33

## LIST OF FIGURES:

Figure 1 Proportion of transportation demand of Dalian from 2000 to 2014.....	16
Figure 2 Variance analysis .....	19
Figure 3 Regression analysis in EXCEL .....	21
Figure 4 Forecast of logistics volume .....	23
Figure 5 Forecast of proportion .....	23
Figure 6 GDP and port throughput situation .....	32
Figure 7 GDP and container throughput situation .....	33

## CATALOGUE

<b>1.Introduction .....</b>	<b>1</b>
<b>1.1 Background of Dalian port .....</b>	<b>1</b>
<b>1.2 Literature review .....</b>	<b>1</b>
<b>1.3 The framework and content of the dissertation .....</b>	<b>5</b>
<b>2. The situation and development of Dalian port.....</b>	<b>6</b>
<b>2.1 The situation of Dalian port group.....</b>	<b>6</b>
<b>2.1.1 Dalian port development strategy and business strategy .....</b>	<b>6</b>
<b>2.1.2 The current situation of Dalian port .....</b>	<b>6</b>
<b>2.2 Existing problems .....</b>	<b>7</b>
<b>2.2.1 Main business need to be transformed .....</b>	<b>7</b>
<b>2.2.2 Lack of talents .....</b>	<b>7</b>
<b>2.2.3 Relative to the hardware facilities, soft power need to be strengthened.....</b>	<b>8</b>
<b>2.3 Development and transformation opportunities and threats .....</b>	<b>8</b>
<b>3. Analysis of logistics development trend in Dalian port .....</b>	<b>10</b>
<b>3.1 Regional economic and social development data .....</b>	<b>10</b>
<b>3.1.1 The data of social economy in northeast area .....</b>	<b>10</b>
<b>3.1.2 Industry data in the northeast of China .....</b>	<b>11</b>
<b>3.2 Analysis of the development environment of logistics industry nearby.....</b>	<b>12</b>
<b>3.2.1 The development of logistics industry in Northeast China .....</b>	<b>12</b>
<b>3.2.2 The current situation of the development of logistics industry in Dalian city .....</b>	<b>13</b>
<b>3.3 Analysis of the demand of logistics in Dalian city.....</b>	<b>14</b>
<b>3.3.1 Present situation of transportation demand in Dalian .....</b>	<b>14</b>
<b>3.3.2 The analysis of Dalian city freight traffic characteristics .....</b>	<b>16</b>
<b>3.4 Logistics demand forecast.....</b>	<b>18</b>
<b>3.4.1 The ideas and methods of forecast .....</b>	<b>18</b>
<b>3.4.2 Forecast of logistics volume of Dalian port.....</b>	<b>21</b>
<b>4. The analysis of Dalian port's logistics development strategy .....</b>	<b>25</b>
<b>4.1 Strategy plan .....</b>	<b>25</b>
<b>4.1.1 Promotion of port function .....</b>	<b>25</b>
<b>4.1.2 Establish a regional distribution center.....</b>	<b>26</b>
<b>4.1.3 Establish target customer base .....</b>	<b>26</b>
<b>4.1.4 Work closely with other ports .....</b>	<b>27</b>
<b>4.2 Suggestions .....</b>	<b>28</b>

4.2.1 The innovation of management and operation system .....	28
4.2.2 Cooperation with international partners.....	29
4.2.3 Introduce talents, optimize configuration .....	29
4.2.4 Support from the governments.....	30
5. Analysis on the relationship between economy and port throughput in Dalian .....	31
5.1 Overall situation .....	31
5.2 Regression analysis comparison .....	33
5.3 Summary .....	34
6. The strategy of develop Dalian harbor city .....	35
6.1 The usual solutions to the problems of the port city relationship .....	35
6.1.1 Plan coast line.....	35
6.1.2 Strengthen environmental protection, energy saving, safety awareness .....	36
6.1.3 Improve the comprehensive competitiveness of ports .....	36
6.1.4 Improve management level .....	37
6.1.5 Solve the remove problems .....	37
6.1.6 Improve the investment and financing system.....	37
6.1.7 Strengthen port emergency system .....	38
6.2 Strategy plan .....	38
6.2.1 Develop coastline at the north of Bohai sea side .....	38
6.2.2 Reasonable planning of port construction.....	39
6.2.3 Push forward the dangerous goods in port construction steadily .....	39
6.2.4 Speed up the construction of the logistics system in the city .....	39
6.3 Summary .....	40
7. Conclusion .....	41

## **1.Introduction**

### **1.1 Background of Dalian port**

Dalian port was founded in 1899 and Dalian port group Co., Ltd was established in April 2003, which is one of the biggest enterprises in Dalian. In 2013, Dalian port group had 333.4 million tons throughput, increasing 10.1% and had 9.91 million TEU throughput, increasing 23.8%. Facing the downturn of global shipping market and the complex economic situation, Dalian port has developed container liner service with COSCO, China shipping, Maersk, CMA CGM and other more than 50 domestic and foreign shipping companies and container liner routes has reached 105. The route network covers Europe, Mediterranean and other major trade area in the world and it realize “full coverage”.

Ports used to focus on the throughput and people think that throughput is the main index to judge whether the port is big or small, advanced or backward. Now, throughput is not the most important index to ports. The modern port is becoming the fourth generation port which function is environmental protection, smart, livable port community. At present, Dalian port industry overcapacity, the homogenization of competition is obviously, the increase of throughput will be difficult to continue to judge the port, so structure optimization, integration of resources, intensive type development etc. will become the inevitable choice of port development and transformation.

### **1.2 Literature review**

Both scientists in China and abroad have done quite a lot of research on transformation and development of China’s ports to make them more optimized.

First, research on transformation and development is abundant.

Wang Hui, Luan Weixin, Du Linan[10] has talked about the new features of Dalian port in her paper. She has analyzed that Dalian port doesn't only focus on the throughput but deep water channel, new port area, LNG port, capacity structure, the overall service level and so on. In her paper, ports need to further improve the infrastructure and equipment, efficiency and service level to adapt to the large scale and the needs of the new route adjustment of the ships. In addition, the essay analyzes the relationship between port throughput and economy.

Zhou Jun, Hou Jian[8] said that transformation is a new breakthrough of Dalian port. They thought modern port should become a set of transportation, storage, assembly, disassembly, product processing, urban transport and information processing.

Second, many scientists have given their opinions on how to develop a port.

He Qing[4] proposed a paper to say that Dalian port has developed to environmental protection, intelligent, livable symbiotic port community. Dalian port should improve port logistics services and the ports and the cities should be integrated.

Shi Yue[2] proposed his paper to give us a point that developing modern logistics is the inevitable choice of port production development. In his paper, he said that ports has its advantages to develop modern logistics because different kinds of goods will be delivered to the ports. Besides, ports also need to enhance service level.

Zen Fanping[7] has discussed that the starting point of Dalian port is transformation, innovation and cooperation. Development of port logistics is to improve the port service project and the ability of supply chain to realize rising in port operations by optimal allocation of resources.

Liu Biyu, Yang Haidong[6] thought the main feature of Dalian port now is to develop economic in the port and the harbor cities, and port enterprises provide

customers with different kinds of port logistics services.

Besides, Yan Zhao[9] proposed a paper to say that transformation is the main task of Dalian port and innovation is the key of transformation. In addition, transformation needs to be low carbon and environmental protection.

Xu ze, Li Hao[5] give opinions that ports should construct complementary integration system of port groups, transform the mode of resource utilization and maintenance regional security. And the development of harbor city interaction is also very important.

Chen Duanhai[3] thought the development of international logistics will provide ports a good industrial system and it can lead to functional transformation. Also, international logistics will develop the logistics of the ports.

