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Study on site selection of Dalian Dry Port Group

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STUDY ON SITE SELECTION OF DALIAN DRY PORT GROUP

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Declaration

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

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

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Abstracts

With the rapid development of international multimodal transportation，container transportation has expanded from sea to inland while its capacity in each area is becoming increasingly deficient. As a new mode in logistics transportation centre，dry port has become the hot issue that academy and business focus on.

Research and practice on the field of dry port have been carried out since 1980s.As for Dalian port，its system study on dry port lacks of systematic study on location and site selection of dry port.

Based on the above background，this paper develops systemic analysis on the subject of location of dry port cities which are cooperated with Dalian. We impose analytic hierarchy process to make proposal in the range of Liaoning Province. This paper includes five chapters as follows：

(1) This paper expounds the related theories，research background，target and method of dry port and gives a systemic summary of the present status.

(2) This paper discusses the connotation，sort，function，development mode and current situation of it in China.

(3) This Paper sums up the current development of both Dalian and the nominee cities of dry port. Feasibility analysis is given from the perspective of economy and society.

(4) Analytic hierarchy process is used to build the evaluation index system for dry port location. Basic proposal for dry port location in the range of Liaoning Province has been generated and four target dry port cities are selected.

(5) Aim at the shortage of Dalian port from its development history; we put forward suggestions for its dry port project implementation and practice development.

Key words：Dalian port, dry port, location, Analytic hierarchy process

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Chapter 1 Introduction

1.1 Study Background and Significance

By the end of 2010, the cargo handling capacity of Dalian port has accumulated reached 3008.3 million tons, successfully entered the list of big port of 3000 million tons, its capacity tops the sixth among the port in China and the eighth among the port in the world. The function of Dalian port, its function in accelerating economic development in Northeast China is becoming increasingly obvious. With the stable enhancement of economic globalization development and trade quantity, modern port is developing towards to become the supply chain, Dalian port is no exception.

However, the number of quay berth along the sea and rivers is increasing, the large-scale trend of boat is strengthening, the competition among ports are becoming fierce, how to get the broad economy place and much more resources is the problem that port managers mostly concerning. Under the promotion of outer environment and internal requirement, dry port-one kind of modern logistics center which build inland but has the function similar to the port along the sea emerges as time requires.

China has introduced into construction of dry port since the 1990s in the 20th century, but the aim for it at that time was to use it as one inland port and used as the trade passage with other inland areas, but it had not been used for container multimodal transportation.

In the beginning of this century, dry port is used to service port and sea transportation, many large-scale container ports have already or planning to build dry port inland in order to enhance its handling capacity and transportation capacity. Dalian port, as the first largest port for export and import in Northeast China, it is starts to establishing dry port group of its own. In face with broad economy place, the site selection of dry port of Dalian port has become one of the topics that worth studying.

1.2 Literature Interview

Dry port (inland port, dry port) use their new operation idea and successful development practice, it has become one of the focuses for scholars in China and abroad to study regional development, port development and logistics development. However, as for its study, it is now in the attempt and exploration period, theory and practice structure needs improvement. The number of literature data is little and methods are theoretical analysis and qualitative analysis, the quantification index is little. The theoretical study is mainly focuses on the following aspects: the concept definition of dry port, function and effect, development model, development defect and relative suggestion. The detailed literature is as follows:

Du Ping as the advocator of dry port in China, he has proposed to establish international cargo transportation port-Xian port in the center city, Xian in the west of China. Afterwards, it respectively illustrated the basic operation of international dry port, opinion of turning inland cities into branch dry port and establishing cities by port construction.

Zhang Rong and Huang Ke have illustrated the meaning of inland port, the basic, auxiliary and value-added function of inland port, its effect, as well as propose the assumption of relying on railway container logistics center to establish inland port in the logistics center.

Zhang Qi starts from the connotation of market competition of inland port, railway container, analyzes the cooperation and competition strategy core and its development of comprehensive logistics operation of railway container.

Lv Shunxian, Dong Yandan propose 3 kinds of development models for establishment of dry port: port along the sea will build dry port with inland areas in order to strive for

cargo sources, inland area will build dry port to develop local economy, port along the sea and inland area need to establish dry port for their own development.

On the study of site selection, mainly has:

Wang Weihong has creatively used quantitative math method and focuses on the site selection to do study, the main word including: using discrete choice theory as instruction, and compares with analytic hierarchy process.

Yang Rui adopts data package analysis technology (DEA, data development analysis, one evaluation method for multiple decision units of multi-investment/production, it can be widely used in the performance evaluation), it has initially selected the site selection of dry port; adopting comprehensive evaluation method of AHPE affiliated synthesis, rank the site selection and get the best establishment place of dry port.

Zhang Zhaomin discusses the principles of site selection for dry port(meets transportation demand, the overall, regional plan and pursuit of economy and profit), he proposes the influence factors of its site selection from 2 aspects in regional generation container and transition container volume. He uses 34 inland hinterlands or the potential hinterland that Dalian port relying on as the background, carries out analysis on site selection of dry port according to fuzzy clustering method, then compares with the development and plan of current dry port.

Study on other site selection including: Cheng Cibao, Chen Baoxing, Li Mingshun and so on have proposed one non-capacity limitation model of double-layer customers in site selection optimization model of inland container and empty container, as well as proposed the detailed calculation method. Zhu Xiaoning puts forward by using fuzzy clustering to establish evaluation index to determine the site selection of cargo station.

Secondly, on the practice of dry port, scholars have carried out comprehensive

evaluation for the implementation status of many dry ports: Chen Peiqi illustrates the significance of dry port for port development and inland economic development; he mainly introduces the favorable factors and establishment conditions of Quzhou establishing dry port. In addition, Zhang Jiming and Wang Qingsheng analyze the construction process of Tianjin port in the aspect of dry port in China, Sun Yuefeng summarizes the plan and construction of logistics base of Dalian port, Wei Ziqiu summarizes the operation condition of inland port in Shijiangzhuang, proposes its restricted factors for development, Tan Benji proposes the ocean strategy of establishing dry port in Nanning.

1.3 Study Method and Content

This thesis stands on the altitude of establishing modern and comprehensive logistics system of Dalian port, constructs the win-win inland port group, carrying out deep study in the aspect of promoting regional and economic development of Dalian with surrounding cities. As the core content of study, this thesis will combine the actual operation condition of Dalian port and uses analytical hierarchy process to establish evaluation and index system for site selection, gives that implementation plan of dry port in Liaoning province.

In general, this thesis is divided into 5 parts:

The first part: introduction. It mainly introduces the study background, meaning, content and method of this thesis, carries out illustration on the literature data of dry port in China and abroad

The second part: the relative theory study of dry port.

The third part: the feasibility analysis of Dalian port establishing inland dry port, including the status, logistics development interview of Dalian port as well as the

feasibility analysis for Dalian port to establish inland dry port.

