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The development pattern and competitiveness evaluation research on China inland dry port

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The Development Pattern and Competitiveness Evaluation Research on China Inland Dry Ports

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DRECLARATION

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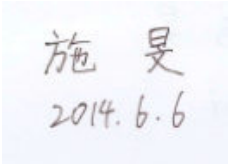

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Abstract

With the trend of economic globalization, the appeals of the development of various coastal ports and inland cities in different countries and the objective requirements of container multimodal transport, jointly promote the construction and development of inland dry ports. Dry port, as an important inland area's node in transportation, play an important role in improving the efficiency of transport services and promoting regional economy.

The practice of China's inland dry ports' construction started from the year 2002. It is developing rapidly and its scale is growing. But at the same time, due to lack of experience, there existed a lot of problems to be solved. So analyzing dry ports and putting forward the new ideas for their construction and development have important significance for their benign development.

In order to make the development of inland dry ports adapt the requirements of economy and transport under the new situation, realizing their independence and scale, we take the theories of competitiveness analysis and comprehensive evaluation as the guidance, combining the theory and practice, both making qualitative and quantitative analysis. On the one hand, we put forward the new pattern of China's inland dry ports' development, and analyze their operations thoroughly. On the other hand, we set up comprehensive evaluation index system to ingrate the AHP method and Fuzzy comprehensive evaluation method, making scientific analysis and evaluation research for the competitiveness of China's typical inland dry ports, making clear the competitiveness strength conditions and putting forward countermeasures and suggestions for the future development of inland dry ports.

Key words: Inland dry port; Competitiveness evaluation; AHP method; Fuzzy comprehensive evaluation method

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1. Introduction

1.1 Research Background

The generation and practice of the concept of inland dry port gradually developed with the trade globalization and the trend of cargo containerization. So called inland dry port, in essence, is a transfer station which provides services for shipping companies and inland shippers and consignees. Except for the operations of the coastal ports such as lading and discharging cargo, the function of inland dry port is quite same as the harbor. Under the direction of global economic integration, the appeals of ports and inland cities and the needs of container multimodal transport jointly promote the inland dry ports' construction and development.

On the one hand, every year the increasing amount of foreign trade makes the modern port develop towards a link in the supply chain and how to find a next high efficiency operation link to ensure that the whole supply chain is unimpeded is a problem worth studying. And with the increase in the number of ports, the competition between ports will become more and more fiercely. So how to gain a broader economic hinterland and the supply of goods will be a very important topic in the port operators' agenda. In the meantime, under the trend of trading globalization inland cities and regions is also trying to open up new way of economic growth. Foreign trade enterprises hope that customs declaration and inspection can be done directly in the local to increase their amount of foreign trade and to create condition for investment and economic development. The inland dry port is a modern logistics center whose location is inland but function is quite similar to harbor is a modern logistics center which is arisen under the two side joint promotion of land and sea and continuously developing with the expanding trade volume.

On the other hand, the emergence and development of container mode of transportation promoted the development and construction of the inland dry port through its requirements to the multimodal transport. In recent years, the throughput rate of container is increased more than 10% every year. Even under the situation that shipping industry is severely

impacted by the international financial crisis, global container throughput in 2010 still maintain rapid growth and China complete the throughput of 145 million TEUs, which grew 18.8%; The growth speed of container throughput in the developed countries such as European countries, America and Japan is more than twenty percent. As surge in the requirements of container ship capacity, the kinds of container cargo become more and more and large-scale container ship technology continues to mature, the advantage of international container transportation has more and more fully embodied.

The transformation of traditional “Port to Port” service to new-type “Door to Door” service has higher requirements to multimodal transport service level and efficiency. So, inland dry port, as the space aggregation of international container multimodal transport channel process on the node, not only relieve the pressure on the yards of coastal ports for a large number of container, but also to be a hinge to distribute a large number and a wide range of container. With the development of multimodal transport, inland dry port is becoming the breakthrough and the key point of promoting integrated transport service efficiency.

The practice about dry port construction in our country since the year 2002 when Beijing Chaoyang port and Tianjing port ratified an accord about direct connection, constructing and operating from nothing, made a great progress. So far, relying on Lianyun port to construct Changchun and Haerbin dry port; relying on Tianjing port to realize sea-railway combined transportation and layout new Asia-Europe continental bridge group; establishing dry ports in several cities such as Jinhua, Yiwu, Shaoxing, Yuyao and Quzhou around Ningbo port. The construction of dry port has made great contribution to improving the efficiency of multimodal transport, broadening the port exports and boosting inland economy. However in the process of the development and construction of dry port, large ports are mostly to be the leading factor while inland dry ports are just as back distributing center for broadening market, attracting supply of goods, which is not able to fully play the real role of the port. But in the face of international trade which is under the influence of today’s financial crisis, dry port both have the challenge of attracting the supply of goods to sustain economy under the situation that the foreign trade is collapsing and the opportunity of expanding domestic demand, making growth in domestic trade promote

domestic trade transport. As the role of the logistics center, the function of dry port will be more obvious and to some extent, the development of dry port will benefit the port and even the entire national economy growth. So it is necessary to conduct a comprehensive analysis and evaluation for its construction development and operation ability.

1.2 Literature Review

Some domestic and foreign scholars have done quite a lot of research on dry ports. The research is associated dry ports with enhanced seaport efficiency, relieving congestion without capacity expansion. Also, they posited how dry ports being essential elements in the competitive position of seaports, as they acted to facilitate access to hinterlands.

(1)Research on the concept and development modal of dry port

For the concept and development modal of dry port, Theo E.N. and Jean-Paul. (2000) [1] published an article to state their view that the development of inland dry port is a process that it transforms from original inland container depot to multimodal transfer station, gradually expanding its functions and business scope and become an inland dry port covered comprehensive trade, logistics and customs clearing functions. Johan Woxenius, Voileta Roso and some other scholars (2002-2005) [2-5] published articles respectively also illustrating the similar views. Among of them, Johan Woxenius put the generating mechanism of dry port as the breakthrough point, analyzing the network structing and operation of dry port and then proposed the concept of inland dry port. Johan Woxenius also combining with actual, classified dry ports in view of the relative role of dry port and harbour and he introduced inland dry port's development process, the influence of related inland economy and trade, the transportation mode changes between port and inland and the changes of economic status on the basis of it.

(2)Reaserch on the operation management of dry port

For the operation managemrnt of dry port, Balis, A., Golias, J. (2002) [6], Violeta Roso, Johan Woxenius, Goran Olandersson. (2006) [7] (2007) [8] published the articles

respectively to discuss the influence to the environment for the construction of dry port, the role of promoting regional economic development as the node of international trade, reducing the transportation cost to increase trade transfer efficiency, solving the problem of inland hinterland transport externality and so on.

Due to the dry port and relation problem is a practical research object, so most of the studies abroad in recent years combined with the actual construction and development and try to use scientific theory to guide and assist development. Andrius Jarzemskis, Aidas Vasilis Vasiliauskas (2007) [9] published articles. Through the investigation of the Baltic Sea container business, they made a research of the ports and their related organization, analyzing different main bodies' opinions and suggestions of the construction of dry port, analyzing from different angles that how dry port should operate to attract more operating subjects to join and comparing the operation of the main bodies participated. In the year 2010, the port logistics organizations, local agencies and university institutes of some European countries, such as Germany and the Netherlands, opened the dry port project together. [10] The project was lasting for three years, which mainly aimed at the northern sea port, studying its development and planning how to cooperate with port operation. The research project aimed at providing harbors with lager capacity, improving the function of inland transportation and based on multimodal transport, promoting the development of inland dry port. Since the project has been carried out, it fully combined with the practice and discuss the inland dry port from multiple views, which contributed a lot to the whole Europe transportation system.

(3)Research on the inland dry port location

For the location selection of the inland dry port, Rutten, B.C.M (1998) [11] published the article which introduced the development of inland multimodal transit nodes, the layout of the transportation network, inland dry port location selection and etc. The article analyzed the development motive power and selecting influencing factors of the dry port. It also compared various location selecting method, making quantitative research and verifying by examples, which provided a theoretical basis for dry port's construction and layout.

Zhang Zhaomin (2007) [12] analyzed the dry port location selecting principle. He put forward site planning influencing factors from regional container quantity and transit container quantity two aspects. He also applied the fuzzy C- mean method to set up dry port site selection model and combining with existing development planning examples made constrastive analysis. Wang Hongwei (2004) [13] systemically analyzed the hardware and software such as layout, container operation, processing equipment, EDI construction and etc. She also applied discrete choice theory to set up dry port site selection modal and compared the results whit AHP analysis method, which showed some certain advantages. Yang Rui(2006) [14] used DEA technique, preliminary selecting candidates for dry port's address and then applied AHP- Fuzzy comprehensive evaluation method to sort candidate address obtaining the best building location of the dry port. Tan Ka [15] (2009) made establishing dry port group around Guangzhou port as the research object, analyzing its feasibility and using AHP method to analyze the site selection of dry port group instances.

(4)Inland dry port research of several specific cities in China

For the practical study of the dry port, many domestic scholars, staffs of port enterprises and relevant institutions wrote many articles. They not only analyzed the present development situation, existing problems, countermeasures and strategies of research of inland dry port in China from the macroscopic perspective, but also analyzed the regional construction of inland dry port. Wang Huanming (2008) [16] based on the home and abroad empirical research of inland dry port's construction, analyzing the problems being faced and development strategies of setting up inland dry port in Chengdu. Liu Yang (2009) [17] analyzed the construction of Asia- Europe continental bridge inland dry port in Tianjin. He forecasted the demands of continental bridge, analyzing the necessity of the construction of dry port and putting forward the general idea of layout from line, station and goods flow three aspects. Similarly, there are also quite a lot of analyses [18-23] for status quo, prospect and strategies of inland dry ports in Xian, Shijiazhuang, Nanjing, Nanning, Guizhou, Nanchang, Jinjiang and etc.

From the above home and abroad dry port related research literature, we can see that in foreign countries, especially America and European countries, due to their long-time practice of dry port, so the related research started earlier and the concept has been clearly

defined, which laid the foundation for further research. So far, various resources have been well used and the research has a considerable scale. No matter in theory research aspect or practice application aspect, China is backward. China started a little later in two aspects. The first is that further research on the location of dry port, applying a variety of models and using different algorithms to optimize a site selection problem is scare in China. The other is that most of the research is limited to how to increase intensity support on the basis of qualitative statement current situation to set up dry port. But currently, the study of overall considering dry port operation efficiency, selecting various factors to evaluate constructing or constructed dry port is relatively less. The reasons are as follows: evaluation content and location selection are repetitive, the operation time of dry port is short, the system and regime is not complete, the actual operation is not mature and there are some difficulties in effective evaluation. All above problems provide a broad space for the paper research on inland dry port competitiveness evaluation.

1.3 Research Purpose

The main goal of this dissertation is that starting from the independence of inland dry port, based on the analysis of the present stage development of dry port in China, put forward the new development model of inland dry port and choose typical inland dry port cities, such as Shijiazhuang, Nanning, Chengdu and Xian for analysis, by using SWOT analyzing, preliminary judging their basic capacities and then choose the appropriate evaluation indexes to establish a comprehensive evaluation system to make a comprehensive evaluation analysis of the competitiveness of inland dry port. The suggestions will be put forward on the macro level to the development of inland dry port and the strengths and weakness of each inland dry port will be identified on the micro level. Finally, fostering strengths and circumvent weaknesses, provide advice for the planning of future development direction and the formulation of operating strategy.

1.4 Research Method

The dissertation will use several research methods. The first method is integrating theory with practice. In this paper, the port competitiveness evaluation theory of port will be combined with the actual constructing and developing situation of inland dry port. In view of the present development situation and future planning for the typical inland dry port, the author will carry through comprehensive competitiveness evaluation and guide the actual construction of inland dry port in theory.

The second method is combing qualitative statement with quantitative analysis. When the author analyzes the inland dry port, the author will make qualitative SWOT analysis for inland dry port development and construction combined with quantitative competitiveness evaluation to illustrate the necessity for improving inland dry port's competitiveness. In the process of making comprehensive evaluation for its competitiveness, the indexes such as transport capacity, transport distance and economic data will be selected from quantitative angle. For other indexes such as social benefits and government support which are hard to be qualified, the author will determine them from qualitative angle and combine both of them to build a comprehensive evaluation index system to complete the competitiveness evaluation of inland dry port.

The third method is combing micro with macro benefit in the inland dry port's constructing and developing. Look from the micro perspective, the purpose of each typical city constructing dry port is to put it as the driving force and to promote area social economy well-rounded, which are able to enhance comprehensive benefits. Look from the macro perspective, the construction of inland dry port is also global. How to make overall planning, optimize configuration and avoid duplicated construction or scattered transport capacity will have profound effects on the whole national economy's development. When the author is making a study of the inland dry port's development pattern and competitiveness evaluation, micro and macro will be combined organically, which not only benefits formulating the port's own strategies, but also enhance the efficiency and effectiveness of regional layout. And then realize the benign development of the inland dry port.

2. An overview of dry port

2.1 The conceptual analysis of dry ports

2.1.1 The definition of dry ports

When the concept of "dry port" has been put forward, the definition of "dry port" was given by different authorities and scholars. As early as the year 1992, the American association of container described "inland dry port" as the inland container facilities staying away from ports, which provides services for containers and goods in and out of the inland, such as loading and unloading, short-term storage, customs inspection and etc. The main aim of constructing inland dry port is to realize the containerization, bringing benefits to inland cargo transportation and promoting the containerization of inland cargo transportation. According to the definition given by European commission [24, 25], dry port is an inland freight station directly connected to the harbor. Violeta Rose considered that dry port is an inland depot which directly connected to the port through a big capacity transportation mode and customers receiving and sending containers as if direct delivering in the harbor. Our country is generally accepted that dry port is the inland hub in the container transport network hub and goods distribution center, as well as the connecting point between road concentrating-evacuating and highway-railway transport, which provide distribution, loading and unloading, container short-term storage, customs inspection and other related business for the containers in and out of the port. Dry port extends seaport function to inland except loading and unloading, which relieve container goods pressure to the port and speed up distribution and circulation of container cargo.

The different definitions of inland dry port at home or abroad reflected the differences of dry port development in different region. It also reflected the different demands for the function and development of dry port from different main body. At the same time, with the continuous development of practice, the definition of dry port also had some limitations.

Combining the position given by this paper of inland dry port and internal demand of inland dry port under new situation, in essence, inland dry port should has the following characteristics:

(1)Through large- scale transportation of large capacity mode to butt joint to the harbor. New type inland dry port is not only a simple sense of inland container depot or transit. Not any inland cities or regions which gained approval and connected to the port through the mode of transportation to realize multimodal transport can be called dry port. Instead, inland dry port is the center which distributes supply of goods around by building railway train straight to harbor to gradually replace container multimodal transport once mainly depending on road transportation to reduce cost and achieve scale economies.

(2)Produce significant social benefits. Carrying on the former trait, inland dry port is not only the solution to provide convenience to inland shippers and consignees or to ease the insufficient storage ability of harbor, but also a pathway to solve the urbanization problem today. The city that big coastal ports are relying on is generally the important economic town of the country or the internationalization city. Their land resources are increasingly inadequate, but expanding harbor need place to process business operation. Inland dry port made harbor yard move rearward to a great extension, which relieved land use pressure of harbor cities. In the meantime, gradually adjusting the proportion of multimodal transport can also both realize energy conservation and emission reduction and reduce the number of motor vehicles moving in the harbor cities, which can bring social benefits.

(3)The most fundamental characteristic of inland dry ports is independence. The inland depots, in accordance with the views in this paper, are not regarded as the real sense of inland dry ports. Inland dry ports should be able to distribute cargo independently according to their own development needs and realize the port functions. It should not be limited to a certain harbor, but realize the in and out of container cargo through multiple ports and on this basis, promote import and export trade through railway, highway and air transport, serving inland economy hinterland and domestic and foreign trade body as the real port.

Based on the above summary and analysis of different definitions, to meet the needs of this study, the author puts forward the concept of inland dry port. Inland dry port is a large-scale and independent logistics center which is founded in inland areas, connecting to the harbor by railway transport prior and road transport complementary. In addition to loading and unloading ships, it has all port service functions, such as customs declaration, commodity inspection, issuing bill of ladings and etc.

2.1.2 The difference between inland dry ports and other related concepts

In the practice process of the development of international container multimodal transport network, some facilities whose concepts and functions are close to inland dry port appeared, such as inland container depot, container freight station, container terminal and etc. Analyzing the differences and relations between inland dry port and these concepts can make the nature, characteristics and functions of the research object more clearly and in the meanwhile, make the research more pointed.