Huang Xiaoke[1] thought the way for traditional ports to become modern ports is the port logistics. And modern ports have powerful modern logistics systems and can provide good services to the customers.

Haizhuang Wang[16] proposed a paper to show that Dalian port shipping network has high network density, and its degree distribution follows a power law.

Also, there are some researches which focus on the other factors of ports.

Chioma Jaja[20] proposed a paper to examine the port development in Nigeria focusing on the evolution of the seaports, the traffic they handle and factors of port development.

James J.Wang, Brian Slack[11] analyzed the case of the Yangtze River Delta, where the competition, co-operation and governance of Shanghai and Ningbo, the two largest ports on Chinese mainland, concern all stakeholders from the central and local governments of China to the container terminal operators and shipping lines overseas in their paper.

Anonymous[12] said that China's port expansion, asset integration is the development trend. In China, port is in an accelerated expansion phase. Now current

port capacity is hardly to meet the growth of China's economy and foreign trade. To solve this problem, resource integration is the trend of the development in port industry.

Mengying Feng, John Mangan, Chandra Lalwani[13] Proposed a paper. The purpose of this paper is to report a comparative investigation of port performance between Western Europe and Eastern Asia and develop a strategy to improve their port performance accordingly.

Kunyou Pan, Youhui Cao, Shuangbo Liang, Hongyan Wei[14] measured the spatial structure transformation of the Chinese container port system from the perspective of cargo flow in recent 13 years. It indicates that the spatial structure of container port system enters into "the challenge of the periphery" phase as a whole, the decentralization of container flow become the mainstream tendency of the spatial variation of China's container port system.

Claude Comtois's paper[15] analysed that China's port system is marked by four interrelated transformations: port privatization, port expansion, modification of transactional networks and the emergence of a new business environment. The paper concludes on the need to upgrade China's port development policies.

Chi-Iok Andrew Yuen, Anming Zhang, Waiman Cheung[17] explored the relative importance of factors that determine container port competitiveness from the users' perspective.

Taih-cherng Lim, Yen-Chun Jim Wu, Yenming J.Chen's paper[18] measures a port's green performance. The literature is reviewed and a survey is carried out to identify major green port performance indicators and to evaluate three major ports' overall green performance in Asia.

Yafang Su[19] Proposed a paper to applies multi-disciplinary theories, methods and geographic information system technology to study the investment environment for coastal port cities.

Ports in China become port groups initially nowadays, but the function of the port is unreasonable, and division of labor and development mode has not been formed, especially some port service function overlaps in some areas, which could leads to competition of ports in the area. This could be found in articles [21].

In Wang Hui, Luan Weixin, Du Linan's paper[10], large scale of ship, ship automation and low energy consumption of ship calls for higher requirements in port services. Can operation efficiency and service level adapt to the large scale and the needs of the new route adjustment of the ship? That's a question.

And at present, Dalian port construction need to be examined and approved by many formalities, including the national development and reform commission (NDRC) , land, sea, environmental protection, maritime departments and so on. The efficiency is relatively low. Liu Biyu, Yang Haidong [6] has talked about this problem in his article.

### **1.3 The framework and content of the dissertation**

In this essay, I introduce the situation of the ports and the existing problems of Dalian port first. Then, I analyze the economic and social development of Dalian city and have a goal to develop the logistics service and Dalian harbor city. Chapter 3 will analyze the demand of logistics in Dalian and chapter 4 will give the strategy plan and suggestion. Chapter 5 and 6 will discuss about Dalian harbor city and the relationship between Dalian port and Dalian city. Besides, this essay also gives some strategy plans to develop Dalian harbor city.

## **2. The situation and development of Dalian port**

### **2.1 The situation of Dalian port group**

Dalian port is under a big pressure due to the dense Liaoning coastal economic belt and regional sea ports. Traditional port logistics management model can't suit the competitive situation. Since 2012, Dalian port has made a new development strategy and business strategy which covers from industrial layout to logistics service system to speed up the pace of the reform and realize the transformation. So building a comprehensive logistics service system and develop Dalian harbor city is a way to expand the main business and realize service upgrade.

#### **2.1.1 Dalian port development strategy and business strategy**

Dalian port becomes from relying on the government to create the market, from pursuing quantity to quality, from pure competition to cooperation and win-win, from developing itself to developing the harbor city to become international shipping center in Northeast Asia.

In the business strategy, Dalian port focus on "one island two bay" port layout and build a port group which is based on cooperation and win-win. Also, Dalian port builds five major business segments which are port logistics, business services, port industry, port construction and finance. Besides, Dalian port builds logistics system service platform and the trade integration service platform. In the main business strategy, two service platforms and five major business segments should be integrated to form the whole comprehensive logistics service system.

#### **2.1.2 The current situation of Dalian port**

Dalian port has strengthened information technology to further strengthen the finance and business field besides its main business after the construction these years.

Relying on perfect logistics hardware, Dalian port formed a logistics integrated service system.

Because of the investment in recent years, the hardware of Dalian port becomes better. Dalian port only provided stevedoring services for customers before, but now it can provide services like transport, agent, sea and railway transport and other integrated logistics services. And what's more, Dalian port has strengthened the construction of information platform, expanded trade market services and gradually formed a whole comprehensive logistics service system with its own characteristics.

In the existing business expansion in Dalian port, it is to cooperate with other companies to provide customers with convenient logistics service and full logistics solutions.

## **2.2 Existing problems**

### **2.2.1 Main business need to be transformed**

The main business of Dalian port is to load and unload, storage and provide traditional logistics service. It has put too much emphasis on the growth of throughput. Although the growth of throughput has been realized, the value-added of the traditional services is not high and the growth of other aspects is not obvious. At the stage of port transformation and development, the transformation of the main business becomes the most important. On the basis of traditional business, Dalian port should change the strategy goal and break through the bottleneck of the development of the main business.

### **2.2.2 Lack of talents**

Dalian port proposed restructuring, diversified development two to three years ago. As a typical port logistics enterprise, Dalian port lacks its professional personnel team. Dalian port should cultivate and train its crews, or introduce talents to realize the sustainable development of the new strategy.

### **2.2.3 Relative to the hardware facilities, soft power need to be strengthened**

The hardware facilities of Dalian port can meet the need of the main business of Dalian port. But the soft power needs to be strengthened. Dalian port should accelerate the pace of development of the soft power to increase investment and expand the scope of business development.

## **2.3 Development and transformation opportunities and threats**

### **Opportunities:**

At present, the level of development of the logistics industry in Dalian is relatively low. A very important reason is the integration system of the logistics industry is not enough, and resource elements are relatively dispersed. Logistics links inefficiently, so the overall advantages of logistics systems has not been effectively reflected. If port builds an advanced logistics chain network system, it can have a new advantage in the development of emerging industries.

If Dalian port becomes the leader of the logistics chain network system in its area, it can seize the commanding height of China's modern logistics industry development and form a new development advantage.

The relationship between port and city is helpful to the development of port economy and other related industries in order to drive the development of the regional economy and promote trade between the city and foreign city.

**Threats:**

The competition of other ports and enterprises

If Dalian port has some advantages after it develops logistics and relationship between port and the city, other ports may copy the process and become strong contender.