The fourth part: using analytical hierarchy process to carry out site selection of dry port.

The fifth part: the evaluation of Dalian dry port, including the implementation notices of dry port and its development measures. Finally, it gets the conclusion.

Chapter 2 Theoretical Study on Dry Port

2.1 Connotation of dry port

2.1.1 Definition of dry port

Definition of dry port, as described in America Container Association in 1992: it is the inland container facility far away from port, it provides container loading and unloading to container coming in and out of port, short-term storage and custom inspection etc. The aim of dry port is to achieve containerization and brings profit to inland cargo transportation, as well as promotes the containerization of inland cargo container. Transportation between port and dry port is under the supervision of custom and shipping company will sign their own bill of lading, and undertake the responsibility for the fess and transportation conditions from dry port to foreign port or foreign port as destination.

Theory of dry port develops up to now, the representative definition for it is mainly as follows:

Definition 1: Dry port is the directly connected inland station with seaport in geography. This definition was proposed by European Commission in 1991 and its English name was dry port.

Definition 2: Dry port is one inland station by directly connecting with port of large volume, customer acceptance and container delivery, which similar to seaport delivery.

Definition 3: Compared with Europe, America has wide range for the definition of dry port, it usually regard it as inland port, its English name is inland port, it defined as the multimodal transportation far away from traditional land boundary, seaport or air port and be capable of dealing with international trade and provides value-added service in the process of multimodal transportation. While for the dry port today, they classify it as one of the categories, which is called provide inland port.

Definition 4: In China there are many names for dry port, the usual one is dry port, international port. Dry port is the hub of inland container in container transportation network, it is collection and distribution place of container cargo transportation as well as the connection point among car container, among car container and railway: it provides service to container and cargo coming in and out of port with collection and distribution, container loading and unloading, short-term storage, custom inspection and other relative business.

Definition 5: Another definition on dry port is as follows: the so-called dry port, it is transshipment station services for ship company and inland sea transportation container, except for port and dock shipment and unloading, its function is basically similar to port.

Definition 6: International port is cater for requirement of international trade and located at the joint of railway and road in the city center, the opening-up business port established according to international law or regulations, it is the branch port of costal large-scale international transition port in inland area, is the hub of inland transportation directly to each international port.

From the above analysis, we can see that these definitions are illustrated by each nation from their own different economic development and special national conditions, of which some definitions have some shortage and limitations, so it is necessary to synthesize the above definitions so as to suitable for the national conditions of China on

definition of dry port. Writer comprehensively analyzes and gives its definition, dry port is the logistics base according to demand of regional economy and foreign trade, by relying on corresponding costal container port(mainly branch port), established in inland and has function of customs declaration, inspection and lading bill assignment. Generally speaking to some extent, it is the transition station improving road (railway) container. As for further comprehension, the dry port with extensive meanings, its establishment locations has 2 meanings:

The first one is the pure inland area far away from sea and river, the second one is some regions along the sea and river, although it has port dock, without large-scale costal container branch port, its port dock locates at the branch port or provision port, when choosing the container of foreign container to the nearby costal container branch port, its road container transportation is superior to the water container transportation, people can also establish inland dry port so as to promote the close links of trade transportation, which can produce win-win to the economy of 2 places.

2.1.2 Difference of dry port and other relative definitions

Inland port is usually used in America, it locates at inland area and far away from seaport or land boundary, as one joint transportation place or multiple transportation places to service this area, these transportation manners means the railway and road in the distribution process from port goods to inland. The inland port including many, of which the function of provision inland port is as follows: transport the container from customer to dock delivered to inland port by road, realizes the timely loading and unloading of railway from road distribute to destination, provides a series of value-added service of international logistics and distribution, collection service, including cargo agent, goods collection, logistics combination and information system.

Inland container depot, the English short term is ICD, this name was firstly proposed in India in 1983 and slowly developed in Pakistan and China. UN(1992) defined the ICD

as follows: it provides container loading and unloading for container or cargo locates in inland or far away from port, short-term storage and custom inspection. The main aim of container depot is to realize the profit of containerization to inland transportation, the transportation between port and depot is supervised by custom, and the shipment company usually signs their own lading bill, and undertakes the responsibility for the fess and transportation conditions from dry port to foreign port or foreign port as destination.

Container freight station is the place for container load and unpacking of ship and cargo parties to manage transaction. Its difference from ICD lies in that, ICD is one port cargo(container)collection and distribution place, while for cargo transportation station is service for the container loading and unloading of cargo, its main business is as follows: cargo tallying and hand-over, appearance inspection, if these is unusual condition to manage remark, the container accumulation and loading, unpacking for import and storage, the free carrier makes lead seal and sign the station receipt, manages each certificate and formulation etc.

In function, dry port has further improvement than them, whether it is from inland port, inland container deport or it is container shipment station, some operation of container transportation can not be completed in inland, these operations will be left to be competed in container shipment station or storage station. It will bring much more pressure to port and make the circulation of container in port restricted. However, the condition is different if there is dry port. The cargo owner can make custom declaration for goods in dry port, there is no need to do it when goods arrive in port, this the owner can avoid the deport section and save valuable time. After container goods is cleared by the custom, it can be quickly transferred to container port, after entering port, the time of container goods stays will be also shortened. In general, the establishment of dry port makes the circulation speed of container goods accelerate. The owner can enjoy the time and cost saved due to quick logistics speed. In general, it has all the functions except for the function of loading and unloading, this is the basic reason that people regard the

inland container facility as dry port.

2.2 Function of Dry Port

2.2.1 Service function of micro-service

1) The inland service function of costal port

2) The collection and distribution function of container;

3) Service function in express delivery: by organizing express, shipment service etc, providing effective door-to-door service to owners;

4) Storage function of container: providing whole-package hand-over of import and export container, storage, preservation and deport service, as well as providing container feeder and direction guarantee, creating favorable conditions for connection of the main and branch line of hinterland, short and long-distance transportation or land and river multimodal transportation

5) Goods collection and distribution, storage and allocation function: providing comprehensive logistics service such as unpacking and loading for export and import international container, tallying, container load, goods storage, under bond, manufacturing, re-package, label, classification and allocation, distribution.

6) Package point function of container: approved by the shipping container company, used as the place for shipping company and agent dispatch, hand-over, storage and container packing, as well as responsible for container cleaning, disinfection, suffocating and maintenance service etc.

7) Cargo agent function: undertaking shipment business in domestic and international

market, entrusted by goods owner and agent to accept goods, delivery, assignment, renting and container management, custom clearance and develop multimode transportation business.

8) Inland port function: setting custom, animal and plant quarantine inspection, commodity inspection, and sanitary inspection organization to provide clearance service;

9) Other service function: for example, establishing maintenance workshop, carrying out inspection, cleaning, maintenance for the cars, unloading machine, managing exchange settlement, insurance.