The formulation of Inland Container Depot (ICD) began in 1983, India. In 1992, the United Nations defined ICD as Inland container facility which is situated inland or away from port and provides services for containers or goods in and out of the station, such as loading and unloading, short-term storage and custom services. The main purpose is to achieve the benefits of containerization for inland transportation. Shipping companies issued the bill of lading and being responsible for transport and the customs monitored it. Container Freight Station (CFS) is the place which deals with the handover for LCL vessels or goods packing and unpacking. The main difference between ICD and CFS is that ICD reflects the goods distribution function while CFS serves for LCL packing and unpacking. The construction of Container Terminal was put forward for the construction of double layer container transport channel in China. It is a professional, modernized and radioactive to surrounding areas giant network container freight station which professionally handles the departure and arrival of container train and whole container train loading and unloading. It is the center of the national and regional railway container transport.

By comparing the above formulation and dry port, the function relationship of every facility is summed up as Chart 2.1.

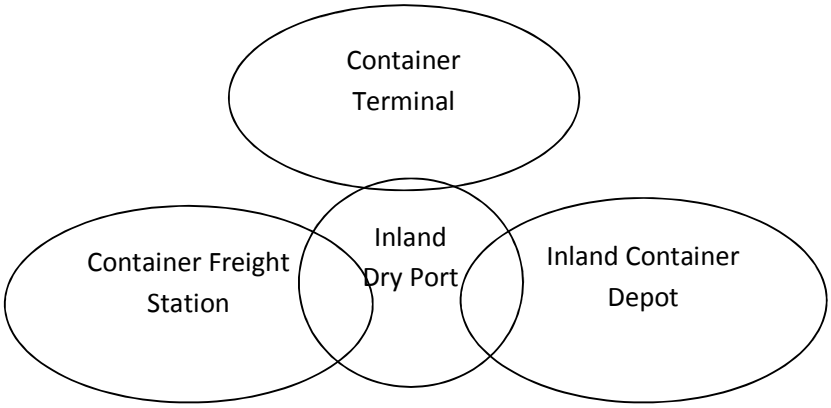


Figure2.1 The set relationship of inland dry port and its relevant definitions

The differences between inland dry port and its relevant definitions are as follows:

(1)Inland dry port is generally constructed on the region where there is a large number of suitable container cargo or a large number of sources covered. The domestic and foreign trade in these regions is frequent and their economy is relatively developed. The original purpose of the construction of dry port is to promote local economic development. CFS and ICD are constructed in some traffic intersection or hinge node relaying on railway or highway. Their construction is mainly considered traffic convenience. Although inland dry port is generally built in the traffic developed area, but the start point of its construction is different.

(2)Inland dry port has more abundant and more perfect functions than those of Container Terminal. According to the above relevant definitions mentioned, some operations are not able to be completed in the inland. Certainly, this will bring more pressure to the port and block the port at the same time. When inland dry port is established, the most obvious

change is that shippers and consignees can complete customs clearance here, completing "one customs office with three inspection projects". On this basis, it can also realize value-added comprehensive logistics functions. The operation of dry port makes trade subject avoid the redundant transit link, shorten the cargo demurrage time and save the costs.

2.2 Function analysis of dry ports

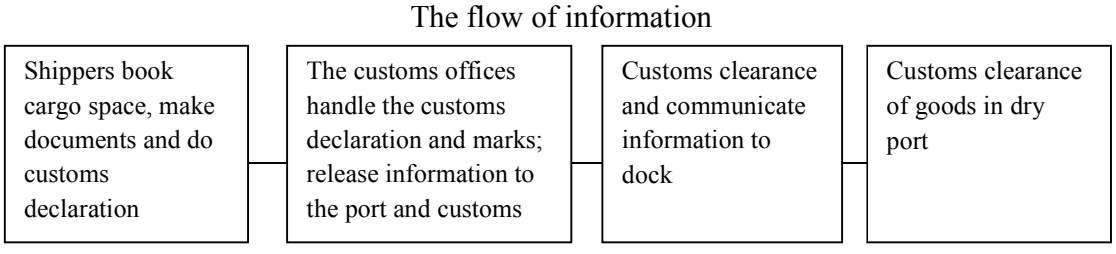
Dry port is similar to sea port and river port. As the city port of export-oriented economy and the important factor promoting the development, inland dry port both have its inherent microscopic function to deal with the operation of container and can drive the transportation network of the city and the surrounding hinterland, which have macroscopic effects on city and regional social economy development.

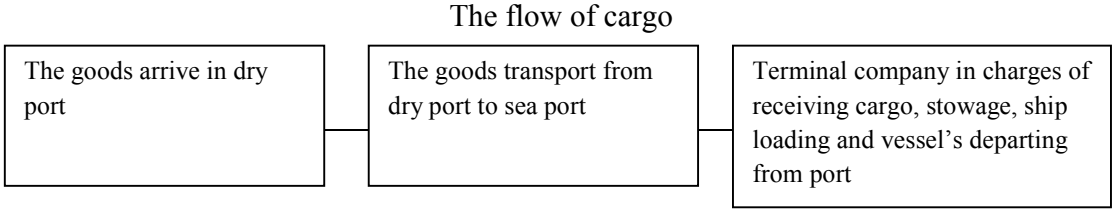
2.2.1 The micro business service function

An independent inland dry port with scale is not just the static aggregation of yard, vehicles, infrastructure and etc. It is the multi-function inland comprehensive logistics center which can meet the requirements of international container inland transportation. It should contain the following major functions:

(1)One of the most important functions: the inland port district of the coastal ports; (2) Container distribution and transshipment function; (3) Rapid distribution of goods, providing convenient "Door to Door" service to the owners, this is also the necessary condition whether the dry port is effective; (4) The node function. Dry port can provide import and export container delivery, storage, stockpiling and transit services, which meet the shippers', consignees' and ports' requirements for goods collecting, distributing and flow direction. Dry port is put to be the node to organize multimodal transport, the long and short transition, main line and branch line connection transformation [26] ; (5) Cargo processing. Dry port implements the collecting and distribution of cargo, and on this basis provide devanning, LCL service, cargo handling, processing, packaging, distribution and

integrated logistics services; (6) Empty container handling. After reaching an agreement with shipping company, dry port can be used as the shipping company agent handing over, taking care of and dispatching empty containers. What's more, dry port can also provide services for empty containers, such as maintenance, fumigation and etc. These save the land resources of sea ports and give convenience to trade body to dispatch empty containers; (7) Being able to handle the international container multimodal transport business (the core function of dry port). Dry port sets up "one customs office with three inspection projects" services; (8) Effective information management and EDI. Inland dry port should be an organic combination of goods and information. While inland dry port accepts, manages and passed the transport documents to related parties, it also makes dynamic tracking management for goods and vehicles to ensure that inland dry port interfaces with sea port seamlessly. Combined with the port function, the introduction of inland dry port's container import and export business process will greatly improve efficiency. The specific process is shown as Figure 2.2 and Figure 2.3 [27]. (9) Other service functions. The auxiliary businesses, such as bank settlement, underwriting insurance, the maintenance of infrastructure and machinery vehicles and etc. are promoted around the port core functions.





The Timeline

Figure 2.2 The export mode of inland dry port

The flow of information

Shipping company publishes information to port and dry port and customs approves customs clearance	Terminal approves documents again and gives related electronic information to dry port	The dry port customs audit documents and information and then release cargo

The flow of cargo

On the way to the port of discharge	The cargo arrived at port and the shipping company picks up the cargo	Transport cargo from sea port to dry port	The cargo arrived at dry port and the owner delivers order, picking up the cargo

The Timeline

Figure 2.3 The import mode of inland dry port

2.2.2 Macroscopic social economic function

The function of inland dry port not only embodies in the extension of port business development, container multimodal transport and the improvement of inland transport efficiency, but also embodies in its scientific and effective planning which can fully optimize resource configuration, reducing the cost greatly, collecting and distributing the large number of goods in its coverage area, promoting investment and introducing capital and promoting regional economic development. These embodied in the following aspects:

(1) Be conducive to the implementation of the effective management and operation of inland container transportation. In the static view, lots of storage sites can realize the unified management and deployment of container in inland; in the dynamic view, inland dry port opened up railway train to integrate a large number of container transportation once collected and distributed by road, which form scale operation. These two aspects implement management optimization together.

(2) Be conducive to improve port competitiveness. On the one hand, from the inland dry port itself, it has independent customs office qualifications and complete operating facilities, which can make shippers and consignees tends to choose dry port as the hinge of cargo collection and distribution to improve the competitiveness of dry port city; On the other hand, linking with the sea port can release the passing capacity of sea port, giving more convenience to shipping companies and shippers, attracting trade flows and indirectly promoting the competitiveness of the sea port.

(3) Be conducive to promote coordinated development of regional economy. The construction and development of dry port strengthened the connection between inland areas and global economy. It also repositioned the city which it is located in the global division. The broadening of port business and the status as a transport hub can promote the construction and development of relevant industries, improving the investment environment and promoting regional economic improvement.

3. China dry ports development pattern analysis

3.1 China dry ports development present situation analysis

3.1.1 The formation and development motive power of China dry ports

(1) Demand power—the objective needs of the development of international container logistics [28]

The development and deepening of international trade made the subject participated expand from world traditional coastal cities to inland area. This requires that the international container transportation with large-scale only on the sea needs to develop to modern comprehensive logistics with large-scale, shortening the transport time, saving cost, realize the seamless transportation and improving the efficiency of multimodal transport. This trend objectively requires modern container logistics should have following characteristics: 1) Low cost, that is, the shipper requests that logistics transportation cost accounts for the minimum proportion of the total cost; 2) Timeliness, on the one hand, refers to deliver cargo timely and accurately. On the other hand, refers to carrier's requirements for container arrival and loading time; 3) Scale, that is, the inland transportation connected to the sea port should develop from traditional scattered work that rely on trailer to scale development that dominated by rail.

Inland dry port was arisen at the historic moment that the modern container logistics requested. Inland dry port became a scale transport node in the inland transportation system. Through effectively coordination for the reloading of multiple transportation modes and through directly connection to the sea port by rail, inland dry port improved the scale and timeliness of inland transportation. At the same time, inland shipper can handle "one customs office with three inspection projects" and other relevant formalities except loading and unloading cargo, which reduce the logistics costs and improve the efficiency of multimodal transport. Therefore, the requirements of trade development for international container logistics also promoted the development of inland dry port.

(2) Adaptive dynamic—the needs of port regionalization development

China's foreign trade rose year by year. This made domestic ports continuously expand through various ways, increase cargo handling capacity and attract supply of goods. The competition arising from the increasing China's foreign trade is mounting. Especially for Asia region, there are 11 out of 20 top container ports in the world located in this area. So how to win a broader economic hinterland and more inland resources are the important concerns of the coastal ports to realize regionalization development.

With the corresponding, the land resource of coastal port city is lacking at present. The limitation of traffic carrying capacity has become a major factor restricting its development. The main way to solve the problem is to establish high accessibility transport logistics links with the inland areas. Since the distribution of the coastal ports in China, the economic hinterland of many seaports is overlapped. Then will certainly choose the seaport which has high accessibility and can provide efficient and fast transportation service. Therefore an important means to improve competitiveness of seaport is to improve its accessibility, attracting more inland cargo owners and developing potential resources. But inland dry port, as an effective solution suiting the development of seaport regionalization, can make seaport extend its own function to inland cities. This makes inland customers to realize transportation transition more conveniently and then uniformly coordinates container transport between inland dry port and seaport. It also uses the large-scale and efficient transportation network to provide more accurate delivery to the shipper and the carrier. At the same time, seaport takes inland dry port as its buffer and rear yard to ease part of seaport pressure and improve service level. So it is said that inland dry port is arising to adapt the future development planning of seaport at the historic moment.

(3) Motivated power—large-scale development of the vessel

The trend of international container ship upsizing intensified in recent years. Data show that the 12000-TEU container ship has been put into use. As of the year 2014, the global top 20 liner companies will operate more than 625 5000-TEU container ships, which cover 23% of the world's container ship quantity and the proportion of transport capacity is up to 45%. The putting use of large container ships gradually achieves the high efficiency and

low cost of maritime transport, but at the same time also requires its affiliated ports have enough ability to discharge. Whether port transportation system can meet the growing transport demand and whether port city can bear such high transport pressure in a short period of time are two major problems to be faced.

The arising of inland dry port effectively solved the crowd caused by upsizing vessels and the increase of work quantity. It also solved the high urban traffic pressure. Establishing dry port in the social and economy highly developed inland cities can collect supply of goods, and then by rail train directly to the dock to load cargos, which change the traditional fragmented transport conditions. At the same time, for the large number of goods unloaded in the port can be transported to inland dry port by rail first and then be distributed by road. Inland dry port can increase the inland container operations, effectively release port throughput capacity and solve the urban traffic pressure problem. Therefore it is said that ship large-scale trend promote the development of inland dry port by acting on coastal ports.

The main body affected by three kinds of power of inland dry port formation and development and its position are different. If inland regions or cities construct and develop inland dry port through developing foreign trade and promoting regional economy, then the demand power is dominant; if coastal ports lead the construction of dry ports, intending to attract inland cargo resources and expanding the scope of the hinterland, then adaptive power is dominant; while motivated power mainly makes seaport and inland transport improve their ability passively under the trend of large-scale vessels. The formation and development of inland dry port is the result of interaction and complement of three kinds of power. But due to different dominant power will lead inland dry port having its own development characteristics and forming different development patterns, the following article will analyze the operation and characteristics of different development mode.

3.1.2 The summary of China existing dry ports development mode

The development practice of China dry port began at the year 2002 when Beijing Chaoyang port and Tianjin port signed the straight in agreement. The construction and operation was from scratch and achieved great progress. According to the development characteristics and current situation, the development of dry port in China can be divided into three modes which are seaport driving, dry port driving and double ports linking.

(1) The promotion of seaport [29]

The development mode of dry port driven by seaport mainly reflects in that coastal ports actively cooperate with inland region to construct dry port for the supply of goods. The essential demand is to further expand the economic hinterland of port, covering more inland supply of goods and improving the competitiveness of seaport.

In this mode, there are two main well-developed domestic ports, Tianjin port and Ningbo—Zhoushan port. The practice of inland port construction in Tianjin is located at the top in China. Tianjin port implemented the strategy of "going out", setting up dry ports in Xinjiang Wulumuqi, Hebei Shijiazhuang and Henan Zhengzhou, increasing the economic hinterland of Tianjin port in a wide range, which made Tianjin port with only 37 km^2 land area has 4.5 million km^2 expanded inland area. The selection chosen by Tianjin port to set up inland dry port is the longitudinal extension strategy, namely gradually extending to inland along the new Asia-Europe continental bridge, hoping to gradually form the dry port chain which put Tianjin port as the terminal of land and sea, covering surrounding areas in each dry port node. The total amount of import and export of Tianjin port is 164.11 million dollars in the year 2010, increasing 32.2% compared to the corresponding period. Among them, Beijing, Hebei, Inner Mongolia, Gansu province and other inland dry port contributed up to 54.7%.

Ningbo—Zhoushan port is different form Tianjin port. It adopted surround strategy to build inland dry port and selected Jinhua, Yiwu, Shaoxing, Yuyao and Quzhou these five cities in the Zhejiang province build dry port, which brought a lot of supply of goods to Ningbo—Zhoushan port, achieving the growth of export container quantity and promoting

the development of local economy. In the year 2005, Yiwu transported 130,000 TEU cargos to Ningbo port alone. Under the push of dry port construction strategy, the export container quantity of Ningbo—Zhoushan accounts for over 50% of the total amount of Zhejiang province. With the construction of Ningbo—Zhoushan dry port, the strength of covering inland is increasing. The export amount of surrounding areas reached more than 60% total export amount of Ningbo—Zhoushan port.

Combined with the present development situation analysis of China inland dry ports under this mode, we can see that their structure and function are relatively simple. Inland dry ports, mainly as the extending of coastal port, provide broader hinterland and appropriate buffer to the collection and distribution system of coastal ports.

(2) The promotion of dry port

The dry port development mode driven by dry port mainly reflects that dry ports in inland region were set up based on the cities for the development of local economy. The essential requirement is to develop export-oriented economy of inland city and surrounding area, promoting local economic and social development by increasing the port functions.

Under this mode, the development of domestic typical inland cities in the front row is Xi'an, Chengdu, Nanchang, Ganzhou and etc. Xi'an and Chengdu have some similarities in the development practice of dry port. Both these two cities are deep in the interior and also both are hub cities in their own province. Furthermore, their accessibility of roads and railways is relatively developed and can cover surrounding area effectively. Establishing dry ports can turn goods mostly used for domestic demand in the past to foreign trade, increasing foreign exchange income and promoting economic development.