### 3. Analysis of logistics development trend in Dalian port

#### 3.1 Regional economic and social development data

##### 3.1.1 The data of social economy in northeast area

Northeast area of China is one of the most important industrial bases of our country. Comparing with the area which develops very fast, northeast area of China develops relatively slow, which GDP and industrial added value has decreased from 15%~20% to 10%. In 2003, the Central Committee of China has issued a central file and then the economy of northeastern provinces has developed faster. In 2012, GDP and industrial added value of the three northeastern provinces become 5.0431 trillion and 2.3021 trillion respectively, accounted for 8.1% and 11.5% of the nation. The data of major economic index in northeast China are listed in the following table:

Table 1 Economic Index of Three Provinces in the Northeast of China (Source: National Bureau of Statistics of China)

Area Major index	Liaoning	Jilin	Heilongjiang	Northeast China
Land area (thousand km <sup>2</sup> )	148	187	789	
GDP (billion yuan)	24801	11938	13692	50431
Among: Primary industry (%)	8.7	11.8	15.4	
Secondary industry (%)	53.8	53.4	47.2	
Tertiary industry (%)	37.5	34.8	37.4	
Total industry added value (billion yuan)	12159	5257	5605.6	23021.6
Investment in fixed assets	21535	9462	9376	21469.5

(billion yuan)				
Total retail sales of social consumer goods (billion yuan)	10215	5253	6001.5	21469.5
Total amount of import and export trade (billion dollars)	1040	246	378	1664

### 3.1.2 Industry data in the northeast of China

Northeast China as an old industrial base, is a main raw material production and processing base in China, taking the heavy chemical industry, mainly. There are many advanced industries: the equipment manufacturing industry, automobile manufacturing, shipbuilding industry, agricultural product processing industry, metallurgy industry and oil chemical industry. The output of major industrial and agricultural products are listed in the following table:

Table 2 Product Yield of Industry and Agriculture in Northeast China Region (Source: National Bureau of Statistics of China)

Product name	Liaoning	Jilin	Heilongjiang	Northeast of China
Grain (thousand tons)	20710	333430	57600	411740
Crude oil (thousand tons)	10000	8100	40020	58120
The processing capacity of crude oil (thousand tons)	66030	9220	16770	92020
Ethylene (thousand tons)	870	830	540	2240
Raw coal (thousand tons)	64160	51900	92660	208720

Pig iron (thousand tons)	65650	8300	6670	80620
Crude steel (thousand tons)	62420	9920	7840	80180
Rolled steel (thousand tons)	59160	12300	6100	77560
Cars (thousand)	870	1980	100	2950

As shown in the above table, Liaoning Province is focus on equipment manufacturing industry, metallurgy, petrochemical and agricultural industry.

### **3.2 Analysis of the development environment of logistics industry nearby**

Port development mainly depends on the environment and logistics industry. The development of Dalian port mainly relies on the northeast of China and the integration of the logistics resources. The construction of perfect logistics system and logistics development environment will further strengthen the construction of logistics system of Dalian port.

#### **3.2.1 The development of logistics industry in Northeast China**

##### **(1) Professional logistics develops rapidly**

There are many raw materials in northeast China. Professional logistics has a big market, and grain, coal, timber and other traditional logistics market has a larger scale. Coal has been turnover 16.5 million tons and wood has been sold 50 million cubic meters through Tongliao Economic and Technological Development Zone. Jilin JiuTian Storage and Transportation and Jilin Petrochemical have cooperated for a long time. They have become well-known enterprises for transporting dangerous liquid.

## (2) The current situation of the development of logistics industry in Liaoning Province

Under a series of logistics industry development support, the logistics industry in Liaoning Province has developed very fast, and its logistics added value has accounted for about 20% of the GDP of the whole province. The transportation equipments are advanced and form a logistics and distributing system with combination of seaports, airlines, railways, highways and pipelines. The construction of logistics information has a initial scale. Besides, Logistics information service rises rapidly. GPS, EDI and other technologies has been used widely so the level of logistics management improves. Although the development of logistics industry in Liaoning Province has achieved remarkable results, it is still in initial stage and has many problems.

### **3.2.2 The current situation of the development of logistics industry in Dalian city**

Due to the construction of the shipping center, Dalian logistics industry has developed very fast. The throughput promotes and Dalian port has formed a international logistics system.

#### (1) Transition from traditional logistics to modern logistics

With the introduction of the new concept and technology in modern logistics, especially the construction of international shipping center and the promotion of ports, some large multinational logistics enterprises have entered Dalian, which bring Dalian most advanced business philosophy, experience in logistics management, international market and customer network. At the same time, the original traditional logistics enterprises have begun to use computer and network technology to achieve

the management of warehousing, distribution, transportation, procurement and other business, and speed up the cash flow in logistics. All these phenomenon solid the foundation of Dalian international logistics industry.

(2) Modern logistics facilities become mature

Through the investment in the hardware facilities, Dalian port has formed a relatively perfect port facilities and transportation system. The network to Japan, Korea and other countries are mature. And some logistics park has established with its own characteristics.

(3) The scope of international logistics expands

The logistics network has been established to connect with Shenyang, Changchun, Harbin, Tumen, Tongliao and other central cities. The business field expand from three provinces in northeast China to many other nearby provinces.

### **3.3 Analysis of the demand of logistics in Dalian city**

Dalian port logistics is the core part of the system of city logistics. Therefore, combined with the northeast regional economic and industrial situation, and then analysis fully the present demand situation of transportation of Dalian city to get the Dalian port logistics demand.

#### **3.3.1 Present situation of transportation demand in Dalian**

According to the transportation demand data of Dalian city and then investigate the data, the following table and figure can be made.

Table 3 Transportation demand in Dalian (10 thousand tons) (Source: National Bureau of Statistics of China)

Year	Total	Highway demand	Railway demand	Port demand	Airline demand	Pipeline demand
2000	26931	9969	4907	9699	7.63	2348
2001	28365	10311	4979	10519	8	2548
2002	30295	11206	5094	11188	9.34	2798
2003	32046	11213	5246	12602	9.51	2975
2004	35355	11937	5679	14516	9.25	3214
2005	39435	13042	5841	17085	9.91	3457
2006	43979	14256	6125	20046	10.9	3541
2007	48210	15762	6533	22286	12.2	3617
2008	53448	18525	6808	24588	12.94	3514
2009	61259	23402	7044	27203	12.58	3597
2010	70285	27734	7460	31399	14.06	3678
2011	77545	31739	8312	33691	13.79	3789
2012	84327	36563	8560	35211	15.42	3978
2013	91872	41354	8945	37541	16.54	4015
2014	100699	47651	9234	39647	18.96	4148

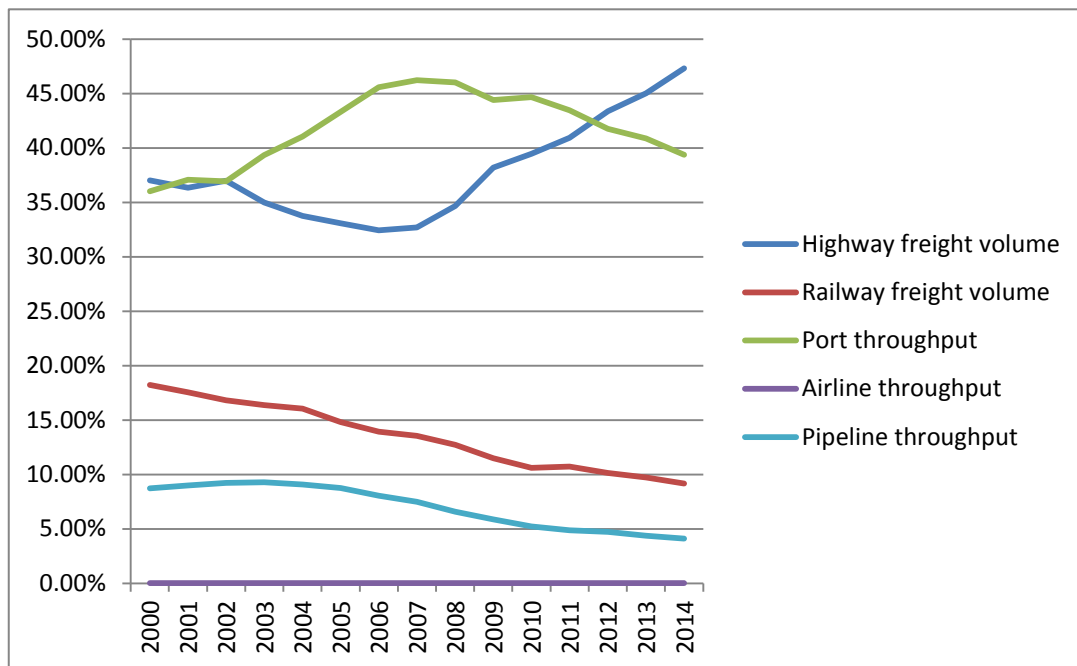


Figure 1 Proportion of transportation demand of Dalian from 2000 to 2014

### 3.3.2 The analysis of Dalian city freight traffic characteristics

After analyzing the freight transportation demand from 2000 to 2014, the overall transportation of goods demand has the following characteristics:

#### (1) The total freight transportation demand increased

From the point of view of the total, with the continuous increase of the development of the economy and the government investment of traffic infrastructure construction, the total freight transportation demand of Dalian city has increased. Especially since 2006, Dalian industrial and commercial industry and logistics industry shows a rapid development trend, which drive the growth of the freight

transportation demand. From 2007 to 2014, the average annual growth of the total rate up to 12%.

#### (2) Share of highway demand rise

With the rapid space of highway building, highway has its absolute advantage because of its flexible characteristics. From 2000 to 2014, the average annual growth rate of highway demand has reached more than 11%, and the transport share has remained in 32% to 47%. The development situation is good.

#### (3) Share of railway demand decrease

Dalian railway development is relatively stable. The average annual growth from 2000 to 2014 is 4.3%. In recent years, with the rapid development of highway freight and shipping industry, the share of railway demand has declined. But railway transportation is still very important in regional freight transportation because of its scale and unique.

#### (4) Port demand is dominant

From 2000 to 2014, port demand has a growth trend, increasing from 96.99 million tons in 2000 to more than 3.9 billion tons in 2014, which annual growth rate is up to 12% and the proportion in the whole transportation system are continuous increasing. Port demand has a good prospect because of its low cost, large amount and long distance.

#### (5) Airline demand grow steadily and the proportion is low

The proportion of airline transportation is low. From 2000 to 2014, the annual growth rate is about 5.5%. With the further development of the economy, the

demands of valuables, fresh goods and precision instruments etc. will increase and this will lead the increase in the air transportation.

(6) The pipeline transportation demand remain steadily

In recent years, the pipeline transportation demand remains steadily, but its share decreased year by year. With the rapid economic development and change of the energy structure, the pace of the construction of the pipeline infrastructure will accelerate.

### **3.4 Logistics demand forecast**

#### **3.4.1 The ideas and methods of forecast**

According to the analysis of the logistics demand due to the economic development, Dalian port will rely on the distribution and transportation from “one island two bay” port area. This prediction method will combine qualitative with quantitative methods. The logistics demand forecast in this essay includes local goods logistics demand forecast and logistics volume and proportion forecast of Dalian port.

The prediction method will be regression analysis in order to predict the logistics demand of Dalian port and Dalian city.

The data is used from table 3 and then the regression analysis is made in EXCEL.

The following figure is the result of regression analysis of Total demand. We can see that Significance F which is actually P value is smaller than 0.0001, so the

confidence level is larger than 99.99% and that means the regression analysis is significant and effective.

	df	SS	MS	F	Significance F
Regression analysis	1	8.12E+09	8.12E+09	260.0972784	5.62791E-10
Residual	13	4.06E+08	31203965		
Total	14	8.52E+09			

Figure 2 Variance analysis

Except Total demand, the regression results of other logistics demands is also significant and effective (Significant F is smaller than 0.0001). Here the variance analysis of other logistics demands is omitted.

When using the regression analysis in EXCEL, I compared with many trend regression analysis methods and choose one which  $R^2$  is closest to 1. The closer  $R^2$  is to 1, the more accurate the regression analysis is.

Table 4  $R^2$

$R^2$	Index	Linear	Logarithm	Quadratic polynomial
Total	0.9929	0.9524	0.952	0.9924
Highway	0.9559	0.8765	0.8759	0.9968
Railway	0.9879	0.9702	0.97	0.993
Port	0.9936	0.9816	0.9814	0.993
Airline	0.9622	0.9456	0.9453	0.9697
Pipeline	0.8823	0.9191	0.9195	0.9616

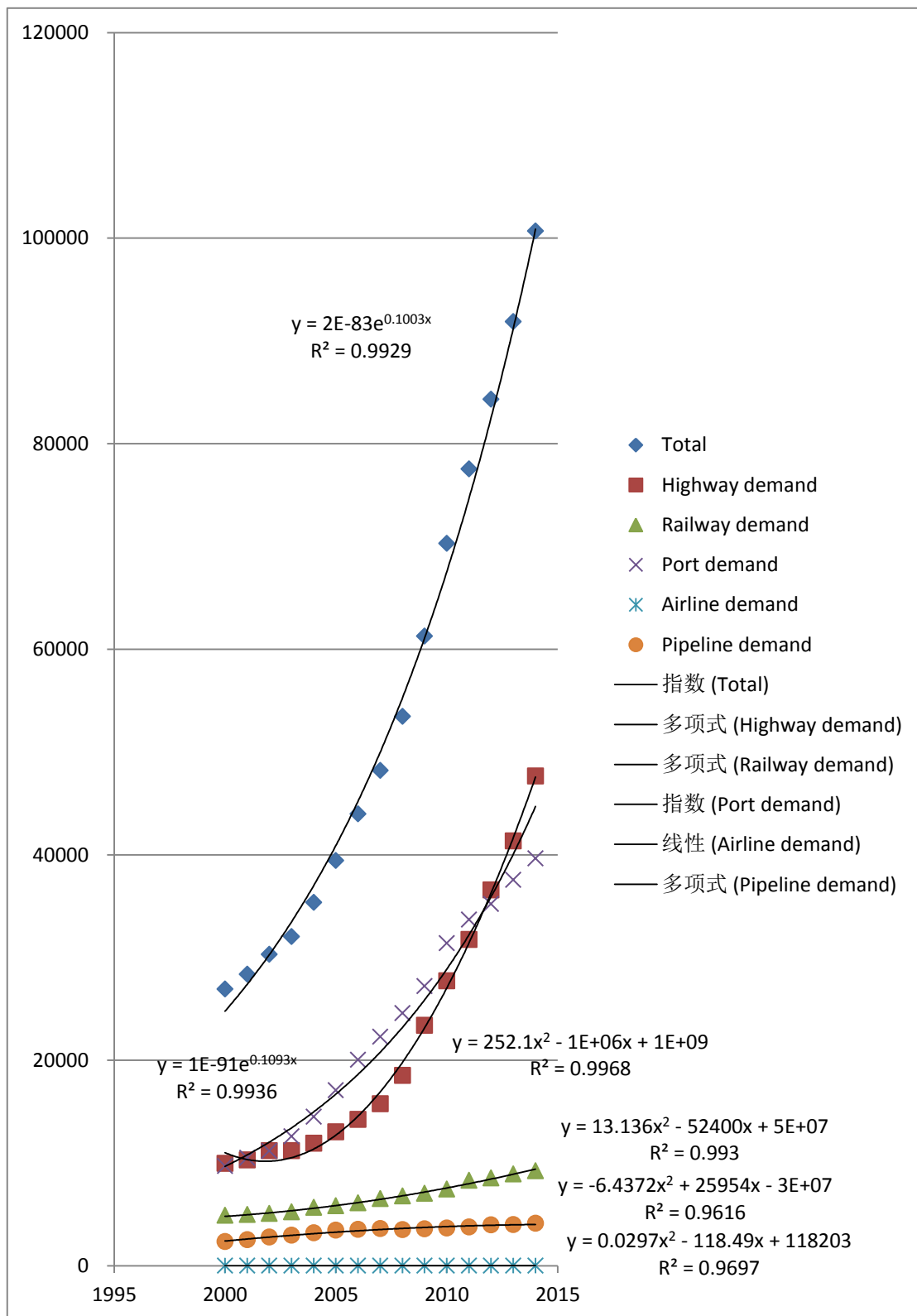


Figure 3 Regression analysis in EXCEL

And then the following forecast is made:

Table 5 The regression of transportation demand of Goods in Dalian (10 thousand tons)

Year	Total	Highway demand	Railway demand	Port demand	Airline demand	Pipeline demand
2016	122049	60871	10494	49901	18.62	4036
2017	134921	68273	11073	55665	19.33	4029
2018	149150	76178	11678	62094	20.05	4009
2019	164880	84588	12309	69266	20.76	3976
2020	182269	93503	12966	77266	21.48	3930
2021	201491	102921	13650	86190	22.19	3871
2022	222741	112844	14360	96145	22.9	3800
2023	246232	123270	15096	107250	23.62	3715
2024	272201	134201	15858	119637	24.33	3618
2025	300908	145636	16647	133456	25.05	3508

Note: Total transportation demand result is forecasted, not the sum of all transportation demands.

### 3.4.2 Forecast of logistics volume of Dalian port

Dalian port is the main freight transformation role in Dalian city, and the following table is the annual logistics volume of Dalian port:

Table 6 Logistics volume and proportion of Dalian port (Source: National Bureau of Statistics of China)

Year	Logistics volume of Dalian port (10 thousand tons)	Proportion
2000	9408	34.93%
2001	10203	35.97%
2002	10852	35.82%
2003	12224	38.14%
2004	14081	39.82%
2005	16572	42.02%
2006	19445	44.21%
2007	21617	44.84%
2008	23850	44.62%
2009	26387	43.07%
2010	30457	43.33%
2011	34336	44.28%
2012	37930	44.98%
2013	42068	45.79%
2014	47308	46.98%

According to the above data and combined with the service capacity of Dalian port, we can get the following forecast results:

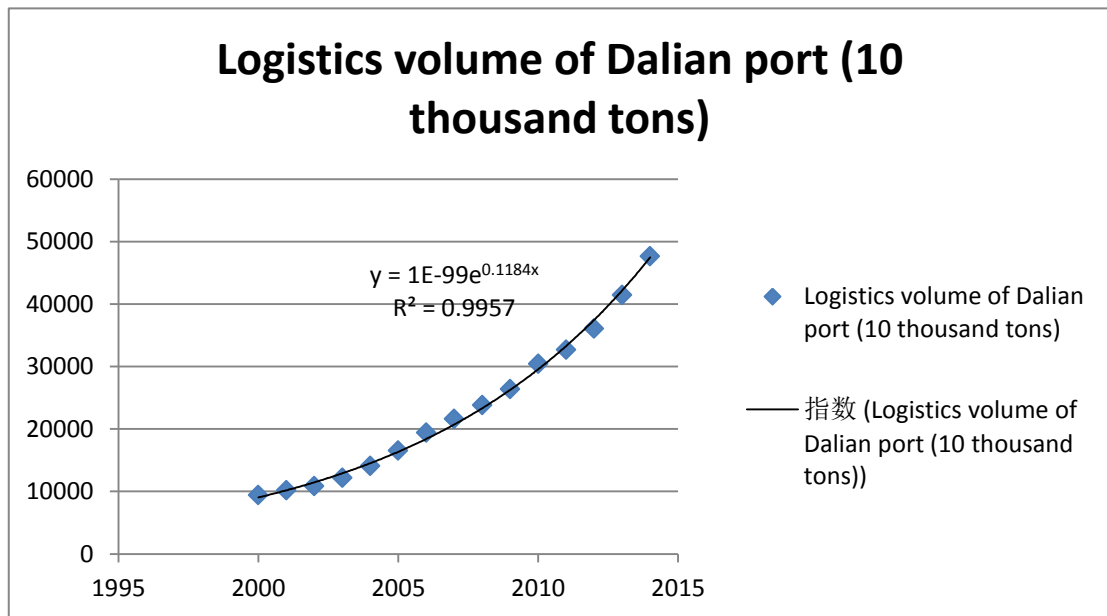


Figure 4 Forecast of logistics volume

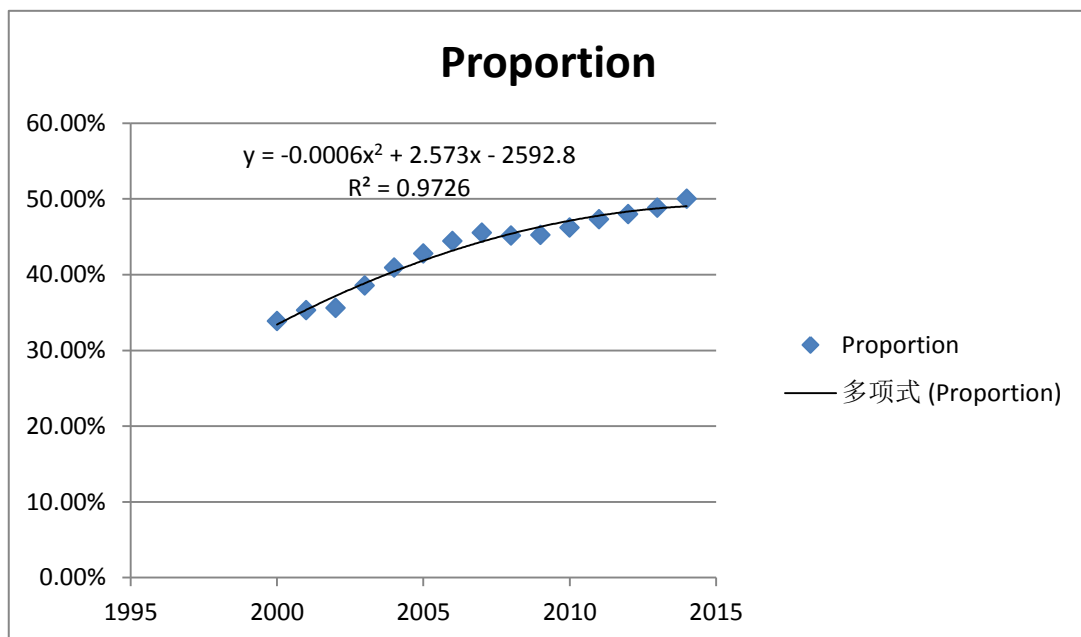


Figure 5 Forecast of proportion

Table 7 Forecast of freight volume and proportion

Year	Freight volume of Dalian port (10 thousand tons)	Proportion
2016	64851	51.48%
2017	71127	52.43%
2018	80107	53.37%
2019	90222	54.24%
2020	101613	55.14%
2021	114442	56.01%
2022	128891	56.81%
2023	145165	57.51%
2024	163493	58.22%
2025	184135	58.89%

According to the forecast data, the proportion of the logistics volume of Dalian port increases year by year, but there is still some room for further growth. As one of the most important local logistics companies, Dalian port isn't just limited in the shipping field. The construction of the integrated logistics system is conducive to the Dalian port and it can expand the logistics volume.

#### **4. The analysis of Dalian port's logistics development strategy**

With the global transportation services enter the era of integrated logistics, profound changes have taken place in the social and economic development. Port is a link in the global transportation network and its function changes from loading, unloading, warehousing to the integrated logistics center. It is a trend to develop logistics services in ports. Therefore, Dalian port has accelerated the development of port logistics, and they think it is a good way to keep the port competitiveness.