10) High-efficient information management and EID system. The main function of information management and EDI system are as follows: carrying out dynamic receiving for container, car, and hand-over, transaction for delivery order, networking with custom and three inspection organizations, timely obtaining information and providing information service for customers.

2.2.2 Micro social and economic benefit

1) It is favorable to achieve high-efficient management and operation of inland container delivery, favorable for uniform management and dispatch, achieving reasonable stowage, increasing delivery efficiency and guaranteeing effective connection and hand-over in inland transportation, at the same time it can save energy and reduce pollution, relieve transportation pressure in city.

2) It is favorable to enhance competition of port, not only strengthens communication between port and domestic economic hinterland, but also provide effective convenience to ship company and cargo owner.

3) It is favorable for the harmonious development of local economy and regional economy, enhance regional competition and expand communication, seek one position in industry labor division under the globalization condition, at the same time promoting local investment, especially investment from domestic and overseas, expanding financing.

2.3 Development of Dry Port

With the development of multimode transportation in container, port and Ship Company is increasingly needed to establish container transportation network in inland hinterland, increase the transportation scale of container and economic profit. While for the inland container facility established for container transportation network-dry port as the inland section for multimode transportation of container, promote the radiation strength of port to inland hinterland, it has important effect for development of container transportation. In order to study construction of dry port, we firstly understand the development status of dry port in China.

2.3.1 Development status of dry port in China

Development of dry port in China is in the beginning stage, but it is in the good development period from its development conditions, it has formed inland port group from north to south of China, including inland port group of 12 provinces and cities such as Tianjin, inland port group from Shanghai, Zhejiang costal area radiated to south and southwest of China. According to report issued by of Hong Kong special area of China in October of 2008, including the newly built inland port, Xiamen and Sanming has signed the cooperation and investment paper to establish inland port, Ningbo Custom and Ningbo Port Group etc have signed cooperation memorandum of establishing inland port. At the same time, Tianjin, Beijing, Hebei, Shanxi, Henan, Shanxi, Xinjiang, Ningxia, Gansu, Sichuan, Qinghai, Inner Mongolia have signed Custom Clearance Cooperation Memorandum in North Area and Cooperation Letter of

Intention of Establishing Inland Port in new area of Binhai, Tianjin. In a word, establishment of inland port will become better and better, its construction will promote quick development of inland economy and foreign trade.

2.3.2 Problems existed in Dry Port Establishment

Wes should clearly see that China is slow in developing international multimode transportation; establishment of dry port in China is still in the development stage. We need to solve many problems in this period.

(1) Because of division of administrative region and region division in China, establishment and layout of dry port is mostly restricted in the inner area it can not make uniform plan.

(2) China is in the fast development period of container transportation, inland container facility gets quick development. But these container facilities are in disorder; many facilities have small scale and have not formed dry port of hub scale.

(3) Establishment of dry port is one system project, which needs cooperation of functional department such as government, custom etc, port and ship company, so that it can get good development in operation. But some places and enterprises refuse to cooperate on dry port for the short-term benefit, which restricts the development of dry port.

(4) Dry port is one capital-intense facility; its constriction fees can reach 10 million even 100 million Yuan. Therefore, dry port needs to attract social capital for investment, it not only needs domestic capital, such as port, Ship Company, government and private capital, it also needs foreign capital for investment. However, investment part for dry port in China is few, it needs organization and guidance of government.

Chapter 3 Feasibility Analysis on Establishment of Dry Port in Dalian Port

3.1 Development interview of current state and logistics of Dalian port

3.1.1 Development introduction of Dalian port

Dalian port is the main hub port in northwest China, accelerated by quick and continues development in economy, cargo handling capacity of Dalian port is continually increasing, up to the end of 2010, its cargo handling capacity has accumulatively completed 0.30083 billion tons, successfully entered the list of big port with 0.3 billion tons, its capacity tops the sixth in port of China, and the eighth place in the world port.

Dalian is the leading in northwest China, it is the foreign door for world, it undertakes the responsibility of establishing the important international shipment center in Northeast Asia, international logistics center and regional finance center, each costal port on behalf of Dalian port has obvious superiority in geographical position, the policy superiority of bond port, it is the leading of northwest China.

3.1.2 Business introduction of Dalian port

(1) Container

Dalian is the important logistics hub for container port in northeast, Dalian port and its affiliated dock are the main container port in Dalian. At present, the port logistics enterprise of Dalian, Dalian port and its affiliated port totally have 85 container airline

in domestic and international, the freight density reaches more than 300 times monthly, undertaking over 90% trade container deport business in 3 provinces of northeast China.

(2) Oil product and liquid chemical

Oil product of Dalian port Dock Company mainly undertakes loading, unloading, shipment, storage for oil product, liquid chemical product. Of which the crude oil dock of 300000 tons is now the biggest crude oil dock in China, it is also the only one dock that can stop in VLCC large-scale oil tanker. It has storage capacity for crude oil of 3750000 cubic meters, oil product for storage capacity of 368000 cubic meters and 120000 liquid chemical products in storage capacity.

(3) Loose goods

At present, the kinds of Dalian port mainly includes carbon steel, wooden material, coal, paraffin, fodder, packaged grain, loose grain, banana, marine lives, and large parts. It receives and unload nearly 1000 railways, the rate for multimode transportation is over 80%, Dalian has become the important deport center for looses goods in northeast China.

(4) Car

The main goods of car logistics in Dalian port is foreign trade goods and carload, the main harbor is Dagang car dock, which locates at the bonded area in Dayaowan, it is the largest logistics part in northeast, it is also one of the import ocean carriage of four carload, now the pass capacity for car dock in Dlian is 600000 cars, with the construction completion and usage of second project, the annual capacity of the whole car dock will reach 1000000 cars, it can store 24000 cars at a time.

(5) Mineral

Dalian port has the largest, and most advanced mineral parking place in China, it is the main dock for mineral import in northeast China. At present, the fourth storage area of Dalian port dock is in construction, with its completion, the storage capacity of the whole dock will reach 6000000 tons, the shipment unloading rate reaches 7500 tons an hour, the load efficiency reaches 4500 tons/hour, the annual pass capacity reaches 20000000 tons.

(6) Grain

Grain logistics business of Dalian port is mainly completed by Dalian port loose grain dock and loose grain dock of Beiliang port. Loose grain dock of Dalian port is the deport center with most competition in northeast China, parking place for loose grain of 80000 tons is operated by computer, over 100 silo can contain loose grain of 800000 tons, the hourly efficiency of transportation line reaches 1000 tons. It can receive and load import grain of 3000000 tons and export grain of 10000000 tons, which provides whole-way grain logistics to customers.

3.2 Feasibility Analysis of Establishing Dry Port

Dalian port cooperates with cities of Liaoning to establish dry port, which is one basic construction project relates big range and influence; we need to measure its implementation feasibility from logistics profit, social.