In order to speed up lining with international standards and highlight its international status, the dry port constructed in Xi'an-- "Xi'an international port district" will be constituted of one center (Under bond logistics center) and three sets of area (International logistics area, Domestic comprehensive logistics area and Logistics industry cluster area). The project was initially built in 2010. The project gradually achieved moving seaport function to interior and directly butt joint the international trade of Shanxi and western region with international cargo airlines, realizing the effective connection between aviation,

railway, highway and sea transport, giving play to the role of Xi'an as the city of new Asia-Europe continental bridge economic belt center to a great degree. Chengdu is similar to Xi'an. It invested enormously in the aspect of building inland dry port and spent 20 billion yuan to promote the construction of road-river transportation customs clearance in Longquan city to realize the seamless docking of Luzhou port and Longquan logistics center. At the same time, the proposal that based on the Asia's largest container terminal being constructed on Qingbai River and joint Chongqing to build China's largest dry port was put forward.

Nanchang, in the construction of inland dry port, chose beginning at multipoint. Because the geographical location of Nanchang has certain advantages and its accessibility to seaport is also higher. So Nanchang has a close contract and cooperation with Xiamen, Shenzhen and Ningbo—Zhoushan port, opening dry port by "Railway-sea transport". The establishment of dry port greatly shortened the distance between Nanchang and the international market, attracting more foreign capital and improving the degree of opening to the outside world.

Under this mode, the scale of inland dry port is larger, building inland port customs clearance from the perspective of the whole city and even region, starting from itself to construct and develop export trade. And through gradual development, it is possible to establish "land-sea-land" model of multimodal transport which put dry port as the terminal, choosing appropriate costal ports as the "transshipment port" of dry port.

(3) Two ports linkage

The dry port development model formed by two ports linkage mainly embodies in constructing and developing dry ports in coastal ports and inland areas respectively to achieve profits to both sides. Its characteristic is the balance of practice subject status. On the one hand, inland dry port needs seaport to implement the high efficiency of goods transport, improving foreign trade interdependency to further develop foreign trade; On the other hand, seaport needs inland dry port providing a broader and more abundant supply of goods to achieve further growth of throughput.

The typical cities under this mode are Dalian, Shenyang, Changchun and Harbin. In June 2005, in the second four northeastern cities' mayor summit, the idea "Put Dalian as the portal, establishing inland dry ports in Changchun, Harbin and Shenyang" was established. This project will lead the freight source of Dalian covering hinterland and expanding to the whole northeast three provinces. At the same time, three provincial capitals located in the inland will also base on the construction of dry ports, strongly promoting the development of local economy, speeding up the pace with international practice, giving play to the role of the central city of economic belt. In February 2009, Shenyang bonded logistics center was formally approved to become the only bonded logistics center in three northeast provinces. And officially start the operation in October, marking the two ports linkage development model is in an orderly way.

The promotion of seaport, the promotion of dry port and two ports linkage these models are the basic operating condition of the dry ports in China. But putting the construction of dry port as the foothold, making dry port as the analysis subject, this paper argues that the first pattern of inland dry port cannot become the real "inland dry port". The reason is that such a port or bonded logistics center is mainly driven or advocated by large coastal port. It was constructed in order to extend its yard and economic hinterland, lacking standing on the whole inland cities development level to consider problems. For example, at the end of 2005, Yingkou Port Corporation constructed a dry port which covers an area of more than 40000 square meters and employs more than 30 staffs in Shenyang Hunnan New Area. After the formal operation of the port, the transport capacity can reach 100000 TEU per year, which accounts for 11% of Yingkou port throughput capacity throughout the year, binging great economic benefits to Yingkou port. This is the bonded logistics industry based on the development of the coastal ports which just put particular inland area as its extended port. And as Shenzhen South China international logistics center, it is a bonded logistics enterprise far away from port. The customs has offices in the center and can directly deal with "one customs office with three inspection projects". Bonded logistics area is the specific situation of seaport extension and multimodal transport under the new situation. Therefore, from the aspect of city dry port construction, we should focus on analyzing the last two kinds of dry port development model. We should start from the

characteristics and conditions of inland city itself, making the city become a modern dry port which integrates logistics, trade and transportation.

3.1.3 The existing problems analysis of dry ports development in China

The transportation mode that based on inland dry port has played a huge role in promoting the social economic development of coastal ports and inland areas. But for the present development situation of dry ports in China, there still exist the following problems to be solved in practice.

(1) From a macroscopic point of view, the construction of inland dry ports started late in China. Different subjects noticed that the construction of dry ports can effectively promote the economic development. Therefore, there are no unified consideration and planning in the construction of dry ports. Most current dry ports construction is confined to the provinces and the cities within the administrative area, causing unnecessary redundant construction. The construction plan of dry port should be made from national level, reasonably distributing and effectively covering inland economic hinterland, avoiding redundant construction and waste of resources.

(2) From a microscopic point of view, the construction of every inland dry port is a complex system project which needs whole hearted cooperation of administrative function department such as local government and customs, the coastal port enterprises, various shipping companies and shippers. But in the current construction, there existed myopic behaviors in some places and enterprises, which limited the development of dry ports for the sake of the local interest. Such as some inland dry ports constructed by the leading of seaports. Seaports are in strong position while the independence of inland dry ports is not strong, only relying on the seaport for its services and unable to scientifically plan to achieve their own comprehensive development. This needs to strengthen the communication and cooperation of the participation of dry ports construction and main body, to the long-term interests, achieving mutual reciprocity and mutual benefit.

(3) Contrast current various dry ports being operated or built, their construction and development is uneven. Inland dry ports are mainly for container cargo transport. At present, the growth speed of China's container throughput is fast and the development of transportation is rapid, correspondingly leading the construction of inland container collecting and distributing facilities. But so far the related construction and development in inland is inconsonant, most scale of which is small. As described above, most inland dry ports only embodied in a container yard or bonded logistics enterprises. The construction of inland dry ports needs from the city level and emphasize the scale.

(4) The construction of dry ports needs large investments. The construction cost needs more than ten million or even more than one hundred million yuan. It is a capital intensive construction. At present, the number of investors of the construction of China inland dry ports is small and the investment subject is single, which mainly are coastal ports and government. The investments in the construction of inland dry ports should carry out reasonable organization and guidance, not only attracting domestic capital, such as shipping companies, the owner enterprises, private capital and etc., but also considering attracting foreign capital participating in investment, making the construction and investment of dry ports more sufficient and the progress more smooth.

3.2 China inland dry ports new development pattern analysis

3.2.1 The development goals of China inland dry ports

In order to solve the problem that how to perfect and improve the development of China inland dry ports, we should clear the characteristics and the goals achieved after the construction of inland dry ports. In view of the above existing problems proposed in the development of China dry ports, combining with China's national condition, analyze the development target of inland dry ports.

(1) Independence

Independence is the most fundamental and most direct characteristic of inland dry ports. Independence refers to the inland dry ports keeping independent on the overall operation links including collecting and distributing transport, choosing the discharge port and etc. Inland developed cities which will build dry ports should have plenty of land resource for ports' site selection, expedite traffic network and should be based on factors such as type of goods, supply of goods, cargo volume to select appropriate coastal ports as the transshipment ports. The core of independence is to construct inland dry ports as "home ports", rather than attached to the large coastal ports. The relationship between the two sides should be mutual benefit and common development.

(2) Scale

Scale is the important target of the development of inland dry ports based on the city level. The final point of the traditional sense of inland dry ports must be a bonded logistics center or container depot, which is understandable. But developing dry ports based on the city level, we should emphasize the changing of economy growth method of the whole city and the role of foreign trade growth. Therefore there must be a certain amount of inland cities to become dry ports. The trade volume through dry ports in the bonded logistics area or container depot with large scale should occupy an appropriate proportion in the national economy. Scale is also a sign of difference between dry ports and bonded logistics center. The construction of Xi'an dry ports mentioned above reflected the requirements. Xi'an international port district project will be constituted of "One center and three projects". "One center" means the bonded logistics center and "Three projects" means international logistics area, the domestic comprehensive logistics area, logistics producing and collecting cluster area. The completeness of this project will move the international port service function to interior area, docking the import and export trade of Shanxi and the western region with the international freight line directly, realizing the effective connection of airline, railway, highway and sea transport. Xi'an will be the important part which meets the needs of the multinational corporation management strategy of international logistics system.

3.2.2 New development mode of inland dry ports in China

On the basis of the analysis of the current situation of dry ports development in China, further clarify the current problems existing in the process of dry ports development. In order to effectively solve the problem and to realize scientific and benign development of inland dry ports, basing on the above mentioned inland dry ports development target, combining the actual situation in China, put forward new development model of China inland dry ports.

Building inland dry ports, China should start from inland cities themselves to ensure their independence as the fundamental purpose. From the city level and the level of bonded logistics center, follow the principles of sea-land linkage, covering surrounding, diversiform mode of transportation, perfect logistics system and etc, taking development mode of driven by inland cities and coordinating related factors. Figure 3.1 is the illustration of China dry ports operation mode. The author will combine the following China dry ports development model for further details.

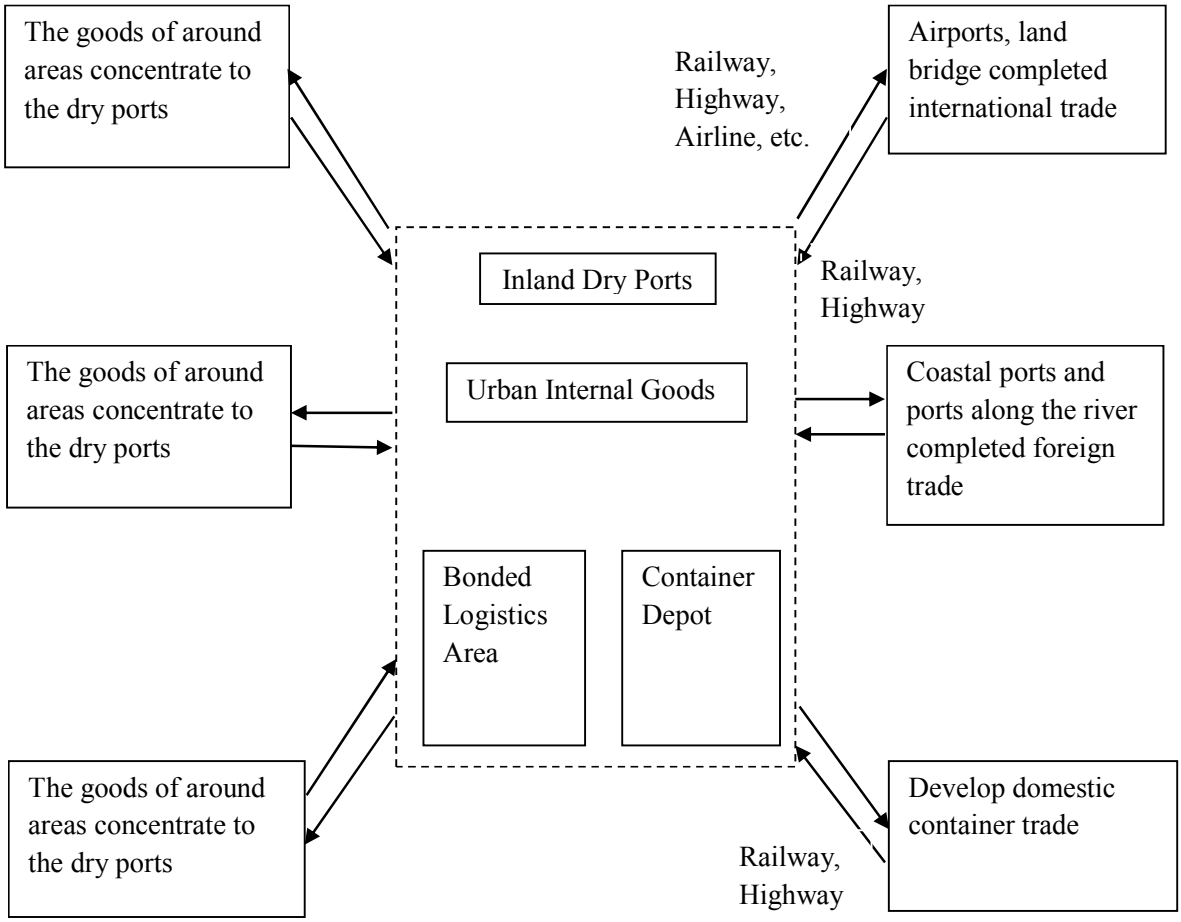


Figure 3.1 China inland dry port operational mode

(1) Inland dry port not only promotes the development of its urban economy and foreign trade, as the center or the hub city in a region, but also drives the industrial and economic development in the surrounding areas. So in addition to the supply of goods in its city, it should also actively open up channels to organize supply of goods in surrounding relatively undeveloped areas, taking full advantage of low cost and high quality to carry on international trade, promoting the coordinated development of the surrounding areas by dry ports. It also demands that the perfection of the traffic network system of the whole area should be speed up when the dry ports are being constructed, ensuring the transport channels and transport efficiency. Taking the west or southwest areas in China as the example, the construction of dry ports is an effective measure of "going out" strategy. The

whole area carrying on foreign trade will be more efficient than cargos being transported from inland to coastal ports before customs clearance.

(2) The main way of transporting cargos which completed customs clearance is transporting cargos to coastal ports or ports along the river by railway and highway, continuing to implement shipping. The different position between coastal ports and dry ports and cooperative mechanism with coastal ports are the important contents of dry ports development mode. Dry ports shall select seaport flexibly according to the kind and number of cargo to achieve optimal cost and largest benefit. For dry port and the special commodities of its surrounding area, dry port can choose these coastal ports which have rich experience in transporting these kinds of commodities and have obvious advantages to establish a long-term relation of cooperation. Dry port should also be diversified use of bonded logistics area while maintaining the independence, carrying out various forms of business with coastal ports, promoting each other.

(3) On existing airports and land bridge node business, dry port should be further strengthened. From the analysis on geographical position in China, although inland dry port is far from east coast, but the southwest area connects South Asia and Southeast Asia, central and northwest area connects Eastern Europe. They are the important parts of Asia-Europe continental bridge transportation system and inland dry port will have certain advantages when it conducts foreign trade in these areas. Under the new mode of inland dry ports, we can focus on the potential market and customers and at the same time pay attention to developing the export of characteristic cargos in surrounding areas, maximizing the use of roads, railways and air transportation to complete the foreign trade part which shipping is not available, further strengthening its competitiveness.

(4) Using new developing inland port function, optimize the carriage way of goods in international trade and choose the most suitable mode of transportation. Aiming at containerized cargo transport intensified trend, dry ports should be another way of business besides foreign trade. Specifically, dry ports pack the goods former in bulk form into containers, using container depot collecting and distributing goods and then completing the domestic trade, opening up new way of using the facilities of dry ports. It also requires

perfecting the construction of inland container transportation facilities in China as soon as possible, making inland dry port to become the hub port in the transportation system.

The above analysis is mainly centered on inland dry ports, abandoning the traditional thought that takes coastal ports as the start point to analyze the construction of dry ports, mainly emphasized the independence and the scale of the inland dry ports. Coastal ports, of course, in order to alleviate the storage of yards and the pressure of traffic jam and to further expand the hinterland, attracting supply of goods, the construction and development of inland dry ports is understandable. In view of the above introduction of the classification of dry ports, this paper also puts forward the inland dry ports construction mode dominated by the coastal ports. As shown in Fig 3.2, combine short distance, medium distance and long distance dry ports to form the dry ports system which takes coastal ports for terminal and extends to inland.

As shown in the figure, the Shipper 1, 2, 9, 10 who are close to seaport are served by short distance dry port. Because they are close to seaport and their working time is easy to control, which can be used as a coordination of a single loading and unloading of the ship; The Shipper 7 and 8 concentrate cargos on transfer station first and then transport to seaport directly for shipment through medium distance dry port; The Shipper 3 and 6 are deep in inland. Long distance dry port carries goods by rail train and then serves for the shipper respectively.

It is obvious that building a dry port can effectively reduce the number of roads connected to the port directly. At the same time, a lot of work that cause port to be blocked such as customs clearance, security and information processing and etc. can be transferred to inland dry ports, which can save valuable space in seaport. In this aspect, the practice of Tianjin port is worth reference, relying on it as a municipality directly under the central government with relatively strong economic strength and policy support, basing on the new Asian-European land bridge to set up inland dry ports from the near to the distant, forming the service chain.