Dalian port group should adapt to the development trend of world ports, seize the opportunity to develop comprehensive transportation system and logistics services and expand the advantages of the port. It is important for Dalian port group to choose to develop logistics and it is the best starting point for the port transformation.

#### **4.1 Strategy plan**

##### **4.1.1 Promotion of port function**

The port is the source and foundation of the development of the Dalian port group and has comparative advantage when Dalian port transforms to the comprehensive logistics enterprises. Although Dalian port's business center and the profit center will be transferred to the logistics business, the functions of the port must be strengthened. Focus on the future development of Dalian port, we shouldn't stare at the throughput but the improvement of the port function. In port construction and layout, Dalian port group should have the strategic thinking and make overall planning. According to the development of the logistics industry and the surrounding areas of port competition, Dalian port should determine the development plan. First, Dalian port should improve and upgrade the existing port function, strengthen the

island three bay port functions and enhance the comprehensive advantages of the core area. Second, according to the market demand, the construction of the new port should be considered to accelerate the Changxing island transit terminal terminal and support tanks.

#### **4.1.2 Establish a regional distribution center**

It is important to construct the regional logistics and distribution center besides some external logistics channels. The construction and development of logistics distribution center is divided into several levels of:

First, to construct the international logistics distribution center as the starting point .

Dalian port should build a regional distribution center to expand advantage of Dalian port and city. The most urgent task at the present stage of Dalian port is to build a regional distribution center and the city logistics distribution system. By building this center, Dalian port can use its function to achieve a relatively perfect distribution system.

Second, regional logistics distribution center can build in nearby cities to serve Dalian port.

Build distribution center in Shenyang, Changchun, Harbin city and other nearby cities. These distribution centers have connection with Dalian port, and will share some of logistics tasks of Dalian port to build a perfect distribution system.

#### **4.1.3 Establish target customer base**

For the logistics enterprises, the most important resource is customers. If Dalian port group want to become the largest logistics enterprise in the northeast area, the most basic and the most important thing is to establish a big customer base. Dalian port group has a high reputation and influence in the northeast area of China, and there are a number of large customers who have deep relationship with Dalian port. But Dalian port's existing customer base is built due to the port throughput and port service, if Dalian port group changes to the area logistics operators, it should not only provide services for the port transport but also provide local logistics, and this will change the basic and key factors to build relationships with customers. So, Dalian port group should use the new service concept and modern logistics operation mode to provide customers with safe, convenient, standard and value-added logistics service, and this customer relationship will be more closely, more stable and more long-term than the relationship between port enterprises.

First, is to choose a number of large customers. These customers should be selected according to its logistics demand, logistics management mode, outsourcing logistics demand and the relationship with Dalian port group.

Second, is to develop logistics services and get the trust of the large customers by strategic cooperation with them. Then Dalian port can also trade with some small and medium-sized enterprises under these large customers with low cost and get profits by logistics services.

#### **4.1.4 Work closely with other ports**

Dalian port become northeast comprehensive logistics operators and it serve and face not only Dalian port itself but also ports in the province of Liaoning and Tianjin, and these ports should become strategy partners and support Dalian port to develop

logistics services. Design the best logistics process scheme, minimize the logistics cost, meet the customers' demands and improve logistics efficiency is what Dalian port need to do. Therefore, Dalian port group have to cooperate with other ports in the Liaoning province, especially Yingkou port, and change the relationship from competition to cooperation and become the goods provider in the province of Liaoning.

## **4.2 Suggestions**

### **4.2.1 The innovation of management and operation system**

To realize the transformation to the logistics operator, Dalian port should adjust internal management and operation methods and adjust the strategy direction. Furthermore, Dalian port should establish a social environment which is conducive to the development and integration of logistics. The transformation of Dalian port group to the logistics operator means a great change of the company, and innovation of management and operation system is particularly important. Reconstruct the organization and operation system as the core of the logistics industry, realize the diversification of investment and attract strategic partners to join can be useful to innovate. Secondly, Dalian port group need a social environment to build a comprehensive logistics system. To achieve this goal, Dalian port group need to deepen the reform of transportation management system, port management system and foreign trade management system to strengthen the communication between the areas, establish the smooth communication system, break regional blockades and monopoly and promote regional economic integration. Third, create a good market environment to make all kinds of logistics enterprises access to the market equally. Only the enterprises with good leaders can survive in the competition.

#### **4.2.2 Cooperation with international partners**

First, Dalian port should work with some international partners and cooperate with some well-known logistics enterprises. Dalian port and these enterprises can set up a joint venture company and establish a strategic alliance and other forms of joint cooperation to develop logistics market.

Second, Dalian port should learn advanced logistics and supply chain management, reconstruct the organization system and establish the management system and operation mode of integrated logistics operators from well-known enterprises.

Third, Dalian port should learn the experience of the supply chain and supply chain management from well-known enterprises and so that Dalian port's management and service can fit international standards.

#### **4.2.3 Introduce talents, optimize configuration**

First, is to cultivate logistics talents. Crew should train to be familiar with logistics service so that they can serve customers well. The training should highlight the logistics theory, knowledge, skills and service methods, and strengthen cooperation with teaching institutions and universities to cultivate talents.

Second, is to hire more talents in key positions. By hiring more talents, Dalian port can transform more quickly and get a higher level at the starting point, and these talents will lead the crews to do better.

Third, is to optimize the allocation of human resources. Talents may flow to every structure of the enterprises and optimize the management or process of the logistics service.

#### **4.2.4 Support from the governments**

Dalian port should get the support from the governments like reducing the taxes, build more logistics centers, build logistics information infrastructure and so on.

## 5. Analysis on the relationship between economy and port throughput in Dalian

After a hundred years of development, Dalian port and Dalian city have achieved remarkable results. The development of Dalian port drives Dalian city's rapid economic development and the continuous improvement of people's living standards. Also, the economic development of Dalian city guarantees the supply of the source of Dalian port and the transportation, improve the popularity of Dalian port, and enhance the competitiveness of Dalian port.

### 5.1 Overall situation

According to the report, GDP of Dalian city, port throughput and container throughput of Dalian port is shown in the following table:

Table 8 GDP, port throughput and container throughput (Source: Clarkson and National Bureau of Statistics of China)

	GDP(billion yuan)	Port throughput(billion tons)	Container throughput(ten thousand TEU)
2001	1235.6	1.05	121.7
2002	1406	1.12	135.2
2003	1632.6	1.26	167
2004	1961.8	1.45	221.12
2005	2150	1.71	268.8
2006	2569.7	2	321.2
2007	3131	2.2	381.3
2008	3858.2	2.46	452.5
2009	4417.7	2.73	457.5
2010	5150.1	3.14	526.2

2011	6100	3.37	639.57
2012	7002.8	3.74	806
2013	7650.8	4.08	1002
2014	8002	4.28	1012

From figure 6 and figure 7, it can be seen that in recent years, the change of GDP of Dalian city and port throughput and container throughput of Dalian port are basically the same.