3.2.1 Analysis on logistics profit

1) Establishment of dry port is favorable to enhance logistics efficiency and accelerate circulation cycle.

Dry port has important function for optimization of inland container transportation

process, planning dry port can not only greatly reduce enterprise storage of owner, reduce occupancy of flow fund and decrease circulation fees, so that guarantee the orderly operation of inland container logistics and accelerates circulation cycle of goods.

Secondly, it is favorable for the quick development of logistics industry of dry port and relative service industry, it paves solid base for the rising of comprehensive logistics center, at the same time, it can further simplify procedure for custom clearance and accelerate trade clearance speed, achieve custom declaration for one time, pass for two times and increase logistics efficiency.

2) The establishment of dry port is favorable to obtain more broad inland hinterland market.

From its own development for port, we should consider 2 problems in implementing targets in port, firstly is how to establish basic facility meet handling capacity, and secondly is how to obtain enough goods source to achieve profit of port. For the measure of increasing handling capacity is to expand port area, increase container dock parking places and storage land area. We should consider establishing nearby dry port to relieve the crowded dry port and increase handling capacity under condition we can not expand port area.

With the expansion of port scale and increase in handling capacity, the competition among container port is becoming increasingly fierce, the competition point turns from single handling capacity to the strive for inland market. The pass rate of inland port restricts the competition of port, if there is no enough pass degree, port will lose its hinterland market in competition, at the same time, it has no competition for the potential hinterland market. Therefore, port should not only pay attention to the transportation connection between port and the current economy hinterland, but also the connection between port and the potential hinterland. Port and hinterland are mutually

exist, striving for inland goods source is not only the measure to increase competition of ship company, but also one effective manner of increasing competition, if we want to obtain enough goods source, port must keep close links with inland hinterland.

From the above, the main body of service import are in providing inland logistics service is changing from the traditional shipment enterprise to inland logistics supplier focus on port, port regionalization is the new stage in port development, that is sea port establishes distribution center(dry port), which is the effective measure to increase port goods source and competition.

3.2.2 Social feasibility analysis

From the cities of dry port, the completion of project will effectively expand development hinterland and space of Dalian port, greatly promote construction peace of international port city, further enhance city concentration and radiation function, and accelerate regional economy development, which has far-reaching social influence. From development of regional economy, extending the regional superiority of dry port to costal cities is the superiority of international port, achieving breakthrough in regional superiority, create favorable conditions for great-leap-forward development of local economy, construct broad platform for opening-up economy development. Therefore, we should quickly study to establish port groups co-win with Dalian port, it is urgent task for Dalian, development and planning of Liaoning in port and economic development.

Chapter 4 Site Selection of Dalian Dry Port by AHP

4.1 Introduction to AHP

Evaluation index for site selection of dry port is one multilayer index system, if we want to evaluate the advantage and disadvantage of one candidate city, we need to correspondingly choose and apply each comprehensive factor, integrating multiple target and layer and factor suggestion from many party. AHP is the popular comprehensive judgment method at present.

AHP is one multi-decision method proposed by America operational professor T.L.Saaty, is one convenient, flexible and practical method, it composes the component factor according to nature and requirement of problem (target, principle and plan) and integrates one layer and structure model according to factor layer difference among factors, then analyzes by layer and finally gets the important weight value of low level factor for high level factor. The characteristics of this method uses little quantitative information base on the nature of problems, influence factor and internal relations, so that provides simple decision method for complicated problems of multi-target, multi-principle or non-structure. It is especially suitable for occasion difficult to calculate and measure.

The implementation steps of AHP is as follows:

1)Index system is divided into target level, principle level and plan level.

2) Constructing judgment matrix

Judgment matrix is the element value by using certain factor of the above level as judgment principle to do comparison to determine matrix.

In the AHP, by using scale of 1-9 to measure importance among factors, getting that judgment matrix is the key procedure. But in the actual operation, because there are many evaluation objects and influence of evaluation body, quality, preference, it is difficult for evaluation body to use scale of 1-9 to express the relative importance of each factor, so we ca n usually find contradicted judgment and the judgments matrix is worse. In order to overcome these shortages, we need to carry out the above procedures so that achieve satisfied result.

Table 4-1: 1-9Scale

Scale a_{ij}	Definition
1	I factor is equally important to J factor
3	I factor is very important to J factor
5	I factor is obviously important to J factor
7	I factor is strongly important to J factor
9	I factor is extremely important to J factor
2,4,6,8	The scale value is the middle state of 2 judgments
reciprocal	If compared j with I,， the judgment value is $a_{ji} = 1/a_{ij}$

If comported I with j and gets a_{ij}, so the judgment of factor I and factor j is $1/a_{ij}$. For certain principle C_k, it is as follows, for some factors of $A_1, A_2, \cdots\cdots, A_n$, we can get one judgment matrix of $n \times n$, A=（a_{ij}）, it is indicated as table.

Table 4-2: judgment matrix

C_k	$A_1, A_2, \cdots\cdots, A_n$
A_1	$a_{11}, a_{12}, \cdots\cdots, a_{1n}$
A_2	$a_{21}, a_{22}, \cdots\cdots, a_{2n}$
……	……
A_n	$a_{n1}, a_{n2}, \cdots\cdots, a_{nn}$

Judgment matrix has the following natures:

1） $a_{ij} > 0$

2） $a_{ij} = \dfrac{1}{a_{ji}}$

3） a_{ij}=1 （i=j）

Based on the above natures, it can be positive reverse matrix. According to nature 2) and 3), we need to give 2 judgments for the triangle factor when judging the matrix.

(3) Inspection of level single arrangement and uniformity.

This procedure is under the principle of C_k, n factors such as $A_1, A_2, \cdots\cdots, A_n$ arrange

the weight and carry out uniformity inspection, through comparison of $A_1, A_2, \cdots\cdots, A_n$, the obtained judgment matrix is A, the answer characteristic root is AW= $\lambda_{\max} W$, the W is the weight through standardization under arrangement of principle level of $A_1, A_2, \cdots\cdots, A_n$, this weight arrangement method is called as method of characteristics root.

Under condition of low accuracy, we can use approximate method to calculate $\lambda_{\max}$ and W, here we will introduce 2 methods, addition method and root method.

Addition method:

The first step: standardize the factors of A by order

The second step: add each judgment matrix after standardization

The third step: use the row and order after standardization to arranged as W

The fourth step: the biggest characteristic root by the following formula $\lambda_{\max}$

$$\lambda_{\max} = \sum_{i=1}^{n} \frac{(AW)_i}{nW_i} \tag{4-1}$$

$(AW)_i$ Means the I factor of vector AW

Root method

The first step, times the factor of A by row

The second step, the accumulation points times each other n times

The third step, standardize the root and arrange it W

The fourth step, calculate $\lambda_{\max}$ according to the above formula.