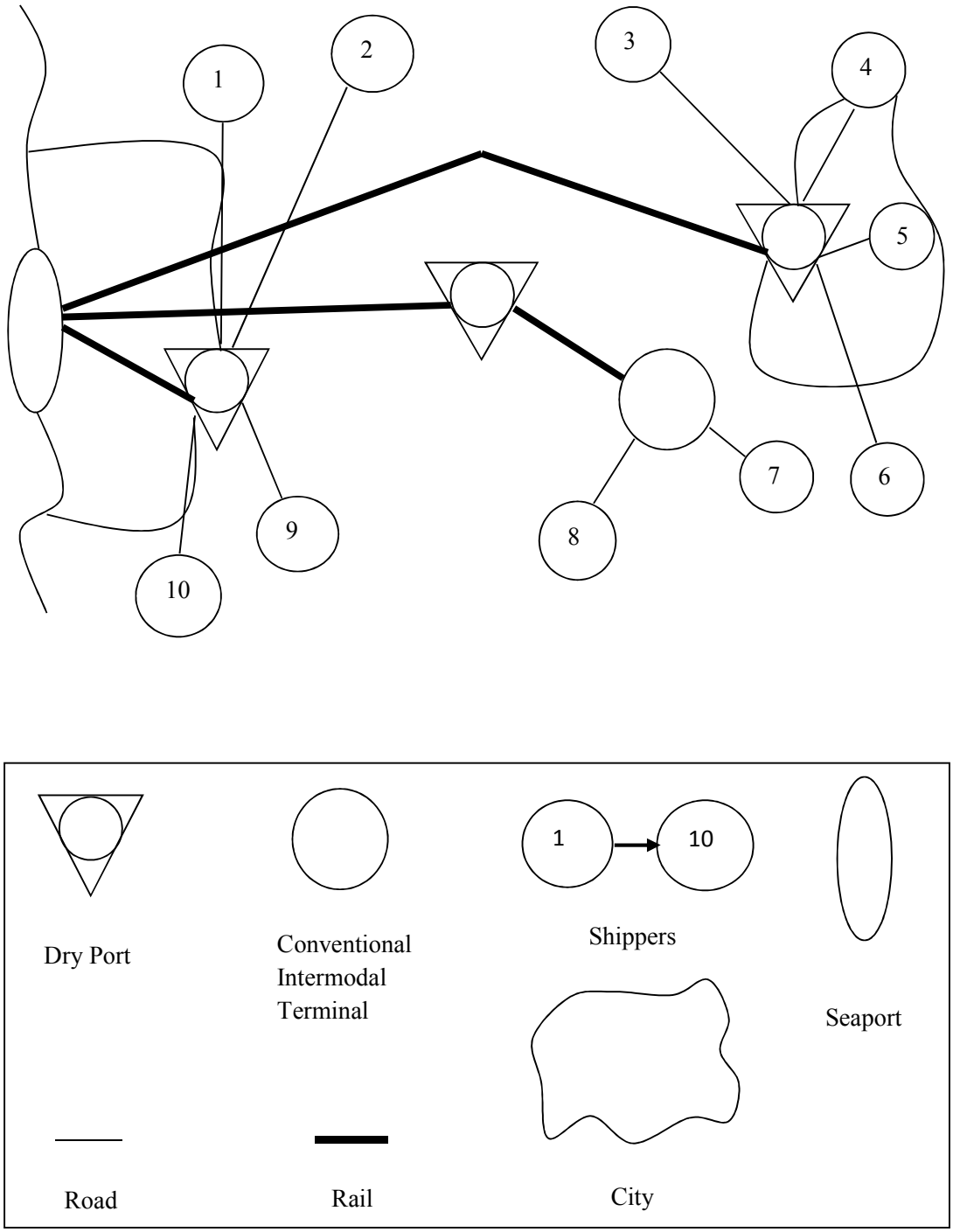


Figure 3.2 The new mode of developing inland dry port relying on coastal port

To sum up, the construction and development of inland dry port is a complex engineering system, involving many factors. No matter inland dry port considers the independent construction and development or promoted by seaport, considering the vast inland areas of

China and great development space and opportunities, the final mode and goal of inland dry port construction and development should be to form that coastal ports and inland dry ports cover each other, priority to railway transport, road transport is complementary, deep developing air and land bridge foreign trade. Multipoint to multipoint port network, that is, each coastal port depending on the kind of cargo, the amount of cargo and the different shippers to realize transportation through different dry ports. Each inland dry port can realize import and export through different seaport according to the different requirements of the transport effectiveness for a given period of time, shipper and the transportation destination and etc. Realize optimal allocation of resources in a scientific and reasonable inland dry port—seaport transportation network, promoting the development of China's foreign trade.

4. The typical China inland dry ports development level and SWOT analysis

4.1 The analysis of the typical inland dry ports development in China under the new mode

According to the research idea of this article, the focus of the analysis is still in accordance with what the above proposed, building inland dry ports by using the development mode of being driven by inland cities and emphasizing the independence of inland dry ports. In order to make the research more targeted and effective, the inland dry ports in China which are under construction or have already begun to take shape are selected to analyze in this chapter. The construction and development of dry port in China is still in its infancy. Therefore choosing the inland dry port whose current development is more advanced, analyzing its operation situation and advantages and disadvantages, can both improve its own competitiveness and provide reference to the construction and development of dry port whose maturity is not high. After full consideration of the

development situation and data of various inland dry ports in China in prior research, in line with the principle that make the analysis object have full difference degree and cover different inland areas, this section choose Chengdu, Xi'an, Nanning and Shijiazhuang these four typical inland dry port cities as the research object, taking the new development mode for target and guide, analyzing their development deeply.

4.1.1 The development analysis of Chengdu inland dry port

Chengdu, as the capital of Sichuan province, is also the inland hub city in the west of China at the same time. It also showed a strong strength and determination in the aspect of building inland dry port. The mode that Chengdu constructed and developed dry port is very close to the new mode advocated by this article. Because of the long distance from Chengdu to seaport, so Chengdu chose Luzhou Port as its important transfer station in the Yangtze River. By implementing the seamless connection between Luzhou Port and railway container terminal, accelerate the construction of Chengdu dry port and promote Sichuan province from large waterway transport province turn to strong waterway transport province.

On October 10, 2008, Chengdu has signed logistics development strategy cooperation framework agreement of the two cities with Luzhou, marking Chengdu as a railway hub and Luzhou as a shipping hub realizing land and water connection successfully. Chengdu, with 1.3 million square kilometers of the market covering scope, the coverage of more than 200 million people, nearly 90 billion yuan of total sales of social consumer goods and many well-known foreign enterprises such as Inter, Toyota, FAW and etc. There is a lot of goods need to be transported passing Chengdu to Sichuan and even the entire western region. Luzhou has the unique golden waterway of the Yangtze River and port resources. The Luzhou part of the Yangtze River is 136 km long, which accounts for two-thirds of Jiangchuan part and can allow 1000-ton vessel to pass day and night all year round. Luzhou Port is the only one port in Sichuan province of 28 main national inland river ports. It is the biggest port in Sichuan and the only container terminal in Sichuan province. Therefore, speeding up the development and cooperation of port logistics between Chengdu and

Luzhou, fully giving play to the Chengdu's covering effects as the regional economic center and logistics center and the advantage of Luzhou waterway port, using "the Yangtze River golden waterway" to build big circulation pattern and forming modern logistics network which take Chengdu as the center in Sichuan as soon as possible, have important practical significance and strategic significance on promoting the economy and social development of the two cities, promoting the construction of logistics center in the west and accelerating the construction of the western economic development highlands.

The specific plan of inland dry port construction in Chengdu which takes Luzhou Port as the node is as follows. The short-term goal of the cooperation (By the end of 2014): 1) to speed up the logistics infrastructure construction. Luzhou should accelerate Luzhou Port expansion, improving customs clearance condition, upgrading the Luzhou Port for a first class water transportation port and increase the liner density, forming one million TEU port capacities. Chengdu should accelerate the construction and development of Qingbai River container terminal and Longquan Post logistics center. Chengdu should also accelerate the construction of highway-waterway and railway-waterway transport port facilities, facilitating customs clearance for export goods, forming the container transit center docking with the Yangtze River waterway transport port. 2) Open intercity container truck between Chengdu and Luzhou, reaching more than 200 shifts a day. The throughput of Luzhou Port reaches more than 400 thousand TEUs. 3) Open Chengdu and Luzhou railway-waterway transport, five fixed shifts of rail freight. 4) Establish convenient customs clearance cooperation mechanism of import and export goods between Chengdu and Luzhou. Medium-term and long-term goals (2014-2030) are: By joint efforts of the two cities, make Luzhou Port to become the main logistics channel from Chengdu to the lower reaches of the Yangtze river and Shanghai Port. By the year 2015, the container throughput of Luzhou Port will reach 800 thousand TEUs and that of 1.2million TEUs in the year 2020. By the year 2030, Luzhou port will form the port container throughput capacity of 4million TEUs and the container throughput capacity will reach more 3.2 million TEUs.

Center on Chengdu dry port, taking Luzhou Port as the export, the two cities will work together to strength the function of dry port. This is to coordinate customs department to

further expand the range of "more customs declaration points, inspecting in Luzhou and releasing in Shanghai" and to optimize the customs clearance mode, forming the quick customs clearance between Chengdu, Luzhou and Shanghai, providing convenience for going through the formalities of customs clearance and customs transfer of import and export goods.

4.1.2 The development analysis of Xi'an inland dry port

Similar to Chengdu, Xi'an as the important city and economic and cultural center in the Midwest, Xi'an has also paid high attention to the construction of dry port, taking the construction of "Xi'an international port zone" as the core, proposing the slogan to build China's top dry port.

Xi'an international port zone project is the major construction project of Shanxi province and Xi'an during the period of "11th five-year" plan. Xi'an international port zone is the international land hub port in western area. It is the international operation platform relaying on the transportation means of railway and highway. It is the extension of international logistics services of various coastal ports in Xi'an and it is the collection of various coastal ports in Xi'an feeder port; Xi'an international port zone is linking the west and east, connecting the north and the south, to be the collecting and distributing center of domestic material flow in western area. Its construction will be the international logistics center in the western region, international trade center and information center, providing modern integrated logistics services for the international and domestic economic development of Xi'an, Shanxi province and the western area in China.

The planning area of the project is 8.2 square kilometers and the total planning investment is 9.8 billion yuan, from 2006 to2015, using ten years divided into three phases to complete. The first phase of the project spent three years, from 2006 to 2008. It is the start-up phase of the main function, constituted from the projects such as type B bonded logistics center, the international logistics area, the domestic comprehensive logistics area, infrastructures and comprehensive services area. It has been basically completed now and

it has achieved the basic function of international logistics, domestic logistics and international bonded logistics, preliminary forming a modern integrated logistics park. The second phase of the project construction is from 2009 to 2012. It is the core ability establishment stage and its goal is to make the park to become the base of international and domestic logistics and modern processing and manufacturing in Shanxi province and to become the international and domestic trade and information exchange center. The third phase of the project construction is from 2013 to 2015, which belongs to the formation stage of industrial cluster. The park plans to become the concentration area of modern integrated logistics, ecommerce and financial capital platform and brand innovation.

The core of Xi'an international port zone project is one center and three groups. Among them, a center refers to the type B bonded logistics center. Its main function is: ensure tax and store import and export goods and other goods that have not been transferred to the customs formalities; provide simple negotiable processing and value-add services for the goods stored; global purchasing and international distributing and dispatching; transit trade and international transit; logistics information processing and consulting services; other international logistics business approved by the customs; provide good logistics operation services for enterprises within the center. Three groups, namely the international logistics area, domestic comprehensive logistics area and logistics industry cluster area, their main functions are: international port services, commodity inspection, collecting and distributing and transshipment of the cargos, logistics distribution, value-add processing, commodity circulation, logistics information service and other comprehensive functions.

4.1.3 The development analysis of Nanning inland dry port

Nanning is located in China's southwest region. On the one hand, in order to strength the business contact with Guangxi Qinzhou, Beihai and Fangcheng port, on the other hand, to further expand land import and export trade with south Asia, east Asia and other countries, Nanning is speeding up the pace of building and developing dry port. On December 22, 2009, China's biggest dry port in southwestern region—Nanning bonded logistics center was confirmed comprehensively by the nation and started operation officially, marking the

construction of regional logistics base facing the ASEAN in Nanning achieving a breakthrough.

On May 28, 2009, the construction of Nanning bonded logistics center started, planning land area of 19.09 square kilometers, which is the core and first construction phase project of China—ASEAN international logistics base. Its start area is 29.09 hectares with a total investment of about 1 billion yuan, including the customs bayonet area, office services area, custom inspection area and bonded logistics area these four functional areas. Nanning has invested incomparable human, material and financial resources into the construction of inland dry port. It cost just 288 days from the first day when the project was approved and started to construct and it is known as the "North Bay speed'.

The traffic condition of Nanning bonded logistics center is very convenient. It faces expressway around the city and Xiang—Gui railway and its west is an urban main road of important cities in the north and the south—Yin Hai Avenue. The subordinate urban roads under construction are in the east of Nanning bonded logistics while the Yu Dong railway station cargo terminal and the planning rail-road transport site are in the northeast. The south side entering the Wu Wei international airport through airport high-speed is 30 kilometers, about 22 kilometers from the city center and the overall advantage in transportation is obvious. At present, the existing eight shipping companies such as Guangxi Cosco international freight Co., Ltd., five logistics companies such as the Guangxi branch of SINOTRANS and two companies such as Foxconn technology group, have beat in Nanning bonded logistics center. The establishment of Nanning bonded logistics center will effectively promote the Guangxi North Bay economic zone modern logistics and other industries linkage development, speeding up the foreign trade goods transfer in the southwest area and Guangxi hinterland and enhancing the collecting ability of international container supply of goods in coastal ports. The operation of Nanning bonded logistic center will be based on Guangxi, extending to surrounding provinces and cities, oriented to ASEAN countries and other countries and regions, providing the logistics services of production and living materials, such as transport, storage, handing, packaging, circulation processing , distribution, information processing and etc.

4.1.4 The development analysis of Shijiazhuang inland dry port

Shijiazhuang, as the capital city in Hebei province, is adjacent to international container ports, such as Tianjin port and Qingdao port. Shijiazhuang, in the aspect of inland dry port construction and development, started earlier, having a unique advantage. On April 6, 2007, Shijiazhuang inland port officially opened the port. This marked that Shijiazhuang realized direct connection with Tianjin and Qingdao port, becoming a port city in the true sense. The landed place and departure place of import and export of goods can be directly identified as Shijiazhuang instead of transfer. Enterprises in Shijiazhuang inland port can go through the import and export formalities, such as going through the customs, inspection and quarantine.

Shijiazhuang inland port is north China's largest international logistics park and located in the international logistics park of the planning Shijiazhuang economic and technological development zone. It covers an area of 326 units of area, a total investment of 268 million yuan. It is the inland dry port with national second function which was approved to construct by provincial government on the basis of former Shijiazhuang international container multimodal transport Co., Ltd. The inland port is located in the transportation hub area, which can fully realize the highway, railway, land-sea and air multimodal transport, realizing the function of coastal ports and inland border port extending to inland area in the true sense.

Due to the huge volume of cargo transport and trading of large container ports such as Tianjin port, the effect of the construction of Shijiazhuang inland dry port is obvious in the aspect of saving cost. On the one hand is time cost. In the past, there are 400 kilometers of high-speed from Shijiazhuang to Tianjin port. The customs clearance formalities of import and export cargo should be handled either to drive to the Tianjin port directly or go through the customs clearance in Shijiazhuang first and then transfer to Tianjin port to go through the customs clearance, which needs 3 to 5 days at least. Now the declaration, inspection and releasing can be handled once in the import and export trade in the same day. The customs clearance formalities such as booking, customs clearance, commodity inspection and issuing a bill of lading can be completed in one-stop, which is equivalent that moving

the seaport to the inland. If the goods need to be inspected, customs agents should just go to the bonded warehouse in dry port for inspection and then go through the corresponding formalities. On the other hand is the transportation cost. In the past, the freight container form Tianjin port was empty back and its actual loading rate was only 50%. Now relying on dry port information platform of communication, cargo can be loaded from Shijiazhuang and back to Tianjin and the actual loading rate increased to 100%. Lower transport costs directly results in the decrease of cost of import and export goods. And compare to the traditional formalities completed by enterprises themselves independently such as transport, customs declaration, inspection, loading, procedure of port and port handling fee, about 300 yuan per TEU can be reduced now. If the import and export trade of 10000 TEU somewhere so calculate, the cost of 3 million yuan can be saved.