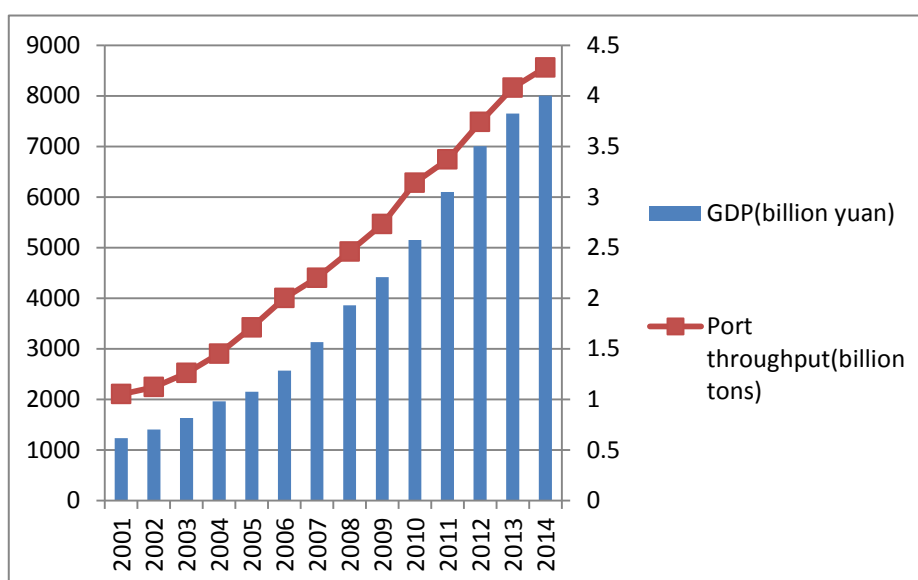


Figure 6 GDP and port throughput situation

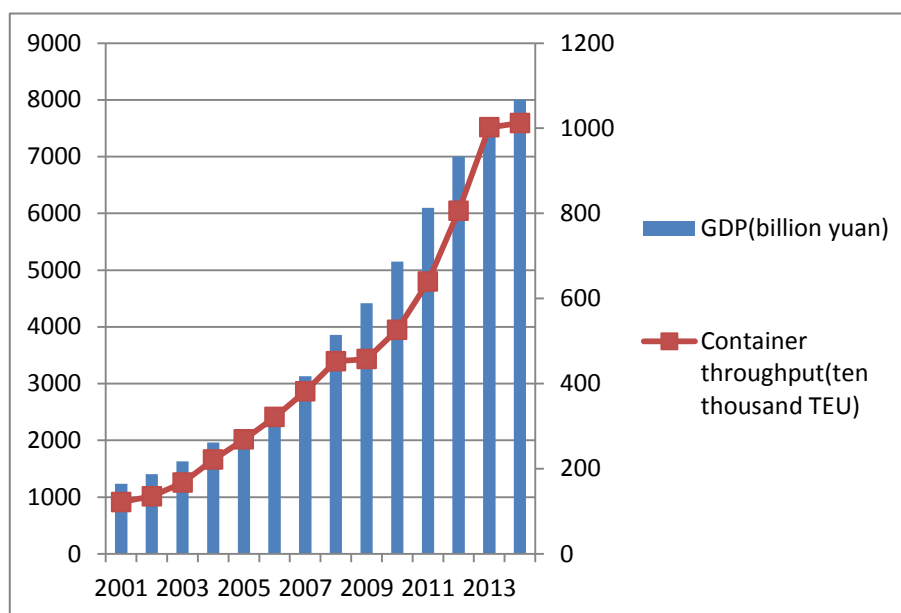


Figure 7 GDP and container throughput situation

## 5.2 Regression analysis comparison

The data of GDP of Dalian city, port throughput and container throughput of Dalian port is used in regression analysis, and port throughput and container throughput will be used as independent variable to calculate a simulation GDP respectively. We can see that container throughput fits better, and the error is generally within 3%. However, the error of the port throughput is around 5% and some of them are 10%.

Table 9 Regression analysis result comparison

	Use port throughput			Use container throughput		
(Billion yuan)	Simulation GDP	Actual GDP	Error	Simulation GDP	Actual GDP	Error
2001	1279.4	1235.6	-3.42%	1318.48	1235.6	-6.29%
2002	1390.92	1406	1.08%	1413	1406	-0.5%

2003	1612.28	1632.6	1.26%	1624.87	1632.6	0.48%
2004	1911.62	1961.8	2.62%	1963.88	1961.8	-0.11%
2005	2326.17	2290	-1.55%	2284	2290	0.26%
2006	2807.05	2569.7	-8.46%	2674.01	2569.7	-3.9%
2007	3157.41	3131	-0.84%	3223.66	3131	-2.87%
2008	3644.69	3858.2	5.86%	4087.27	3858.2	-5.6%
2009	4199.23	4417.7	5.2%	4158.72	4417.7	6.23%
2010	5162.02	5150.1	-0.08%	5314.34	5150.1	-2.94%
2011	5898.85	6100	3.41%	6370.76	6100	-4.25%
2012	6893.77	7002.8	1.57%	6783.03	7002.8	3.24%
2013	7842.95	7650.8	-2.45%	7469.3	7650.8	2.43%
2014	7781.02	8002	2.84%	7703.86	8002	3.87%

### 5.3 Summary

Overall, GDP of Dalian city has a positive correlation with port throughput and container throughput. And that means the development of Dalian port can affect Dalian city and the development of Dalian city can affect Dalian port.

## **6. The strategy of develop Dalian harbor city**

Port has the effect on the development of the city economy, the industry, the infrastructure construction and the social, so port can promote the development of the city.

City can support the port on resource, economy and policy, so city can promote the development of the port.

In a word, it is a win-win strategy to develop Dalian harbor city.

### **6.1 The usual solutions to the problems of the port city relationship**

#### **6.1.1 Plan coast line**

Port planning should focus on the following two aspects.

First, grasp the characteristics (macro, comprehensive, forward-looking) of port planning accurately.

Port planning should consider the relationship between port and industry, port and city, port and regional economic. And the scope of port planning should be expanded.

Plan coast line should focus on the overall layout, function convenience and resource utilization, and the concrete construction scheme should be adaptable and flexible. Coast line planning ideas should be changed from “demand oriented” to “resource and demand oriented”, and ports should study the new theory and method under the new situation. Also, ports should understand and utilize the demand of transportation, the demand of industrial development, city development, the relationship between the neighboring ports and ship type development.

Second, strengthen the port planning and implementation.

Port planning should be adjusted and improved timely and the coast line should be planed under the port law. Ports also need to establish a system to control the passing ability when ships go through the coast line.

#### **6.1.2 Strengthen environmental protection, energy saving, safety awareness**

Port enterprises need to strengthen environmental protection, energy saving, safety awareness and build some new equipments and add some new technology to reduce the emission of pollutants, improve safety management level, reduce the cost of the enterprise, improve staffs' and citizens' living quality, and enhance the pride of the employees so as to enhance the competitiveness of the enterprises. Port should use environmental protection and energy-saving technology like wind power, water source heat pump to improve the level of environmental protection and the port safety.

#### **6.1.3 Improve the comprehensive competitiveness of ports**

Port enterprises should look at present and long-term to develop the science and technology research and strengthen personnel training, improve the level of port information management, play an important role in the supply chain, extend the industrial chain, strengthen the efforts of the port industry and city, build brand employee, brand team, brand enterprises and improve the comprehensive competitiveness of the port.

The key to improve the comprehensive competitiveness of the port is to promote the shipping legal consulting industry, information service industry and port engineering research and development and the port should have financial service,

insurance service, law service, information service and other services to make the port becomes the core zone. Ports should strive to get rid of vicious price competition model and improve the comprehensive competitiveness by developing the port related industries, improving service levels and increasing income.

#### **6.1.4 Improve management level**

Improving the management level is the effective way to improve the competitiveness of the ports because some objective conditions can't improve in a short time. Port manager should pay attention to collect the daily data and strengthen the market by accumulating and analyzing the data. Try to use the data to analysis the decision and improve the decision making level, reduce the subjective assumptions and play the well management fully in the development of the enterprise.

#### **6.1.5 Solve the remove problems**

The ultimate goal of port construction, economic development is to improve the standard of living of people, so the reasonable demands of the people should be met and conflicts should be avoided. In the process of remove, the compensation should be solved and avoid the illegal demolition. In recent years, some illegal demolition destroyed the relationship between the port and the city. We build the port for the people, and people have the right to enjoy the benefits of port construction.