When we judge the uniformity is excessive, arrange and weight calculation as basis that some problems will occurs, so after getting $\lambda_{\max}$, we need to do uniformity inspection and its procedure is as follows:

The first step, index of calculation uniformity C1

$$C.I.=\frac{\lambda_{\max}-n}{n-1} \tag{4-2}$$

N is the order of judgment matrix

The second step, average and random uniformity index $R.I.$, which is got by doing calculation delay of random to get judgment matrix and then use its average. For order matrix 1-9, Saaty got the value of $R.I.$ is as follows:

Table 4-3: Average and random uniformity index

n	1	2	3	4	5	6	7	8	9
R.I.	0	0	0.52	0.89	1.12	1.26	1.36	1.41	1.46

The third step, to calculate the uniformity percentage C.R.

$$C.R.=\frac{C.I.}{R.I.} \tag{4-3}$$

When C.R.<0.1, we generally think that uniformity of judgment matrix is acceptable.

When C.R.>0.1, we need to analyze the evaluation of judgment matrix, and then change it, the method is as follows:

a)：Integrate the n ratio of judgment matrix, that is:

$$\begin{bmatrix} a_{11} & a_{12} & & a_{1n} \\ a_{21} & a_{22} & & a_{2n} \\ & & \cdots & \\ a_{n1} & a_{n2} & & a_{nn} \end{bmatrix} \Rightarrow \begin{bmatrix} a_{11}/a_{1n} & a_{12}/a_{1n} & \cdots & 1 \\ a_{21}/a_{2n} & a_{22}/a_{2n} & \cdots & 1 \\ & & \cdots & \\ a_{n1}/a_{nn} & a_{n2}/a_{nn} & \cdots & 1 \end{bmatrix}$$

b) Examine whether the value of each row is approximate, change some values which are not approximate and make them similar.

c) If each row is different in the same live, we should change the last evaluation of factors.

4) Level arrangement and uniformity inspection

In order to get all the factors weight relative to the general target of the step level structure, we need to integrate the calculation of the third step and carry out general uniformity inspection. This procedure is carried out from top to low, and finally get the factor of the lowest level, that superior sequence of decision plan and relative weight, as well as inspection result of judgment uniformity. .

If the above level include m factors, the general level arrangement of $A_1, A_2, \cdots\cdots, A_m,$ is respectively as $a_1, a_2, \cdots\cdots, a_m,$ the next level B include $B_1, B_2, \cdots\cdots, B_{m,}$ they are the

single level weight of $b_{1j}, b_{2j}, \cdots\cdots, b_{mj}$, (when B_k has no connection with A_j, , $b_{kj} = 0$), at that time, the general arrangement value is listed in the following table:

Table 4-4: General weight of level

Level A	A_1	A_2	……	A_m	General arrangement value of level B
Level B	a_1	a_2	……	a_m	
B_1	b_{11}	b_{12}	……	b_{1m}	$\sum_{j=1}^{m} a_j b_{1j}$
B_2	b_{21}	b_{22}	……	b_{2m}	$\sum_{j=1}^{m} a_j b_{2j}$
……	……	……	……	……	……
B_m	b_{n1}	b_{n2}	……	b_{nm}	$\sum_{j=1}^{m} a_j b_{nj}$

For uniformity inspection of step of level combination, we need to calculate level by level, that is carried out from top to low. If some factors of B level, the single arrangement uniformity for A_j is CI_j, the corresponding random uniformity is RI_j, so the random uniformity of general arrangement of B level is as follows:

$$CR = \frac{\sum_{j=1}^{m} a_j CI_j}{\sum_{j=1}^{m} a_j RI_j} \qquad (4\text{-}4)$$

Similarly, when CR is less than 0.1, we think step level has satisfied uniformity in level judgment, otherwise, we should change matrix or reconstruct it.

4.2 Index choice

The site selection of dry port firstly needs overall consideration, secondly is long-term consideration. The part should obey to the general, the current profit should obey to the long-term profit, we should not only consider the actual demand, but also consider the future development. Dry port is service for multimode transportation of international container, and international trade, so the site selection of dry port should use regional economy development as background. In addition, we should fully consider the regional economy development of covered area of container multimode transportation, the generation number, flow rate and flow characteristics, using it as center and strengthen transportation construction of container hub, extensively develop multimode transportation and display its superiority, so that achieves the aim of increasing the overall efficiency and profit, at the same time we should participate in the multimode transportation of container and get better profit. We should consider the following principles:

(1) Principle of meeting logistics resources distribution and market demand

Meeting distribution of logistics resources and market demand is the premise and aim of establishing dry port. Therefore, we should fully consider the resource distribution of candidate place, such as facility resources railway, road, water way as well as local development state of local enterprises, we should fully consider economic development and industrial structure of Liaoning, development trend and transportation demand for container of industrialization, commercialization and urbanization, in addition, we should also consider effect of regional development on container flow and direction.

(2) Principle of combining overall plan and regional plan

The site selection of dry port is uses transportation system of Liaoning as one overall system to plan for it, makes coordination the stable facility and equipment of dry port,

self-equipment and public equipment, regional distribution and technology level. From the overall perspective of Liaoning, establishing dry port can effectively cover the demand and production area of container transportation, so that adapts to demand of overall economy development of Liaoning achieves the aim of using container multimode transportation to accelerate local economy development. From the perspective of regional development, because there is unbalanced condition in regional economy development, in the process of multimode transportation for container, forming some cities and areas having many flow rate in container. These cities and areas have advanced allocation and distribution system, which have become the network section of container transportation, it has displayed important function in accelerating transportation quantity of surrounding areas. In the construction of dry port, we should consider these areas in key points, according to transportation characteristics relying on hub to establish corresponding facility of dry port. In general, the site selection of dry port concerns profit of owner and port etc, so we should evaluate the fees in site selection.

(3) Principle of seeking economic profit

Fees for site selection mainly includes construction fees and logistics fees, its place in different cities, its construction scale, land fees, construction fees are all different. We should use principle of the lowest fees in site selection.

(4) Dynamic strategic principle

Many factors related to dry port are stable, for example, number of users, demand quantity, operation cost, and traffic condition are dynamic factors. In view of this, we should consider the lay out of dry port by developmental perspective; carry out full investigation and consultation especially for city plan and development. Design and plan of dry port should also have certain flexibility mechanism, so that we can adapt to the change demand in environment in the future. Further speaking, site section of dry

port is not things of enterprise itself; the chosen dry port is also one part of Liaoning, concerning environmental protection, economic development and traffic facility etc.

4.3 Index system of establishing dry port

There are many factors influencing site selection of dry port, this thesis will use some main influence and summarize them as geography and traffic factors, economic basis factor and public facility factor.