Before the construction of dry port, the enterprises in Hebei province or even surrounding areas may choose importing and exporting from Tianjin port directly. Now, the enterprises within the north of Hebei Anyang, east of Shanxi Yangquan, south of Hebei Baoding and west of Hengshui area, will choose Shijiazhuang dry port for import and export. In the next 10 years, the amount of passing cargo of Shijiazhuang dry port will reach 400000 TEU, cargo throughput of 1.5 million tons and the total import and export of foreign trade will exceed 7 billion dollars. The construction and continuous development is gradually realize the seamless docking between Hebei port and various coastal ports such as Tianjin port, to further improve customs clearance efficiency to reduce the comprehensive logistics cost and to promote the regional economic cooperation and common development.

4.2 SWOT analysis of China's typical inland dry ports

China is currently in the period of social economic development and the trend of foreign trade will still grow. So the construction and development momentum of inland dry ports will also increase. The construction and development of dry port should not only focus on the heavy qualifications, blindly increasing the quantity, but also should pay attention to the quality and scale, seeking great development on the basis of existing built port, gradually improving the competitiveness of inland dry port. This part carries on the above

analysis on the typical inland dry ports under new mode, using SWOT model to analyze internal and external environment and the competition advantages and disadvantages of China's typical inland dry ports. Clear the competitiveness of various dry ports qualitatively and pave the way to the countermeasure of inland dry port development in the following article through analysis. Because there is more commonness in the development of inland dry ports, so in the SWOT analysis, we first analyze the strengths, weakness, opportunities and threats of inland dry ports from the overall. Then aiming at the specific inland dry port and combined with its own characteristics to analyze in detail. Figure 4.1 illustrates briefly the advantages and disadvantages as well as the opportunities and threats to be faced in the construction and development of China's inland dry ports. Below a more in-depth and detailed analysis will be opened up.

Strength	**Weakness**
1.Superior location 2.Traffic developed 3.Leading economy 4.Rich in resource	1.Insufficient hardware construction, Lack of planning 2.Lack of logistics concept and related law 3.Talent shortage 4.The low degree of informatization
Opportunity	**Threaten**
1.The tendency of policy and the support of government 2.The trend of developing export-oriented economy 3.The strategy measures of expanding hinterlands	1.Fierce competition between inland dry ports 2.Business share being shared responsibilities for international logistics enterprises

Figure 4.1 The SWOT analysis of China inland dry port developing

4.2.1 The strengths of the typical inland dry ports analysis

(1) Location and traffic advantages

Location and traffic advantages are the most significant competitive advantage of inland dry ports. When provinces and cities are establishing inland dry ports, they will choose the cities whose geographical position is superior and the traffic system is mature. On the one hand, it may exploit the existing geographic and transportation advantages. On the other hand, it can further strengthen the construction of transportation hub on this basis, which can only save resources and avoid redundant construction, but also give full play to the advantages of existing facilities [30].

(2) Economic advantages

Similar to the first point advantage, choosing the social and economic development leading cities to build inland dry ports can further enhance the cities' economic construction, making the introverted economic cities gradually shift to export-oriented, at the same time, better extending to surrounding areas to drive their economic development. If choose an inland dry port again, at the same time repeated construction also has the potential to cause unnecessary competition with existing core cities, which may make the resources and development center cannot be balanced.

(3) Resource advantages

Although far away from the coast, unable to fully enjoy the many benefits that continuous development of international trade brings to the cities, but inland cities and the surrounding regions contain a large amount of natural resources that provide a great space for the development of inland dry ports. As the deepening of multimodal transport trend and the deepening of resources value, inland dry port will rely on its possession of huge precious natural resources to enhance its status as a port.

Above is the general advantages of the construction and development of inland dry port. To understand these factors from another angle is also the necessary condition for the construction of inland dry port. If the above advantages are not available, both policy and normal business activities will not prefer to this city. Specific to the above analysis of the typical dry ports, these advantages have different embodiment.

1) Chengdu

Chengdu is located in the southwest area, especially in the core of Chengdu-Chongqing economic zone, a unique geographical condition and it is the key area of western China development. It has the location advantages of strategy hub in promoting international regional economic cooperation and promoting the harmonious development of east, middle and west regions. Chengdu has good area resources base, strong industrial base, strong comprehensive ability, especially the equipment manufacturing industry, high-tech industry and national defense science are in a leading position in the country.

The economy of Chengdu occupies the leading position in Sichuan province. It is the most competitive economic strength city in the southwest region or even in the western region. It realized the region's total GDP 555.13 billion yuan in 2010, year-on-year growth of 15%. The growth of foreign trade is rapid. In 2009, the foreign trade import and export in Sichuan province total 24.23 billion dollars, up 9.6% from a year earlier. The growth speed is the top in China. Chengdu accounted for the largest proportion, realizing the total foreign trade of 17.86 billion dollars, an increase of 15.4%. The construction of inland dry port will obviously further promote the development of export-oriented economy in Chengdu.

2) Xi'an

Xi'an is located in the joint position of two big economic regions in the west and in the east respectively. It is the world famous historical and cultural city and an important hub city of the western region. It is also an economic belt core region of Longhai and Lanxin, which has the function of linking the east and the west and connecting the north and the south. These geographic advantages of strong aggregation and far extending are particularly prominent and important in the development of modern logistics industry and the construction of dry port. As for the transportation, air, road and rail have preliminary already constituted the three-dimensional transportation networks of Xi'an. Xianyang airport navigated with more than 50 cities in China; the "米" character superhighway arterial networks have also been built; Xi'an railway has formed linked networks with the northeast, east China, south China, central China, southwest and Eurasia land bridge. The three-dimensional traffic networks hub has been formed.

In the aspect of economy, the GDP growth rate of Xi'an has been more than 13% a year. In 2008, the logistics industry's contribution to the economy of Xi'an has reached 60 billion yuan, accounting for 13.5% of the proportion of GDP. The demand of economic development for modern logistics and the construction of dry port is increasingly strong. In the aspect of resources, Shanxi province has outstanding advantages in energy mineral resources. The identified potential mineral resources reserves worth 42 trillion yuan, accounting for about one-third of China's and is the highest in China.

3) Nanning

The most obvious advantage of the construction of inland dry port in Nanning embodies in its location. Nanning is adjacent to Guangdong, HongKong and Macao, back to the southwest, face to southeastern Asia. It is the economic, political and cultural center of Guangxi. It is also the intersection city of southwest, south China and southeastern Asia economic circle, the frontier city of China-ASEAN free trade area, Guangxi North Bay economic zone core city, only one hour away from the closest port in North Bay. Looking from the hub location of Nanning, Nanning can not only rely on the Behai, Qinzhou and Fangcheng these three seaports to realize multimodal transport, but also establish close contact with frontier ports such as Dongxing, Youyi and etc., strengthening land foreign trade transportation. These are beyond the other inland cities.

In the aspect of the economy, Nanjing is the most economically powerful city in North Bay or even the whole Guangxi province. As the China-ASEAN expo located in Nanning, the pace of Nanning's participation in multi-regional cooperation speeding up and the industrial structure being optimized and reasonable, the comprehensive economic strength is obvious. During the year 2001 to 2009, the GDP of Nanning had kept double-digit growth for nine consecutive years. In 2009, the GDP reached 149.238 billion yuan, an increase of 15%. In recent years, the economy of Nanning has entered a longest rapid growth and most stable development period since the reform and opening-up policy.

4) Shijiazhuang

The most obvious advantage of the construction of Shijiazhuang inland dry port embodies in its transportation conditions. In the aspect of land transportation, Jing-Guang

Railway, Shi-Tai Railway, Shi-De Railway pass across at this place and Shuo-Huang Railway is across the north of the city, which is the important traffic node of ‘’coal transported from west to east’. Highways such as Jing-Shen, Shi-Tai, Shi-Huang, Shi-Yin, Shi-Ji, Zhang-Shi and national highways such as 107, 307 and 308 crisscross in the city area; the crisscross highway traffic networks are formed by provincial main lines as the skeleton and local roads as the branches. After the revamping and expansion of main railway lines, such as Jing-Guang, Shi-Tai, Shi-De and Shuo-Huang, the repairing of Shi-Tai expressway and the construction of Qing-Yin expressway during the “Tenth five-year” plan, the integrated transport capacity of four compound transport channel such as Jing-Guang, Shi-Tai, Shi-De and Shuo-Huang, are significantly increased and the land transport status and transit transport function are significantly enhanced.

The convenient transportation system makes Shijiazhuang to be able to handle a large number of goods rapidly. At the same time, the vast inland land resources can be used as a storage area to apply, making Shijiazhuang has the dual advantages of static storage and dynamic transportation. In the meanwhile, Shijiazhuang is close to Tianjin port and other international port, the transportation is convenient. So the seaport is more inclined to co-operate with such inland dry port to collect and distribute goods more efficiently.

4.2.2 The weaknesses of typical inland dry ports analysis

(1) Hardware construction is insufficient, lack of overall planning

A port from construction to growing up, needs more than ten years or even decades to make the overall strategy planning and the continuous construction and updating of a large number of hardware and facilities to be constantly improved in every aspect. At present, although China’s inland dry ports have the cities as the backing, but their construction and development history is no more than ten years. The time was very short, so the problem of insufficient hardware construction is still very obvious. The dry ports whose development is relatively fast, such as Chengdu and Xi’an, have gotten through the primary stage and are now in the construction and improvement of infrastructure and software and hardware

conditions; and at this stage, such as Nanning and Shijiazhuang can only be known as the prototype stage of dry ports. Only one or several comprehensive logistics centers are not enough to constitute a fully functional, mature scale inland dry port. This needs the long-time hardware construction.

Lack of overall planning is also the shortcoming of the construction and development of inland dry ports at present. Despite slow development and small scale dry ports, at present, the shortcomings also exist in the China's leading dry ports. On the one hand, the system relationship between the planning of inland dry ports and existing urban comprehensive logistics center is not clear, and there are overlaps and conflicts in some certain functions; inland dry port has failed to well merge together with some subsystems, such as railway container terminal, comprehensive freight yard and port industrial zone, to form normative operation system. On the other hand, the planning of inland dry ports is only limited within the city and less overall planning of extending to the surrounding areas was considered. So in the long-term development, this will limit the scale expansion of inland dry port and also cannot effectively improve the economic development in surrounding areas. At this point, all current domestic ports all have shortcomings. Although the construction of dry port is a long-term systematic project, but in the early stage of construction, overall planning should also be fully considered to realize the goal of building in an orderly way.

(2) The lack of modern logistics concept and legal support, talent shortage

While the government is actively advocating and propagandizing the construction of dry port, the concept of the new operation type of inland dry port is not clearly understood by some enterprises. They still tend to choose the traditional way that going to the seaport to handle transport formalities and to operate process for trading activities. Dry port market has not been really established. Making dry port to become a social consensus, universal transportation operation pattern, also need to increase the intensity of construction and adjust the development strategy. The international transport laws and regulations between inland dry port and seaport, inland dry port are blank at present. The operation management system of inland dry port is also blank and if there is no international transportation regulations management system, the advantages of inland dry port will not be given full play.

Talent shortage is also a disadvantage in the development of inland dry port. On the one hand, China is lack of interdisciplinary talents with high quality in the aspect of transportation and logistics management. On the other hand, due to the shallow cognition degree of inland dry port, most relevant professional talents tend to choose to develop in coastal ports. This leads the human resources not being able to keep up with the construction of inland dry port and causes gap in the aspect of management.

(3) The low degree of informatization

Another disadvantage of the construction and development of inland dry port is the low imformatization level. This has close relationship with the short construction time of the port. The mature developed coastal ports are also through the long-time exploration and test, and then eventually form a set of information management system which is suitable for the actual status of the port. While inland dry port is still in the primary stage of development, so the informationization construction is certain not to follow. It embodied in two aspects: one is that the logistics information management and technological means is fall behind, such as the low use degree of bar code technology, RFID technology and GPS technology; the other is that the management system and the public information platform of the port administrative department of dry port has not been established. The fast and convenient operation cannot be achieved in a short time when cargo customs declaration and customs clearance is being handled in the dry port.

4.2.3 The opportunities of typical inland dry ports analysis

(1) The support of national support and the great attention of government

Needless to say, the present rapid construction and development of inland dry port is benefited from the policy support that China comprehensively revitalized the logistics industry and several preferential policies for the development of inland dry port. Inland dry port can take this opportunity to broaden the channels in large scale and to construct and to develop in multi-angles.

(2) Inland cities' needs for developing export-oriented economy and diverting industry gradient

Inland city is from international port and it is inconvenient to trade with the countries around the world. Many resources cannot be more effectively serve for the regional economic development, which seriously restricts the speed of economic growth. To build quick and easy international trade channel is always the eagerness of inland cities. The construction of dry port is beneficial to the development of import and export foreign trade, promoting the export-oriented economy level of inland cities. At the same time, with the implementation of the strategy "The development of western China" and "The rise of central China", the gradient shift pattern from the eastern China to central and western China has become the trend of economic development. The construction of inland dry port can provide convenient transportation conditions for the establishment of new industry in inland cities more smoothly, accelerating the process of gradient transfer.

(3) Coastal port hinterland development opportunities

Although the development of inland dry port is independent, it is closely connected with the support of coastal ports. Inland dry ports, in order to free space and ease traffic pressure, occupy the dominant position in the competition with other seaports, will spare no effort to choose the appropriate inland dry port to expand the economic hinterland and attract more inland sources. Inland dry port should take competition trend of coastal ports as its important opportunity of development, together with the port planning, form effective development plan and establish a multimodal transport system extend in all directions, achieving a double win situation.

In view of the construction and development of typical inland dry ports, the opportunities are different and the factors of concern have different emphases. The specific contents are as follows:

1) Chengdu—Policy support

The opportunities of the construction of Chengdu dry port mainly embody in the great supports and assists of the local government. At present, Sichuan has signed agreements

with many coastal ports to speed up and promote the exports of goods in Chengdu: ①The Sichuan, Chongqing and Shanghai governments signed the port customs cooperation agreement of the three provinces and cities. Shanghai port will open new branch transport lines for Sichuan and Chongqing, and shorten the retention time of container ships in Shanghai port, which will greatly shorten the customs clearance time of the enterprises. ②Chengdu customs and Tianjin customs have signed "The cooperation memorandum of dependency customs declaration" that Sichuan enterprises can enjoy the priorities of customs declaration, order receiving and releasing these "three priorities" measures in Tianjin. ③Sichuan inspection and quarantine bureau and Shenzhen inspection and quarantine bureau have signed the "The direct releasing of import and export goods in Shenzhen port" and "The fruits and vegetables supplied for port" these two cooperation memorandum. The Sichuan goods exporting through Shenzhen, if they are qualified in the inspection and quarantine in Sichuan, they don't have to be check in Shenzhen and can be "directly released". The introduction and implementation of these policies has provided a good opportunity for the development of Chengdu inland dry port.

2) Xi'an—Export-oriented economy and port modernization

The construction and development of Xi'an inland dry port can depend on the trend that Xi'an strived to develop exported-oriented economy in recent years and spared no efforts to promote the modernization of port to implement. Xi'an as one of the old industrial base in China, its machinery, textiles, electronics, electrical equipment and cars hold an important place in China. The production and processing enterprises are intensive. High-tech industry is developing rapidly in recent years. The construction of inland dry ports can further promote the development of the enterprises, making the exports of merchandise which has a comparative advantage to increase, promoting the transformation of the economic structure. Xi'an also attaches great importance to the work of the aspect of port modernization. By the end of 2005, Xi'an has opened a first tier port—the Xi'an Xianyang international airport aviation port and a second tier port—Xi'an Daxing Road rail freight port. But with the development of container sea-rail transport, the facilities, scale, site and regulatory conditions of the rail freight port cannot meet the needs of the development of the situation. So the construction of inland dry port of Xi'an international port district is

adapt to the situation, seizing the opportunities, promoting the comprehensive service level of the port.

3) Nanning—Regional cooperation and the needs of economic development

The development opportunities of Nanning inland dry port more reflected in the strengthening of regional cooperation around the city and the needs of economic construction and development of southwestern cities. The China-ASEAN free trade area being built will bring the enormous opportunities for development to the economy of Nanning. The influence of China-ASEAN Expo which is permanently settled in Nanning increased year by year. Nanning is becoming the important node city of many China-ASEAN bilateral big enterprises for expanding each other. As the inland dry port, Nanning will take this opportunity to create unique road port development mode for ASEAN.