#### **6.1.6 Improve the investment and financing system**

We should pay attention to the development of the port and improve the investment and financing system to improve the port construction fund shortage problems. Existing port constructed in a place where natural conditions are relatively good, so the new port construction costs become higher and higher recent years and

it gives a big pressure to the port construction enterprise. The cost problems can be solved by land replacement, cooperation, joint venture, BT, BOT, TOT and other ways.

#### **6.1.7 Strengthen port emergency system**

Port should make emergency plan system and improve emergency plans at different levels. Improving emergency monitoring and emergency response facilities, the port emergency capability construction and strengthen the relationship between nearby cities to ensure that the rescue resources are enough when emergency happens.

### **6.2 Strategy plan**

#### **6.2.1 Develop coastline at the north of Bohai sea side**

Most Dalian ports were built in the south of the Liaodong Peninsula, and the transport cost of the cargo owner is relatively high because of this. Furthermore, this will weaken the competitiveness of Dalian port, so the best way is to build the new port in the north of the city and shorten the transport distance and the transport cost of the cargo owner. The economy of the area near Bohai sea is relatively lagged, resulting the big difference of the living standard of the people in the east and west of the Liaodong Peninsula, and this also restricts the city development prospects, so the Bohai sea side should be developed.

Taiping bay coast line is located at one side of the Bohai sea and it is the northernmost coastline of Dalian city and the natural condition is superior. Taiping bay coast line should be developed as early as possible to enhance the competitiveness of the Dalian port, develop a new economic growth pole and broaden the development space of the port and the city.

### **6.2.2 Reasonable planning of port construction**

The planning and construction of the Dalian port should follow the economy development and the cargo throughput of the port. Reasonable positioning and stage construction is a need. Also, Dalian port should analysis the development trend of other ports nearby in order to avoid the homogenization construction and reduce the waste of resources.

### **6.2.3 Push forward the dangerous goods in port construction steadily**

Chemical industry in Dalian has developed very fast so that the dangerous goods berths and dangerous goods ports should build rapidly. Many accidents which occurred in recent years illustrate that the dangerous goods port construction should pay more attention to the secondary pollution and the port should follow the national related laws and regulations to reduce the possibility to cause the accidents. Ensure the safety equipments are operated and strengthen the check and maintenance of emergency facilities.

### **6.2.4 Speed up the construction of the logistics system in the city**

Dalian should strengthen port transportation system, make transportation system planning and accelerate transportation construction. Speed up the construction of highway and railway which leads to the port and realize the directly connection between port and the highway or railway. And promote the development of multimodal transport.

Promote the transformation and development of the port and develop modern logistics in Dalian harbor city. Strengthen the construction and connection of port and logistics channel and develop container, bulk cargo etc. logistics system is also important. Besides, the port logistics information platform should be innovated to

promote the port information level. Furthermore, the port intelligent production management system, bulk cargo wharf automated loading and unloading control system, container multimodal transport information service system and electronic data interchange system should be promoted to establish a information service system to realize the information sharing and information integration service.

### **6.3 Summary**

There are still some problems in the Dalian port city, including the unreasonable coast line resources allocation, concentrated dangerous goods, unbalanced north and south economic development and so on. These problems should be solved as soon as possible.

To solve these problems, the coast line at the north of the Bohai sea should be developed as soon as possible. Besides, port manager should plan to construct the port reasonably, push forward the construction of port area of dangerous goods steadily and develop the port logistics to realize the coordinated development of Dalian city.

## **7. Conclusion**

As the important role in the shipping industry, port has its advantages to develop whole logistics service system. It is a base and a must for Dalian port to construct logistics service system. Establishing a comprehensive logistics service system is a way to improve the efficiency of enterprises, resource utilization, the efficiency of logistics service and the financial support.

Besides, the development of Dalian harbor city need to be fastened. It is obvious that if Dalian port develops fast, it will help Dalian city to develop fast. So, the development of Dalian port is the key to develop Dalian harbor city.

**List of references:**

- [1] Huang Xiaoke, 2006. The transition of the traditional port to the modern port. Journal of Science and technology of west China, 2006, 4.
- [2] Shi Yue, 2013. Comprehensive evaluation of port logistics development in Dalian port, Chinese Times, 2013, (10).
- [3] Chen Duanhai, 2013. Try to talk about transformation and construction of modern international port of ZhuHai port. Journal of China Business & Trade, 2013, 8.
- [4] He Qing, 2014. Research on the development of port logistics in Dalian port, Market Modernization, 2014, (25)
- [5] Xu Ze, Li Hao, 2012. Explore the transformation of Dalian coastal development-Hebei coastal area spatial development strategy. Journal of Planners, 2012, 28(4).
- [6] Liu Biyu, Yang Haidong, 2008. Dalian port and regional economic relations, China Water Transport, 2008(8).
- [7] Zen Fanping, 2013. Research on the development strategy of Dalian Port group's comprehensive logistics operator, 2013.
- [8] Zhou Jun, Hou Jian, 2014. Research on the transformation and upgrading of Dalian port. Modern marketing, 2014(1).
- [9] Yan Zhao, 2011. Transformation, innovation, cooperation, the development of Dalian port. Journal of China ocean shipping monthly, 2011(10).
- [10] Wang Hui, Luan Weixin, Du Linan 2011. Research on the relationship between the throughput and the economic development of the hinterland of Dalian port. China Harbour Engineering, 2013(11).
- [11] James J. Wang, Brian Slack, 2004. Regional governance of port development in China: a case study of Shanghai International Shipping Center. Maritime Policy & Management. 2004, Vol. 31(4).
- [12] Anonymous, 2008. Research and Markets: China port Industry Report Reveals Cargo Output to be 3.447 Billion Tons. M2 Presswire. 2008.

- [13] Mengying Feng, John Mangan, Chandra Lalwani, 2012. Comparing port performance: Western European versus Eastern Asian ports. *International Journal of Physical Distribution & Logistics Management*, 2012, Vol.42 (5),pp. 490-512.
- [14] Kunyou Pan, Youhui Cao, Shuangbo Liang, Hongyan Wei, 2014. New tendency of Chinese container port system: 1998-2010. *GeoJournal*, 2014, Vol.79(3), pp.373-384.
- [15] Claude Comtois, 1999. The integration of China's port system into global container shipping. *GeoJournal*, 1999, Vol.48(1), pp.35-42.
- [16] Haizhuang Wang, 2014. Preliminary inveigation of waterfront redevelopment in Chinese coastal port cities: the case of the eastern Dalian port areas, *Journal of Transport Geography*, 2014.
- [17] Chi-lok Andrew Yuen, Anming Zhang, Waiman Cheung, 2012. Port competitiveness from the users'perspective: An analysis of major container ports in China and its neighboring countries. *Research in Transportation Economics*, 2012, Vol.35(1), pp.34-40.
- [18] Taih-cherng Lirn, Yen-Chun Jim Wu, Yenming J.Chen, 2013. Green performance criteria for sustainable ports in Asia. *International Journal of Physical Distribution & Logistics Management*, 2013, Vol.43(5), pp.427-451.
- [19] Yafang Su, 1994. Urban investment environment information system for China's coastal port cities. *Chinese Geographical Science*, 1994, Vol.4(4).
- [20] Chioma Jaja, 2009. Port development in Nigeria: trends and patterns. *Journal of Transportation Security*, 2009, Vol.2(4), pp.107-119
- [21] Liang Xiaojie, Dong Chaohui, Xu Ping, 2012. Thinking of the transformation and development of China's ports. *Journal of Port & Waterway Engineering*, 2012(3).