4.3.1 Factor of geography and traffic

(1) Geography location

Generally speaking, logistics enter should be established in areas with large boxes, especially in some crossings if traffic or hubs relying on railway or road, these areas have frequent trade activities, economy is relatively developed, focus on self characteristics of dry port, we should also consider the traffic continence between dry port and Dalian port. This thesis uses road distance of city to measure it, the far the distance, the much more fees, so the index is negative in the index system.

(2) Water transportation

Capability of water transportation has big influence on establishment of dry port, it can measure whether city suitable for road traffic, detailed speaking, the water transportation of city is measure by the cargo handling capability of port. In site selection of dry port, the strength of water transportation has little demand for dry port, so this index is also negative in the index system.

4.3.2 Factor of economy basis

(1) Overall level of economy

Overall level in economy of areas will influence the generation amount of goods as well as goods amount delivered for live and production consumption. Economy in developed areas will promote formation and development of network of multimode transportation, while the formation for multimode transportation of container will also have promotion effect for regional economy. Therefore, establishment of dry port as the core of multimode transportation of container, we generally choose in the area with developed economy so that it can guarantee enough goods source. Dry port is generation of modern economy develops to some certain period, regional GDP is the important macro environment for dry port choose site. Its evaluation index is used as overall level of regional economy, the area with higher ecomonomy is suitable for site selection, and it can adopt GDP of each city and area to measure it.

(2) Trade condition of import and export

Dry port services for international trade have close relations with development level of foreign trade. Development scale of trade is one of the standards to determine whether area can establish dry port or not, area and city with higher development level in foreign trade subjectively needs support of dry port to sustain its international logistics operation. Multinational company and investment is one effective resources to accelerate foreign trade development, it is the basis of supporting dry port, so we use import index to measure import and export condition, choose the import and export amount as well as amount data of each city.

(3) Development level in industry

Industry is the main object service trade, its development level directly influences the

future operation and profit of dry port, and this is the important basis to judge site selection for dry port. Large industrial development scale has positive support function for international trade service, it is favorable for the construction and operation of dry port, this index can use overall amount of industrial production to measure it.

(4) Development level in logistics

Transportation is the basic form and important part in logistics, it can measure development level of logistics in some places, for convenient calculation, this thesis choose annual goods amount as measurement index.

(5) Development perspective in economy

Economy development level can be generally indicted by total production value, however, development perspective of economy is one dynamic concept, so it uses average growth speed of regional total production value as representative, the detailed data collective is the annual GDP growth speed from 2005 to 2009.

4.3.3 Public facility

(1) Road square in city

Road square in city is the total land utilization square of city road in certain area, it has important representative in public facility of city, this thesis uses it as one of the index for public facility in the candidate city.

(2) Investment in stable asset

Investment amount in stable asset can reflect the policy trend of one city, at the same time it can measure construction speed of city, in problems of site selection for dry port,

we will use it as one index of measuring development level of public facility.

4.4 Actual Application in Model of Site Selection

4.4.1 Introduction to candidate city

The comprehensive development of Liaoning locates at the top rank in north of China, city development is very quick and have social, economic and political conditions of establishing dry port. This thesis will adopt 13 cities as candidate cities as dry port in Liaoning province, it describes it from 10 political, social and economic index of traffic distance from Dalian road, cargo handling capacity of port, total production amount of area, total amount of import, total production amount in industry import and export, cargo amount, speed growth of regional production, investment in stable asset as well as road square meters (data of 2009, see table 4-5).

Table 4-5: Development conditions of cities in Liaoning

City	Distance from Dalian /km	handling capcaity of port/10000 tons	Regional GDP/100 million Yuan	Total import amount/100 million US dollars	Total export amount/100 million US dollars	Total industrial amount/100 million Yuan	Cargo amount (road and railway) /10000 tons	GDPgrowth/%	road square in city(10000 square meters)	(Investment in stable asset of project100 million Yuan)
Shenyang	384	0	4268.51	30.4679	35.2349	7637.0998	15159	14.1	5261	2245.5447
Anshan	299	0	1730.47	15.2582	10.3906	2049.3072	13627	17.2	1207	579.6331
Fushun	443	0	698.64	4.2957	4.5881	1203.3541	5724	14.1	1100	412.4079
Benxi	382	0	688.39	15.016	6.4629	1100.0994	7360	18.3	615	285.877
Dandong	316	406	607.52	5.6234	14.4908	708.0924	5506	16.6	743	355.6421
Jinzhou	379	89	727.3	9.4046	8.0647	1236.2583	7606	16	908	232.4103
Yingkou	220	581	806.96	4.7262	12.0037	1684.0552	10502	20.3	713	555.6802
Fuxin	477	0	287.97	0.0793	1.0608	313.7525	4181	16.2	453	148.8712
Liaoyang	320	0	608.26	2.2616	8.7013	1182.3113	7905	16.2	832	269.2279
Panjin	287	12	676.87	0.8288	2.923	1256.2385	5749	10	899	416.8259
Tieling	459	0	605.71	0.1078	4.2017	1435.2892	6914	18	806	544.5646
Chaoyang	471	0	518.09	0.8326	3.7027	736.118	4380	17.6	364	348.2666
Huludao	425	190	445.58	5.2848	4.8522	682.4205	8039	10	446	178.6647

http://www.zgsyb.com/GB/Article/ShowArticle.asp?ArticleID=511

(Northeast China, carriage index)

4.4.2 Primary data and pretreatment

This thesis uses X1 to represent the road traffic distance from Dalian (unit: kilometer), uses X2 to represent the cargo handling capacity (unit: 10000 tons), uses X3 to represent total import and export amount(unit: 100 million US dollars), X5 represent total import amount(unit: 100 million Yuan), X6 represent total industrial revenue(unit: 100 million Yuan), X7 represents cargo amount(unit: 10000 tons), X8 represents growth value of regional production(unit:%), X9 represents road square of city(unit: 10000 square meters), X10 represents investment in stable asset of project(unit: 100 million Yuan). This case adopts date of table 4-5; the index of the above is all from Liaoning Statistics Almanac of 2010.