In the meanwhile, the strengthening of economic cooperation of Fanzhu river delta area also brought good opportunities for the economy of Nanning. In 2003, after the signing of "Fanzhu river delta area regional cooperation framework agreement", the cooperation has entered a new stage. With the construction of Nanning-Guangzhou railway and highway and the expansion of Xijiang waterway, the economic ties between Nanning inland dry port and Fanzhu river delta core area will be more convenient and close.

4.2.4 The threats of typical inland dry ports analysis

(1) The competition between regional dry ports

The main threats existing in the construction and development of China inland dry port come from the more and more intense competition between inland dry ports within the region or across the region. Seen from close term, the cities within the region, in order to compete for supply of goods and promote the cities' traffic volume, will all adapt to the situation to choose the appropriate area to set up inland dry port. This kind of agglomeration of inland dry ports within the region will lead to fierce competition for the limited supply of goods and economic hinterland. Striving for the supply of goods and raising their own

competitiveness is the challenge that every dry port should face. Seen from the middle term and long term, the strong scale and fully developed inland dry ports can be used as the important node of the vast inland multi-modal transport system in China. They can undertake a number of container transports of coastal ports to the east and extend wider hinterland and supply of goods to the west. The inland hub cities whose social and economic development is in the leading position in recent years all have to do something, trying to build inland dry ports which have above functions and status, making their inland core city positions to get further strengthening. The competition and gambling between the construction and development of inland dry ports within the region also brought threats and challenges to big cities.

In specific view, the threat that Shijiazhuang inland dry port faced is more outstanding. Taiyuan, Dezhou and Linyi which are adjacent to Shijiazhuang, are under construction or planning to build inland dry ports. On the one hand, they will inevitably strive for their extended economic hinterland and supply of goods. On the other hand, inland dry ports will take active measures to strength the cooperation with counterpart coastal ports, especially Tianjin port to further expand the scale of the inland dry port. Under this situation, Shijiazhuang inland dry port is bound to play advantages, overcome the disadvantages and occupy a larger share in the fierce competition.

For the challenge of inland dry ports on a broader range, a long history of the competition between Chengdu and Xi'an can illustrate this problem more clearly. Table 4.1 shows the total amount of import and export of the two cities from 1999 to 2012. It is clearly seen that Xi'an is ahead of Chengdu before 2000 while Chengdu has been beyond Xi'an since 2001 and their gap has widened year by year. At present, Chengdu has become the biggest city in the foreign trade in the middle and west area, achieving a leading position in the competition. The reason is that the strength of Chengdu developing foreign trade is larger, the construction and development of its inland dry port started earlier. And in order to close the gap between Chengdu and Chongqing—the first echelon as soon as possible, Xi'an also focus more on the work of building Xi'an international port district, trying to take the strategy of building inland hinge dry port to realize the promotion of import and export of the port. And the completion of the first phase of the project has brought significant

promotion of import and export. It is known from the table that the growth rate of foreign trade in 2010 is 43.1%, which is far more than ever. Under this situation, the construction of inland dry port has already beyond the small range of competition, but to become the foreign trade hinge in a broader region, realizing economic transformation and second leap of the economy of inland cities. This kind of fierce competition is definitely a huge challenge for those inland cities that interested in building dry ports.

Tab 4.1 The comparison of foreign trade situation between Chengdu & Xi'an (Unit: billions of dollars)

Year	**Foreign trade volume of Chengdu (Total/Export)**	**Foreign trade volume of Xi'an (Total/Export)**
1999	16.1/7.4	17.29/9.45
2000	14.8/8.2	17.3/10.6
2001	18.9/8.9	17/8.8
2002	20.8/12.2	18.7/11.25
2003	25.2/13.5	23.1/14
2004	33.7/18.7	30.93/20.35
2005	45.4/26.8	39.01/26.34
2006	69.5/41.4	41.54/27.29
2007	95.2/57.1	53.61/34.71
2008	154.1/90.7	70.40/44.71
2009	178.6/105.0	72.55/33.30
2010	246.6/137.7	103.82/53.17
2011	379.07/229.56	125.98/58.25
2012	475.39/303.61	130.14/72.99

(2) The competition of international logistics enterprises

After China's accession to the WTO, vast inland logistics demand and the market has attracted many international enterprises to enter, to win a certain market share. Due to the powerful economic strength, advanced transportation equipment, leading technology,

modern management and lower operating cost of international enterprises, their adaptability of their services, accuracy and convenience are relatively high, so they have more competitive advantages than domestic transportation and logistics enterprises. This brought huge threats and challenges to the development of inland dry ports. So when the inland dry ports are strengthening the construction of hardware facilities, more attention should be paid to the construction of soft power, cultivating the service ability of inland dry port integrated park or center, giving full play to the local advantages of inland dry port service, promoting the competitiveness of inland dry port, dealing with the challenges brought from the entrance of international logistics enterprises.

5. China inland dry ports' competitiveness evaluation and analysis

The construction and development of China inland dry ports, plays an important role for promoting foreign trade and social economic development of inland cities and regions, and has important practical significance for broadening the hinterlands of coastal ports and realizing the extent of ports. Further, a nationwide benign development of inland dry ports is an important guarantee for the construction of China transport multimodal transport comprehensive system. The development of China typical inland dry ports under the guidance of the new mode has been analyzed in the above chapter, and the development and competition situation of inland dry ports has been qualitatively analyzed through SWOT method. On this basis, this chapter still chooses Chengdu, Xi'an, Nanning and Shijiazhuang these four typical inland dry ports to establish a comprehensive evaluation index system, making comprehensive evaluation and sorting for the present competitiveness of various inland dry ports. Here the author should illustrate that through the above analysis, we can draw that the four typical inland dry ports are in a leading position in their respective areas. They have their own hinterlands, customer bases, development strategies and etc. The competition among them is not very obvious. This

chapter still chooses four inland dry ports to make competitiveness evaluation. The main intent is not to illustrate a competitive relationship and contrast situation between ports, but to evaluate under a system to get comprehensive degree of membership and score, making clear the comprehensive performance of China typical inland dry ports under the index system, giving countermeasures and suggestions for future development through the evaluation results, to further improve the comprehensive benefits of construction and development of inland dry ports from micro to macro and from economy to society.

5.1 The establishment of inland dry ports competitiveness evaluation index system

5.1.1 The principles of the establishment of inland dry ports competitiveness evaluation index system

(1) Scientific principle [31, 32]

Scientific principle refers to that the establishment of evaluation index system should comply with certain theoretical basis. Evaluation index should be able to reflect the essential characteristic of evaluation objects and to realistically and objectively reflect the actual performance degree of the competitiveness of typical inland dry ports.

(2) Practical principle

Practical principle requires that the establishment of index system should not only meet the needs of evaluation studies, but also fully combined with actual performance of the competitiveness of inland dry ports in the construction and development. Each evaluation index should be simple and clear, meaning clear and has strong maneuverability, to be able to well reflect the actual operation situation and various aspects of benefits achieved of inland dry ports, and to be really applied to practice.

(3) Systemic principle

System principle demands that the index system can reflect the comprehensive situation and specific characteristics in all aspects of the competitiveness of inland dry ports

completely and systematically. Evaluation system should have strong hierarchy and clear covering up and down relationship, which can complement each other and fully embody the comprehensive competitiveness of oneness and comprehensiveness, to ensure the reliability of the evaluation study.

(4) Appraisable principle

Appraisable principle is that the measurability of index should be fully considered when screening indicators from many factors which can reflect competitiveness. The indicators being selected should not only be representative and generality and wraparound, but also should consider the availability of the quantitative index data, as well as objective and effective evaluation result of the qualitative indicators being fully understood and provided by experts.

(5) The combination of quantitative and qualitative principle [33]

This principle requires that during the process of setting index system, quantitative index and qualitative index should be combined. They should complement each other and use quantitative calculation as far as possible. If quantitative calculation is not available, they should adopt qualitative analysis. In this paper, in the competitiveness evaluation index design of China typical inland dry ports, the production data and economic indicators of GDP, foreign trade volume and freight volume is mainly selected from quantitative angle. The evaluation indexes of logistics industry development level, policy support and traffic accessibility are mainly selected from qualitative angle.

5.1.2 The competitiveness evaluation index selection and system building of inland dry ports

In the present domestic and abroad study of dry ports, the study of dry ports site selection is in a majority and the study of competitiveness evaluation is less. Different from site selection, the competitiveness evaluation is, among the dry ports being constructed or constructed, considering regionality, scale, representativeness and other factors, selecting

dry ports with strong representativeness and competitiveness as the evaluation objects, establishing index system, to evaluate the competitiveness of China's various inland dry ports from the aspects of economic benefits and transport conditions. In order to more scientificly and objectively make comprehensive evaluation for inland dry ports, the related research on port competitiveness evaluation at home and abroad has been compared and referred, from the two aspects of internal factors and external factors, selecting relevant indicators and from multiple angles and levels to build a comprehensive evaluation index system [34-36], trying to apply the mature theories and methods in the seaport competitiveness evaluation to dry port competitiveness evaluation [37-39], putting forward countermeasures and suggestions to the construction and development of dry ports according to the results, serving for the promotion of the development of inland dry ports.

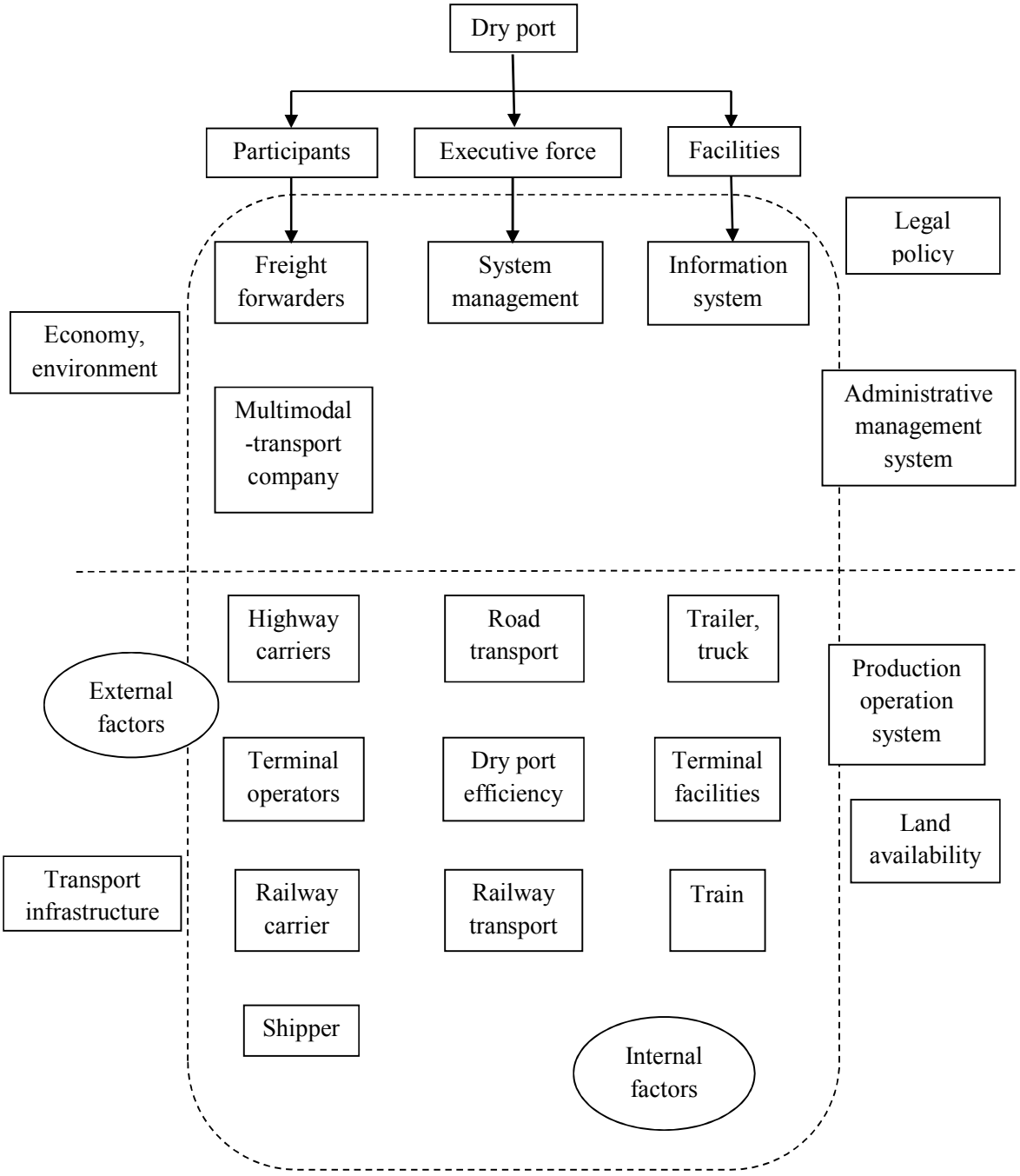


Figure 5.1 The relationship of factors effecting dry port developing

In the aspect of establishing competitiveness evaluation index system, first we should analyze the factors that affect the development of dry port and the relationships among these factors. As shown in Fig 5.1, we establish the multi-level competitiveness evaluation index system on this base [40], as shown in table 5.1.

Tab 5.1 Evaluation index system of inland dry port competitiveness

Index classification	**First-grade Index**	**Second-grade Index**
Internal evaluation index	The equipment service conditions of dry port	The construction scale and level of dry port
		The management level of dry port
	The execution efficiency of dry port	The customs clearance efficiency of dry port
	The benefit level of dry port	Urban logistics development level
External evaluation index	The regional economic environment	The overall national economy level
		Hinterland industrial basis
		Foreign trade level
	The transportation conditions	The accessibility to the coastal ports
		The scale of regional traffic
		Inland transportation situation
	Legal policy measures	The capacity of government support

In view of the competitiveness evaluation index system and the various indicators, the following instructions needed further to do.

(1) The evaluation index system is divided into internal factors and external factors these two parts. Internal evaluation index mainly accounts for inland dry port's own situation and level as the port, including construction scale, management level, efficiency of customs clearance and etc. External evaluation index mainly accounts for the factors in various aspects of the development of inland dry port, including economy, transportation, policy support and etc. Internal factors and external factors determine the competitiveness of inland dry port together. The internal factors can effectively explain the development basis of inland dry port, and at the same time, external factors will affect the follow-up development situation of inland dry port built to a large extent. As inland dry port being different from seaport, it has no water depth, water area situation and terminal facilities these more internal hardware factors, so in the process of making competitiveness evaluation study for inland dry port, external evaluation index will be accounted for more proportion.

(2) The evaluation index system strived to be selected combined with actual inland dry port development, combining quantitative and qualitative analysis. The three secondary class indexes of "The regional economic environment" and "The scale of regional traffic " under "transportation conditions" are the quantitative indicators, selecting city GDP/hundred million yuan, city gross industrial output value/hundred million yuan, total amount of city foreign import and export trade/hundred million dollars and total cargo transport volume/thousand tons as the indicators performance parameters, fully reflecting the positive role of social economy and transportation scale to inland dry port. The rest are qualitative indexes, and through expert scoring, Fuzzy comprehensive evaluation method was applied for degree of membership statistics to get final index performance for the evaluation.

(3) What needed to illustrate is that" The customs clearance efficiency of dry port" under "The execution efficiency of dry port", and "The accessibility to the coastal ports" and "Inland transport situation" under "The transportation conditions" are unique indicators in the competitiveness evaluation of inland dry port. "The customs clearance efficiency of

dry port" is one of the important performance factors of the services and operations of dry port. Whether dry port can effectively become the efficient node of inland multimodal transport depends on whether it can quickly handle the customs clearance of goods for inland shippers and consignees to a large extent. "The accessibility to the coastal ports" can fully show the location factor of inland dry port. In the situation that other conditions are the same, the inland dry port which is close to seaport, on the one hand, is more popular with the seaport, on the other hand, is also easier to attract inland shippers and consignees. "Inland transportation satiation" is also a unique index that can reflect the competitiveness of dry port. The more number of roads and railways, the further the inland dry port whose city's transportation network layout is scientific and standardized will give play to the advantages of transportation, collecting and distributing supply of goods, becoming a hinge of multimodal transport network. In the process of evaluation, more attention should be paid to these two factors.

5.2 The establishment of inland dry port competitiveness evaluation model

China's inland dry port competitiveness evaluation is a multi-level and multi-objective decision-making problem. Carrying on the scientific and comprehensive evaluation to inland dry port involves the integrated analysis and comparison of many factors, such as its construction condition, operation status and economic environment, to get objective and detailed evaluation conclusion. Considering the factors affecting the development of dry port is numerous and the taking value of various factors is uncertain and their interaction mechanism is not clear. With reference to the commonly used evaluation methods, the combination of AHP method and Fuzzy comprehensive evaluation method has been used for the competitiveness evaluation of inland dry ports. We first select AHP method to determine the weight of evaluation indexes and then apply Fuzzy comprehensive evaluation for integration, setting up evaluation model to evaluate the competitiveness of inland dry port, enhancing the objectivity of Fuzzy comprehensive evaluation. The combination of evaluation methods can make the results more clear, the accuracy higher and operability stronger.

5.2.1 The basic idea of applying AHP method to determine the index weight

The AHP method has the advantage of combining qualitative analysis and quantitative analysis. This can not only ensure the systematicness and the rationality of the model, but also can make decision makers to be able to fully use their valuable experience and judgment ability to provide strong decision support for many planning decision problems. In the combination evaluation, the application of AHP method mainly embodies in dividing evaluation index system into hierarchical type hierarchy structure, applying AHP method to determine the weight of each index for the calculation of evaluation model. Here simply introduce the basic idea of using AHP method to determine the index weight [41, 42].

(1) Establishing hierarchical structure model

Analyze the relationship between various factors in the evaluation system and establish index hierarchy-the highest level, the middle level and the lowest level. The highest level illustrates the overall goal of the evaluation. The middle level is also called the rule level. It is the intermediate link when taking measures or schemes to realize the general objective. The lowest level is also called the plan level which gives out the detailed specific measures to solve problems.

(2) Establishing judgment matrix

In order to enhance the objectivity of evaluation, we apply Delphi method to compare two factors between different levels, constructing judgment matrix.

Assuming that judgment matrix $A=\begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{pmatrix}$ $a_{ij} = 1, 2, \ldots, n$

Among them, the judgment matrix element a_{ij} is given by 1-9 scaling method from Santy.

Tab 5.2 The scaling method (1-9) from Santy

Scaling	Meaning
1	The two factors to be compared have the same importance
3	Of the two factors to be compared, one factor is slightly more important than another factor
5	Of the two factors to be compared, one factor is obviously more important than another factor
7	Of the two factors to be compared, one factor is strongly more important than another factor
9	Of the two factors to be compared, one factor is extremely important than another factor
2, 4, 6, 8	The average value of above two adjacent judgment
Reciprocal	The judgment of comparing factor i and factor j is a_{ij} , then the judgment of comparing factor j and factor i is $a_{ji} = 1/a_{ij}$

(3) Hierarchical single sorting and consistency check

Use root method or sum and product method to calculate relative weight of various factors for the rule in the judgment matrix and then further to make consistency check.

The feature vector corresponding to maximum characteristic root λmax of judgment matrix is noted as W after normalization (make the sum of each element in the vector equal to 1). The element of W is the sorting weight of relative importance of factors in the same level towards the factors in the upper level. This process is known as hierarchical single sorting.

Whether the hierarchical single sorting can be confirmed is need to do consistency check. So called consistency check refers to determining the allowed inconsistent range of A. The calculation of consistency index: $C.I = (\lambda max - n)/(n - 1) \cdot R.I$ (R.I is the mean random consistency index, which can be checked in table 5.3).

Tab 5.3 Index of R.I.

Order	3	4	5	6	7	8	9
RI	0.58	0.90	1.12	1.24	1.32	1.41	1.45

It is generally believed that, if C.R $\leq$ 0.1, then the consistency check is passed. We regard that the hierarchical single sorting weight vector value has satisfactory consistency, namely the weight allocation is reasonable, which can be used as the result of the index weight. In the same way, we can continue to the next level of operation when weight allocation of first grade indicators towards target level is obtained. And then we can conclude the weight allocation of secondary class indicators towards the rule level and finally get the weight of the index system.

5.2.2 The principle of Fuzzy comprehensive evaluation method

The method of applying the basic principle of fuzzy mathematics and making an overall evaluation for things or objects restricted by various factors is called Fuzzy comprehensive evaluation method. Fuzzy comprehensive evaluation includes primary evaluation and multistage evaluation. Among them, first grade evaluation is the basis of the fuzzy comprehensive evaluation and its process can be summarized as the following steps [43, 44]:

(1) Setting up the assembly of evaluation objects, index and comments

Factors, namely the evaluation index, refer to the various properties or attributes of evaluation objects. Comment assembly is also called judgment assembly, namely the assembly of comments of evaluation objects. The evaluation work in this thesis involves multiple objects, so it also needs to establish an evaluation object assembly. It is shown as follows:

$W = \{w_1, w_2, \ldots, w_t\}$ is the evaluation object assembly, t is the number of evaluation objects;

$U = \{u_1, u_2, \ldots, u_n\}$ is the evaluation factor assembly, n is the number of evaluation indexes;

$V = \{v_1, v_2, \ldots, v_n\}$ is the evaluation comment assembly, m is the number of evaluation comments.

(2) To determine the index weight

According to the AHP method, the scoring results from every expert will produce a weight combination of the index system. Drawing arithmetic average on all combinations can get the final weight of evaluation index system, forming the weight vector $A = (a_1, a_2, \ldots, a_n)$, $\sum_{i=1}^{n} ai = 1$.

(3) Establishing single factor evaluation matrix, $R = (r_{ij})_{n*m}$

Each evaluation object has fuzzy relationship matrix R, which is called an evaluation matrix of some evaluation object,

$$R = \begin{pmatrix} R_1 \\ R_2 \\ . \\ . \\ R_m \end{pmatrix} = \begin{pmatrix} R_{11} & R_{12} & . & . & R_{1n} \\ R_{21} & R_{22} & . & . & R_{2n} \\ . & . & & & . \\ . & . & & & . \\ R_{m1} & R_{m2} & . & . & R_{mn} \end{pmatrix}$$

In fact, R is the fuzzy relationship between U and V, namely $R: U*V \rightarrow [0, 1]$.

(4) Make a comprehensive evaluation

Evaluation vector B = W ° R = (b_1, b_2, …, b_n). " ° " is some synthetic calculation. What needed to notice is that if evaluation result $\sum_{j=1}^{m} bj \neq 1$, we should make the normalization processing for it.

(5) Get the final evaluation results

According to the results of the evaluation vector, if $b_j = \max \{b_1, b_2, \ldots, b_m\}$, then make comments v_j on evaluation objects. The calculation result is the result of evaluation object aiming at some criterion level. As for multistage evaluation, its principle is the same and just needed to be done from top to bottom step by step. Specifically, it is taking the lower level evaluation results as the input information of the higher level evaluation until all levels have complete the evaluation and then get the final result. According to the inland dry port competitiveness evaluation index system established in the above section, this paper will adapt secondary class Fuzzy comprehensive evaluation model.

5.2.3 The establishment and solution of inland dry port competitiveness comprehensive evaluation model

(1) The determination of index weight

According to the evaluation index system established in above section, we use letter U to express the assembly of China's inland dry port competitiveness evaluation. Thus we can get $U = \{U_1, U_2, U_3, U_4, U_5, U_6\}$, which means that there are six indicators in the first level assembly. We use U_{ij} to express the second level indicators and we get the assemblies: $U_1 = \{U_{11}, U_{12}\}$, $U_2 = \{U_{21}\}$, $U_3 = \{U_{31}\}$, $U_4 = \{U_{41}, U_{42}, U_{43}\}$, $U_5 = \{U_{51}, U_{52}, U_{53}\}$, $U_6 = \{U_{61}\}$.

The AHP method is used in this article to determine index weight. In order to further ensure the effectiveness and scientificness of the weights, in the process of constructing judgment matrix in accordance with the scale of 1-9 Santy method, we don't depend on a single matrix to calculate the results, but we invited four experts who expert in port and transportation respectively to make index comparison back to back, synthesizing the

weight indexes distribution achieved from four judgment matrix and then process them to obtain final results of the weights. It is shown as follows:

Taking the first matrix as the example, its structure is as follows:

$$R_1 = (r_{ij})_{6*6} = \begin{pmatrix} 1 & 5 & 4 & 2 & 2 & 6 \\ 1/5 & 1 & 1/2 & 1/6 & 1/4 & 1 \\ 1/4 & 2 & 1 & 1/3 & 1 & 3 \\ 1/2 & 6 & 3 & 1 & 2 & 5 \\ 1/2 & 4 & 1 & 1/2 & 1 & 7 \\ 1/6 & 1 & 1/3 & 1/5 & 1/7 & 1 \end{pmatrix}$$

Because the scale values is from 1 to 9, so we choose square root method to calculate the weight. Through the calculation of the geometric average of each element and making normalization, we can get feature vector approximation: W = (0.3528, 0.0506, 0.1123, 0.2668, 0.1744, 0.0431). This is the relative weight values of first grade evaluation index.

Next we will make consistency check for the feature vector. First of all, we will calculate the maximum eigenvalue of judgment matrix according to the following equation.

$$\begin{pmatrix} 1 & 5 & 4 & 2 & 2 & 6 \\ 1/5 & 1 & 1/2 & 1/6 & 1/4 & 1 \\ 1/4 & 2 & 1 & 1/3 & 1 & 3 \\ 1/2 & 6 & 3 & 1 & 2 & 5 \\ 1/2 & 4 & 1 & 1/2 & 1 & 7 \\ 1/6 & 1 & 1/3 & 1/5 & 1/7 & 1 \end{pmatrix} \cdot \begin{pmatrix} 0.3528 \\ 0.0506 \\ 0.1123 \\ 0.2668 \\ 0.1744 \\ 0.0431 \end{pmatrix} = \begin{pmatrix} \lambda_1 & & & & & \\ & \lambda_2 & & & & \\ & & \lambda_3 & & & \\ & & & \lambda_4 & & \\ & & & & \lambda_5 & \\ & & & & & \lambda_6 \end{pmatrix} \cdot \begin{pmatrix} 0.3528 \\ 0.0506 \\ 0.1123 \\ 0.2668 \\ 0.1744 \\ 0.0431 \end{pmatrix}$$

We can get the result λ_{max} = 6.2024, so we continue consistency test and get

C.I = $\frac{\lambda max-n}{n-1} = \frac{6.2024-6}{6-1}$ = 0.04048, when n = 6, the value of R.I is 1.24, so C.R = C.I/ R.I = 0.03265 < 0.1. We can get that the judgment matrix has a satisfactory consistency, which can be accepted. And it is also showed that the weight coefficient distribution is reasonable.

In the same way, we also do the same process for the other three judgment matrixes which regard to the relative important degree. The results are as follows:

$$R_2 = (r_{ij})_{6*6} = \begin{pmatrix} 1 & 3 & 1 & 1/4 & 1/3 & 2 \\ 1/3 & 1 & 1/3 & 1/6 & 1/5 & 1/2 \\ 1 & 3 & 1 & 1/3 & 1/2 & 4 \\ 4 & 6 & 3 & 1 & 2 & 5 \\ 3 & 5 & 2 & 1/2 & 1 & 4 \\ 1/2 & 2 & 1/4 & 1/5 & 1/4 & 1 \end{pmatrix}$$

W = (0.1139, 0.0448, 0.1436, 0.3829, 0.2531, 0.0617).

λ_{max} = 6.1586, C.I = 0.0317, C.R = 0.0256, so it has satisfactory consistency.

$$R_3 = (r_{ij})_{6*6} = \begin{pmatrix} 1 & 4 & 6 & 2 & 1/3 & 7 \\ 1/4 & 1 & 3 & 1/2 & 1/5 & 2 \\ 1/6 & 1/3 & 1 & 1/4 & 1/6 & 1/2 \\ 1/2 & 2 & 4 & 1 & 1/3 & 5 \\ 3 & 5 & 6 & 3 & 1 & 8 \\ 1/7 & 1/2 & 2 & 1/5 & 1/8 & 1 \end{pmatrix}$$

W = (0.2551, 0.0847, 0.0376, 0.1594, 0.4178, 0.0454).

λ_{max} = 6.2472, C.I = 0.0494, C.R = 0.0399, so it has satisfactory consistency.

$$R_4 = (r_{ij})_{6*6} = \begin{pmatrix} 1 & 8 & 6 & 4 & 3 & 5 \\ 1/8 & 1 & 1/3 & 1/5 & 1/7 & 1/4 \\ 1/6 & 3 & 1 & 1/3 & 1/4 & 1/2 \\ 1/4 & 5 & 3 & 1 & 1/2 & 3 \\ 1/3 & 7 & 4 & 2 & 1 & 4 \\ 1/5 & 4 & 2 & 1/3 & 1/4 & 1 \end{pmatrix}$$

W = (0.4358, 0.0298, 0.0606, 0.1541, 0.2371, 0.0826)

λ_{max} = 6.2784, C.I = 0.0557, C.R = 0.0449, so it has satisfactory consistency.

Getting arithmetic average for the weight of above four judgment matrixes, we can get the final first grade index weight distribution: U = (0.2894, 0.0525, 0.0885, 0.2408, 0.2706, 0.0582).

Same to the principle of calculating first grade indicators, we also construct judgment matrix according to 1-9 scaling method on secondary class indexes. And we obtain feature vector by square root method, calculating the maximum eigenvalue, testing the consistency and getting the result. Then we deal with the four weight vectors to get the relative weight of secondary class indexes under their corresponding first grade indexes. Since the number of secondary class indexes under each first grade index is less, so the matrix processing is relatively simple and here we don't illustrate. Index system of comprehensive weight is shown in Table 5.4.

Tab 5.4 The index weight of inland dry port competitiveness evaluation

First grade index	Weight	Secondary class index	Weight
Dry port equipment service conditions	0.2894	Dry port construction scale and level	0.6042
		Dry port management level	0.3958
Dry port execution efficiency	0.0525	Dry port customs clearance efficiency	1
Dry port benefits level	0.0885	The development level of urban logistics industry	1
Regional economic environment	0.2408	The national economy overall level	0.3352
		Hinterland industrial basis	0.1671
		Foreign trade level	0.4977
Transportation conditions	0.2706	The accessibility to coastal ports	0.4216
		Regional traffic scale	0.3540
		Inland transportation situation	0.2244
Legal policy measures	0.0582	The capacity of government support	1
The sum of the weights	1		

(2) The determination of each index membership degree and the generation of fuzzy matrix

We set comment assembly as $V = \{v_1, v_2, \ldots, v_m\}$, and v_i means the comment of each level. And $i = 1, 2, \ldots, m$, m represent the number of comments. With reference to the previous similar composition of evaluation index system and comment assembly of construction projects, we get m =5, namely the comment assembly of China's inland dry port competitiveness evaluation modal is $V = \{v_1$(excellent), v_2(good), v_3(general), v_4(slightly poor), v_5(poor)$\}$.

We can adopt the fuzzy statistics method to determine the membership degree of qualitative index of the indicators. In this paper, the basic method to determine the index membership degree is inviting 15 experts and the port business related people respectively to score for the evaluation index of each object according to the comment assembly. They rate in accordance with the grading range and then through the frequency to obtain the relative membership degree. Because this article involves two layer index, so we get the membership degree through the rating of all qualitative secondary class indexes [45].

For the three quantitative indicators under "regional economic environment" and "regional transport scale" under the "transportation conditions", according to the idea of establishing the index system, we select four evaluation cities' 2010 data as the basic evaluation data, which is shown as Table 5.5. In order to unify the horizontal comparability and the vertical consistency of the indexes, we take the actual data as an expert rating standard of consideration. Because there is a certain degree of differences in the aspect of four cities' economy and transportation development, so we illustrate to the experts that when they are horizontally comparing the four cities' data, they should also pay close attention to the progress of each city in the process of constructing their own dry ports. In this way we can effectively avoid the non-objective rating or the too big differences of absolute data.

Tab 5.5 The data of evaluation objectives

The performance of indicators	Chengdu	Xi'an	Nanning	Shijiazhuang
GDP(hundred million yuan)/ The growth rate	5551.3/15.0%	3241.49/14.5%	1800.43/14.2%	3401.0/12.2%
Total industrial output value(hundred million yuan)/ The growth rate	2062.8/20.5%	1006.38/18.1%	1502.68/28.99%	1340.1/16.5%
Import-export value(hundred million dollars)/ The growth rate	246.6/38.6%	103.82/43.2%	22.13/-20.62%	109.7/99.3%
Freight volume(thousand tons)/ The frowth rate	53140.4/18.9%	34331.68/13%	19171.05/23.76%	13900/14.7%

After the data processing of expert rating, we get the membership degree of each index for comment assembly. The specific results are shown in Table 5.6 to Table 5.11.