In order to scale and calculation, we make treatment for the each index: 1) traffic distance from Dalian road, the cargo handling capacity is negative index, that is when we choose site for port, the candidate city should be near to Dalian, the handling capacity of port can reflect the development degree of this candidate city, obviously the site selection of dry port should not consider city with developed water and road traffic. So the data of 2 indexes adopts the maximum value from this index group and adopts negative, so makes its value range is between [-l，O]. 2) Regional total production value, total export amount, total export amount, total industrial production value, cargo amount, growth in regional total production, road square in city have negative effect on site selection of dry port, so the maximum and maximum value in this index group is between [0， 1]. The index after treatment is listed in the following table:

Table 4-6: Index value of city

City	Distance from Dalian /km	Cargo handling capacity / 10000 tons	Regional GDP/100 million Yuan	Total import Amount 100 million US dollars	Total export amount/ 100 Million US dollars	Total industrial amount/ 100 million Yuan	Cargo amount （road and railway）/10000 tons	GDP Growth /%	Road square in city(1000 square meters）	Investment in stable asset (100 million Yuan）
Shenyang	-0.805	0	1	1	1	1	1	0.6946	1	1
Anshan	-0.6268	0	0.0029	0.5008	0.2949	0.2683	0.8989	0.8473	0.2294	0.2581
Fushun	-0.9287	0	0.1637	0.141	0.1302	0.1576	0.3776	0.6946	0.2091	0.1837
Benxi	-0.8008	0	0.1613	0.4928	0.1834	0.144	0.4855	0.9015	0.1169	0.1273
Dan dong	-0.6625	-0.6988	0.1423	0.1846	0.4113	0.0927	0.3632	0.8177	0.1412	0.1584
Jinzhou	-0.7945	-0.1532	0.1704	0.3087	0.2289	0.1619	0.5017	0.7882	0.1726	0.1035
Yingkou	-0.4612	-1	0.189	0.1551	0.3407	0.2205	0.6928	1	0.1355	0.2475
Fuxin	-1	0	0.0675	0.0026	0.0301	0.0411	0.2758	0.798	0.0861	0.0663
Liaoyang	-0.6709	0	0.1425	0.0742	0.247	0.1548	0.5215	0.798	0.1581	0.1199
Panjin	-0.6017	-0.0207	0.1586	0.0272	0.083	0.1645	0.3792	0.4926	0.1709	0.1856
Tieling	-0.9623	0	0.1419	0.0035	0.1192	0.1879	0.4561	0.8867	0.1532	0.2425
Chaoyang	-0.9874	0	0.1214	0.0273	0.1051	0.0964	0.2889	0.867	0.0692	0.1551
Huludao	-0.891	-0.327	0.1044	0.1735	0.1377	0.0894	0.5303	0.4926	0.0848	0.0796

4.4.3 Site selection by AHP

(1) Confirmation and uniformity inspection of judgment matrix

In site selection for dry port, the target level is subjected to influence of 4 decision factors, while 4 decision factors are respectively influenced by each sub-decision factor, through comparison among each relative factor and level structure table, we can construct judgment matrix and carry out uniformity inspection. The evaluation index of this thesis is divided into 2 levels, through marks of relative experts, getting judgment matrix of each factor.

1) Matrix construction and uniformity inspection on principle level

Table 4-7: Judgment matrix of the first level

	Geography traffic	Economic base	Public facility
Geography traffic	1	3	5
Economic base	1/3	1	2
Public facility	1/5	1/2	1

We can get that characteristics vector is $W = (0.6483, 0.2297, 0.1220)^{T}$, characteristics root $\lambda_{\max} = 3.0037$. Uniformity inspection: $C.I = \frac{\lambda_{\max} - n}{n-1}$=0.0018，, according to RI, the average and uniformity index, get R.I.=0.52 by value table, so $C.R. = \frac{C.I.}{R.I.} = 0.0035$<0.1, so we judge that judgment matrix passes the uniformity inspection, each factor of matrix is reasonable.

2) Structure and uniformity inspection of sub-principle geography traffic factor

Table 4-8: Judgment matrix of sub-principle level（geography traffic)

	Distance from Dalian port	Handling capacity of port
Distance from Dalian port	1	1/3
Handling capacity of port	3	1

We can get that characteristics vector $W = (0.25, 0.75)^{T}$, characteristics root $\lambda_{\max} = 2$. Passes the uniformity inspection, for judgment matrix of $n \le 2$, there is no in-consistence problem.

3) Judgment matrix and uniformity inspection of sub-principles economy factor

Table 4-9: Judgment matrix of sub-principle(economic basis)

	Regional total productio n value	Total import amount	Total export amount	Total industrial productio n value	Cargo amount	Growth of regional productio n value
Regional total production value	1	1/3	1/3	1	1/3	1/3
Total import amount	3	1	1	3	1	1
Total export amount	3	1	1	3	1	1
Total industrial production value	1	1/3	1/3	1	1/3	1/3
Cargo amount	3	1	1	3	1	1
Growth of regional production value	3	1	1	3	1	1

We can get that characteristics vector

$W = (0.0714, 0.2143, 0.2143, 0.07143, 0.2143, 0.2143)^T$, characteristics root $\lambda_{\max} = 6$ passes the uniformity inspection, $C.I = \frac{\lambda_{\max} - n}{n-1} = 0$, so $C.R. = \frac{C.I.}{R.I.} = 0 < 0.1$, so judgment matrix passes uniformity inspection, each factor of matrix is reasonable.

4) Construction of judgment matrix and uniformity inspection of sub-principle in public facility

Table 4-10: Judgment matrix of sub-principle（public facility)

	Investment in stable asset in project	Road square in city
Investment in stable asset in project	1	1/3
Road square in city	3	1

We can get characteristics vector $W = (0.25, 0.75)^T$, characteristic root $\lambda_{\max} = 2$ passes the uniformity inspection, for judgment matrix $n \le 2$, and there is no uniformity problem.

(3) General arrangement and uniformity inspection

The weight value of calculating all the factors of the same level for the highest level (general target), it is called as general arrangement of level. This course is carried out from the highest level to the lowest level, therefore, we can get the weight of sub-principle level factor M on general target F.

Table 4-11: General arrangement of level

Principle level Sub-principle level	Geography traffic	Economic basis	Public facility?	General weight
	0.6483	0.2296	0.1221	
X1	0.1667			0.1081
X2	0.8333			0.5402
X3		0.0781		0.0179
X4		0.2109		0.0484
X5		0.2109		0.0484
X6		0.0781		0.0179
X7		0.2109		0.0484
X8		0.2109		0.0484
X9			0.25	0.0305
X10			0.75	0.0915

Comprehensive characteristic vector

$W = (0.1081, 0.5403, 0.0179, 0.0485, 0.0485, 0.0179, 0.0484, 0.0484, 0.0305, 0.9152)^T$,

that is in site selection of dry port, the arrangement of importance is as follows: X_2 is the handling capacity of port, X_1 is the distance from Dalian port, X_{10} is the total investment in stable asset, X_4 is the total export amount, X_5 is the total import amount, X_7 is cargo amount, X_8 is total value growth of regional production, X_9 is

road square in city, X_3 is total amount of regional production, X_6 is total industrial production amount.

Afterwards, calculating the uniformity of level arrangement, according to $CR = \frac{\sum_{j=1}^{m} a_j CI_l}{\sum_{j=1}^{m} a_j RI_j}$, of which, CI_i is corresponding to a_i ,uniformity inspection of judgment matrix in M level, CI_i is corresponding to a_i the average of judgment matrix in M level, that is uniformity index. Getting CR=0, <0.1, so calculation result of level arrangement has satisfied uniformity.

(3) Optimization result and analysis

Using 13 indexes of dry port cities in Liaoning into the level analysis model, getting the comprehensive marks of each city, see table:

Table 4-12: Comprehensive marks of cities in Liaoning (CR can be less than 0.1)

City	Comprehensive marks
Shenyang	0.2499
Anshan	0.0908
Benxi	0.0341
Liaoyang	0.0281
Tieling	-0.0002
Panjin	-0.0006
Fushun	-0.0063
Chaoyang	-0.0241
Fuxin	-0.0438
Jinzhou	-0.0594
Huludao	-0.1950
Dandong	-0.3400
Yingkou	-0.4500

Observing comprehensive marks of each city, we can find that economic development

in Shenyang, Anshan, Benxi, and Liaoyang is very quick, the public facility is relatively better and has high marks, they are the cities firstly taken into consideration in establishing dry port. While for some cities listed in the behind, Dandong, Yingkou has good economy base and public facility, but these cities are near the sea, they can develop sea transportation, so they have low marks in establishing dry port, they are beyond consideration. In the process of developing dry port group in Liaoning, we can consult comprehensive marks to choose site.

The optimization process and result is only used in Liaoning, it is one reference for site selection within province. Of course, establishment of dry port in Dalian is one slow process, we should not stay within province, we should keel eyes to the whole hinterland of northeast China as well as north China, the optimization model is also suitable for large-scale site selection under data support.

Chapter 5 Evaluation on Site Selection of Dalian Dry Port

5.1 Notices on plan implementation of dry port

Plan implementation of dry port, the key point lies in that agreement using dry port as connection and system construction of EID, this thesis will illustrates as follows:

(1) Cooperation of each department by using dry port as connection

Firstly, dry port as one kind of innovated transportation organization, it is also one complicated transportation system, government organization must participate in each aspect of container transportation, firstly is to make regulations, by laws and regulations to restrict participant behavior of multimode transportation for container, carry out indirect management for container, secondly is to set up special organization, directly participate in the management in the process of container transportation. In addition, custom is responsible for all the custom matters, including custom clearance of goods, custom charge, charging (import value-added tax) or drawback (import added-value tax) carry out statistics for container import and export. Custom should keep close contact with owner, goods agent, ship owner, ship agent, operation of container dock, operator of inland container facility, health quarantine bureau, animal and plant quarantine bureau, tallying company, operator of container dock, agent of inland container as well as operator of inland container facility.

(2) Information platform construction of dry port

Nowadays, the application of network technology in trade information is the inevitable

development trend. In international trade, plenty of contracts and document related to trade and transportation need to be signed, reviewed, send-off, acceptance, the disposal of traditional work is subjected to be recorded, transited and transacted in the form of paper. If dry port adopts this manner, it is not only slow but also easy to make mistakes and costly. With the popularization and development of computer technology, people can use office auto technology of computer to do reasonable transaction and transmission of commerce and trade information, which has become the development trend of information transaction. Therefore, in the establishment of dry port, it is one important part to accelerate platform construction of port information, especially for EDI construction.

5.2 Measure of promoting development of dry port

Focus on the special geographical position, economy facility and public facility of Dalian port, this thesis proposes the future development suggestion:

(1) Layer suggestion of Dalian port

Establishing dry port according to requirement of establishing the fourth port

Under the new situation, port must display its superiority and continually strengthen itself, this is the demand of well participating in labor division and cooperation of supply chain, but also the demand of continues development; dry port is also an exception. Establishment of dry port is based on function of the third port, it more stresses interaction of each port and coordination between dry port and supply chain in logistics activity, meeting requirement of transportation market for port difference, provide diligent work and sensitive service, so that forms flexible inland port and accelerates the seamless connection among relative supply chain of dry port.

2) Adopting flexible cooperation manner

Construction fees for dry pots is costly, in the process of investment and construction, we should adopt flexible and diverse cooperation manner, for example, the local government can put investment by land, port can put investment into construction of dry port, cooperate with railway department, by using its container logistics center of container cargo station to establish dry port, using local logistics place to cooperate with logistics enterprise or production enterprise to establish dry port, it can also integrate logistics company with local inland port, road port to accelerate the construction of dry port, for some mature areas in logistics development, we can directly adopt means of business cooperation to construct dry port.

(2) Suggestion of government

1) Accelerating the fracture construction of transportation and network

Inland dry port needs better transportation conditions and form reasonable delivery network, this can expand radiation range and increase goods source, change the source shortage situation in inland dry port, enlarge its scale, it can also further attract container, international delivery agent and international boat to reside in local area. If we want to form reasonable network for transportation, we should not only strengthen cooperation of each province and city, but also need to master different transportation of countries to strengthen cooperation, so that form the seamless connection of each transportation manner.

2) Strengthening cooperation with local government and department

Many locals actively connect with large port and discuss construction of dry port project in order to develop local economy. Its construction needs forceful cooperation of local government, including propaganda and coordination etc, which needs close coordination and active support from local bureau, local custom, inspection, railway,

road, foreign exchange, bank and other relative department, it also needs forceful support from boat company and goods owner. Of which, the negotiation and support of custom is the important guarantee to establish dry port. If without support from custom, inland dry port will have no energy and superiority, so it can not display other effects. Therefore, establishment of dry port needs support from local government and enterprise, especially for the negotiation of custom; it is also an necessary condition and requirement. If we want to achieve the cooperation of the above department and enterprise unit, one important work is to strengthen understanding of each party on dry port. At the same time, government department should make well in planning of dry port.

Dry port, as one new transportation organization and one complicated transportation system, it contains double superiority in efficiency and profit. Firstly, for Dalian port itself, establishing dry port is favorable to attract business and investment, expand economy hinterland, guarantee the smooth supply chain with Dalian port, accelerate the favorable development, secondly, for city of dry port cooperating with Dalian port, it can accelerate development in regional economy, reduce economic difference between developed are and undeveloped area.

Chapter 6 Conclusion

Development of dry port has become one of the most important topics of each port in China, so its site section emerges as the times require, this thesis will develop study on the site selection of dry port in Dalian port.

(1) Carrying out study on dry port from 3 aspects: connotation, function and development situation.

(2) Using development status of Dalian port as background and carrying out feasibility analysis from 2 aspects in analysis on logistics profit and social feasibility, demonstrating the necessity and feasibility for Dalian port to construct dry port.

(3) Using analytical hierarchy process in the site selection of dry port of Dalian port, constructing the index model of site selection of fry port.

(4) Collecting the index data of 13 cities in Liaoning province, and using it in the index model, by using analytical hierarchy process to get the basis for site selection of each city through comprehensive marks and ranking. By observing the comprehensive mark list of each city, we can find that Shenyang, Anshan, Liaoning and Benxi have quick speed in economic development, the public facility has higher marks than inland, they are the cities that first taken into consideration for Dalian port to construct dry port.

(5)Carry out evaluation for site selection of Dalian port, proposing notices and measures.

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