Tab 5.6 Memberships of 2nd class index under U1

Index	Rating description	Chengdu		Xi'an		Nanning		Shijiazhuang	
		Frequentness	Membership degree	Frequentness	Membership degree	Frequentness	Membership degree	Frequentness	Membership degree
Dry port construction scale and level(U_{11})	Excellent	2	0.133	2	0.133	1	0.067	0	0
	Good	6	0.400	7	0.467	5	0.333	6	0.400
	General	4	0.267	3	0.200	4	0.267	5	0.334
	Slightly poor	3	0.200	3	0.200	3	0.200	2	0.133
	Poor	0	0	0	0	2	0.133	2	0.133
Dry port management level(U_{12})	Excellent	1	0.067	0	0	0	0	1	0.067
	Good	5	0.334	5	0.333	6	0.400	7	0.467
	General	5	0.333	4	0.267	4	0.267	5	0.333
	Slightly poor	2	0.133	4	0.267	3	0.200	2	0.133
	Poor	2	0.133	2	0.133	2	0.133	0	0

Tab 5.7 Memberships of 2nd class index under U2

Index	Rating description	Chengdu		Xi'an		Nanning		Shijiazhuang	
		Frequentness	Membership degree	Frequentness	Membership degree	Frequentness	Membership degree	Frequentness	Membership degree
Dry port customs clearance efficiency(U_{21})	Excellent	1	0.067	1	0.067	2	0.133	1	0.067
	Good	3	0.200	3	0.200	3	0.200	4	0.267
	General	4	0.267	5	0.333	5	0.333	3	0.200
	Slightly poor	5	0.333	4	0.267	4	0.267	6	0.400
	Poor	2	0.133	2	0.133	1	0.067	1	0.066

Tab 5.8 Memberships of 2nd class index under U3

Index	Rating description	Chengdu		Xi'an		Nanning		Shijiazhuang	
		Frequentness	Membership degree	Frequentness	Membership degree	Frequentness	Membership degree	Frequentness	Membership degree
The development	Excellent	2	0.133	3	0.200	1	0.067	2	0.133
	Good	3	0.200	4	0.267	4	0.267	3	0.200

level of urban logistics industry(U_{31})	**General**	4	0.267	5	0.333	4	0.267	4	0.267
	Slightly poor	4	0.267	2	0.133	5	0.333	6	0.400
	Poor	2	0.133	1	0.067	1	0.066	0	0

Tab 5.9 Memberships of 2nd class index under U4

Index	**Rating description**	**Chengdu**		**Xi'an**		**Nanning**		**Shijiazhuang**	
		Frequentness	**Membership degree**	**Frequentness**	**Membership degree**	**Frequentness**	**Membership degree**	**Frequentness**	**Membership degree**
The national economy overall level(U_{41})	**Excellent**	3	0.200	2	0.133	0	0	2	0.133
	Good	8	0.533	9	0.600	5	0.333	10	0.667
	General	4	0.267	3	0.200	7	0.467	1	0.067
	Slightly poor	0	0	1	0.067	3	0.200	2	0.133
	Poor	0	0	0	0	0	0	0	0
Hinterland	**Excellent**	2	0.133	1	0.067	4	0.267	2	0.133
	Good	7	0.467	5	0.333	6	0.400	6	0.400

industrial basis (U_{42})	**General**	4	0.267	6	0.400	3	0.200	4	0.267
	Slightly poor	2	0.133	2	0.133	2	0.133	3	0.200
	Poor	0	0	1	0.067	0	0	0	0
Foreign trade level(U_{43})	**Excellent**	3	0.200	2	0.133	0	0	3	0.200
	Good	7	0.467	8	0.534	5	0.333	8	0.533
	General	5	0.333	3	0.200	7	0.467	4	0.267
	Slightly poor	0	0	2	0.133	2	0.133	0	0
	Poor	0	0	0	0	1	0.067	0	0

Tab 5.10 Memberships of 2nd class index under U5

Index	**Rating description**	**Chengdu**		**Xi'an**		**Nanning**		**Shijiazhuang**	
		Frequentness	**Membership degree**	**Frequentness**	**Membership degree**	**Frequentness**	**Membership degree**	**Frequentness**	**Membership degree**
The accessibility	Excellent	3	0.200	2	0.133	3	0.200	3	0.200
	Good	5	0.333	5	0.334	6	0.400	7	0.467

to the seaports(U_{51})	General	5	0.334	5	0.333	3	0.200	4	0.266
	Slightly poor	2	0.133	3	0.200	3	0.200	1	0.067
	Poor	0	0	0	0	0	0	0	0
Regional traffic scale(U_{52})	Excellent	3	0.200	2	0.133	3	0.200	1	0.067
	Good	6	0.400	6	0.400	7	0.467	7	0.466
	General	6	0.400	5	0.334	4	0.266	4	0.267
	Slightly poor	0	0	2	0.133	1	0.067	3	0.200
	Poor	0	0	0	0	0	0	0	0
Inland transportation situation(U_{52})	Excellent	2	0.133	3	0.200	2	0.133	3	0.200
	Good	5	0.333	6	0.400	4	0.267	7	0.467
	General	4	0.267	3	0.200	6	0.400	3	0.200
	Slightly poor	3	0.200	3	0.200	2	0.133	2	0.133
	Poor	1	0.067	0	0	1	0.067	0	0

Tab 5.11 Memberships of 2nd class index under U6

Index	Rating description	Chengdu		Xi'an		Nanning		Shijiazhuang	
		Frequentness	Membership degree	Frequentness	Membership degree	Frequentness	Membership degree	Frequentness	Membership degree
The capacity of government support	Excellent	3	0.200	4	0.267	2	0.133	1	0.067
	Good	5	0.333	5	0.333	4	0.267	5	0.333
	General	5	0.334	6	0.400	5	0.333	6	0.400
	Slightly poor	2	0.133	0	0	4	0.267	3	0.200
	Poor	0	0	0	0	0	0	0	0

According to the comment assembly, we make comprehensive evaluation for each sub-index U_{ij} in the U_i(i=1, 2, 3, 4, 5, 6). And we get the membership degree of each index for comment through calculation, namely the membership degree of the index U_{ij} which belongs to the No. k comment. In this way, we can obtain the fuzzy evaluation matrix of each index in the first layer. As for Chengdu, Xi'an, Nanning and Shijiazhuang these four cities, the calculation of fuzzy evaluation matrix and the subsequent calculation steps are quite the same. So we take Chengdu as an example to illustrate in detail in the calculation part and the remaining three evaluation objects are not necessary to illustrate in detail. We just give the evaluation results. Accordingly, for Chengdu, the evaluation matrixes of the six first-grade indexes are shown below:

$$R_1 = \begin{pmatrix} r_{111} & r_{112} & r_{113} & r_{114} & r_{115} \\ r_{121} & r_{122} & r_{123} & r_{124} & r_{125} \end{pmatrix} = \begin{pmatrix} X_{11} \\ X_{12} \end{pmatrix} = \begin{pmatrix} 0.133 & 0.4 & 0.267 & 0.2 & 0 \\ 0.067 & 0.334 & 0.333 & 0.133 & 0.133 \end{pmatrix}$$

$$R_2 = [r_{211} \quad r_{212} \quad r_{213} \quad r_{214} \quad r_{215}] = [X_{21}] = [0.067 \quad 0.2 \quad 0.267 \quad 0.333 \quad 0.133]$$

$$R_3 = [r_{311} \quad r_{312} \quad r_{313} \quad r_{314} \quad r_{315}] = [X_{31}] = [0.133 \quad 0.2 \quad 0.267 \quad 0.267 \quad 0.133]$$

$$R_4 = \begin{pmatrix} r_{411} & r_{412} & r_{413} & r_{414} & r_{415} \\ r_{421} & r_{422} & r_{423} & r_{424} & r_{425} \\ r_{431} & r_{432} & r_{433} & r_{434} & r_{435} \end{pmatrix} = \begin{pmatrix} X_{41} \\ X_{42} \\ X_{43} \end{pmatrix} = \begin{pmatrix} 0.2 & 0.533 & 0.267 & 0 & 0 \\ 0.133 & 0.467 & 0.267 & 0.133 & 0 \\ 0.2 & 0.467 & 0.333 & 0 & 0 \end{pmatrix}$$

$$R_5 = \begin{pmatrix} r_{511} & r_{512} & r_{513} & r_{514} & r_{515} \\ r_{521} & r_{522} & r_{523} & r_{524} & r_{525} \\ r_{531} & r_{532} & r_{533} & r_{534} & r_{535} \end{pmatrix} = \begin{pmatrix} X_{51} \\ X_{52} \\ X_{53} \end{pmatrix} = \begin{pmatrix} 0.2 & 0.333 & 0.334 & 0.133 & 0 \\ 0.2 & 0.4 & 0.4 & 0 & 0 \\ 0.133 & 0.333 & 0.267 & 0.200 & 0.067 \end{pmatrix}$$

$$R_6 = [r_{611} \quad r_{612} \quad r_{613} \quad r_{614} \quad r_{615}] = [X_{61}] = [0.2 \quad 0.333 \quad 0.334 \quad 0.133 \quad 0]$$

(3) Fuzzy comprehensive evaluation

The evaluation model established in this paper applies secondary class evaluation index system. So in the process of calculation, it is also divided into two levels, making fuzzy matrix calculations in two steps.

The first level is fuzzy evaluation, which makes fuzzy matrix calculation of evaluation matrix R_i for each secondary class index U_{ij}. We obtained membership degree vector B_i of

six first-grade indexes U_i for comment assembly $V = \{v_1, v_2, \ldots, v_m\}$, namely $B_i(i = 1\sim6) = W_i \circ R_i = (b_{i1}, b_{i2}, b_{i3}, b_{i4}, b_{i5})$

Among them, " ° " is a particular synthesis algorithm. In this paper, for all evaluation factors, we considered their weights and balanced them. In order to reflect the integrity of the evaluation, we used weighted average model $M(\cdot, \oplus)$operator. To say in detail, it is the product of the two matrixes. We still take Chengdu as an example, the membership degree vectors according to calculation rules obtained is as follows:

$$B_1 = W_1 \circ R_1 = [0.6042 \quad 0.3958] \circ \begin{pmatrix} 0.133 & 0.4 & 0.267 & 0.2 & 0 \\ 0.067 & 0.334 & 0.333 & 0.133 & 0.133 \end{pmatrix}$$

$$= [0.1069 \quad 0.3739 \quad 0.2931 \quad 0.1735 \quad 0.0526]$$

$$B_2 = W_2 \circ R_2 = [1] \circ [0.067 \quad 0.2 \quad 0.267 \quad 0.333 \quad 0.133]$$

$$= [0.067 \quad 0.2 \quad 0.267 \quad 0.333 \quad 0.133]$$

$$B_3 = W_3 \circ R_3 = [1] \circ [0.133 \quad 0.2 \quad 0.267 \quad 0.267 \quad 0.133]$$

$$= [0.133 \quad 0.2 \quad 0.267 \quad 0.267 \quad 0.133]$$

$$B_4 = W_4 \circ R_4 = [0.3552 \quad 0.1671 \quad 0.4977] \circ \begin{pmatrix} 0.2 & 0.533 & 0.267 & 0 & 0 \\ 0.133 & 0.467 & 0.267 & 0.133 & 0 \\ 0.2 & 0.467 & 0.333 & 0 & 0 \end{pmatrix}$$

$$= [0.1888 \quad 0.4891 \quad 0.2999 \quad 0.0222 \quad 0]$$

$$B_5 = W_5 \circ R_5 = [0.4216 \quad 0.354 \quad 0.2244] \circ \begin{pmatrix} 0.2 & 0.333 & 0.334 & 0.133 & 0 \\ 0.2 & 0.4 & 0.4 & 0 & 0 \\ 0.133 & 0.333 & 0.267 & 0.200 & 0.067 \end{pmatrix}$$

$$= [0.185 \quad 0.3567 \quad 0.3423 \quad 0.101 \quad 0.015]$$

$$B_6 = W_6 \circ R_6 = [1] \circ [0.2 \quad 0.333 \quad 0.334 \quad 0.133 \quad 0]$$

$$= [0.2 \quad 0.333 \quad 0.334 \quad 0.133 \quad 0]$$

Next, the first-grade indexes for evaluation overall target of the single factor evaluation matrix B which is composed of $B_1 - B_6$ is as follows:

$$B = \begin{pmatrix} B_1 \\ B_2 \\ B_3 \\ B_4 \\ B_5 \\ B_6 \end{pmatrix} = \begin{pmatrix} b_{11} & b_{12} & b_{13} & b_{14} & b_{15} \\ b_{21} & b_{22} & b_{23} & b_{24} & b_{25} \\ b_{31} & b_{32} & b_{33} & b_{34} & b_{35} \\ b_{41} & b_{42} & b_{43} & b_{44} & b_{45} \\ b_{51} & b_{52} & b_{53} & b_{54} & b_{55} \\ b_{61} & b_{62} & b_{63} & b_{64} & b_{65} \end{pmatrix} = \begin{pmatrix} 0.1069 & 0.3739 & 0.2931 & 0.1735 & 0.0526 \\ 0.067 & 0.2 & 0.267 & 0.333 & 0.133 \\ 0.133 & 0.2 & 0.267 & 0.267 & 0.133 \\ 0.1888 & 0.4891 & 0.2999 & 0.0222 & 0 \\ 0.185 & 0.3567 & 0.3423 & 0.101 & 0.015 \\ 0.2 & 0.333 & 0.334 & 0.133 & 0 \end{pmatrix}$$

The next is secondary class evaluation, namely making fuzzy calculation for the evaluation matrix B obtained to get overall evaluation target for membership degree vector Y of comment assembly V. The detail is as follows:

$$Y = W \circ B = [w_1, w_2, w_3, w_4, w_5, w_6] \circ \begin{pmatrix} B_1 \\ B_2 \\ B_3 \\ B_4 \\ B_5 \\ B_6 \end{pmatrix}$$

$$= [0.2894 \quad 0.0525 \quad 0.0885 \quad 0.2408 \quad 0.2706 \quad 0.0582] \circ \begin{pmatrix} 0.1069 & 0.3739 & 0.2931 & 0.1735 & 0.0526 \\ 0.067 & 0.2 & 0.267 & 0.333 & 0.133 \\ 0.133 & 0.2 & 0.267 & 0.267 & 0.133 \\ 0.1888 & 0.4891 & 0.2999 & 0.0222 & 0 \\ 0.185 & 0.3567 & 0.3423 & 0.101 & 0.015 \\ 0.2 & 0.333 & 0.334 & 0.133 & 0 \end{pmatrix}$$

$$= [0.1534 \quad 0.3701 \quad 0.3068 \quad 0.1317 \quad 0.0380]$$

Then the evaluation object 1—the membership degree vector of Chengdu dry port's competitiveness for comment assembly V is:

$Y_1 = [0.1534 \quad 0.3701 \quad 0.3068 \quad 0.1317 \quad 0.0380]$

Similarly, according to the three other evaluation objects for the membership degree results of indexes and fuzzy comprehensive evaluation calculation principle in the above table, we get the membership degree vectors for comment assembly V of Xi'an, Nanning and Shijiazhuang. The vectors are as follows:

$Y_2 = [0.1295 \quad 0.3999 \quad 0.2741 \quad 0.1657 \quad 0.0308]$

Y_3 = [0.0932 0.3432 0.3120 0.1917 0.0599]

Y_4 = [0.1083 0.4346 0.2702 0.1602 0.0267]

Above are the results of comprehensive evaluation of China's typical dry ports' competitiveness which are obtained through the integration of AHP method and Fuzzy comprehensive evaluation method.

5.3 Inland dry port competitiveness evaluation results and analysis

According to the evaluation results obtained in the previous section, the membership degree vector Y, can achieve the strength and weakness degree of evaluation objects' competitiveness by contrasting with comment assembly [46]. Taking Chengdu dry port as an example, the results whose competitiveness is affiliated with excellent occupies 15.34%, good 37.01%, general 30.68%, slightly poor 13.17% and poor 3.8%. These results are valid for a single object, but for the transverse comparison of different evaluation objects, we must further process the results, making the fuzzy results become definite. To say specifically, it is making assignment to comment assembly. Because the comment assembly is corresponding to interval number at the time of scoring, so we take the median of each interval as the corresponding value of the comment. Namely "Excellent" is 95, "Good" 85, "General" 72.5, "Slightly poor" 57.5, "Poor" 25. The grading matrix is obtained: M = [95, 85, 72.5, 57.5, 25]. We do transpose and then do product for membership degree vector and grading matrix to get comprehensive score of dry port competitiveness. The calculation of Chengdu dry port's competitiveness comprehensive scores are as follows:

$$V = Y_1 \cdot M^T = [0.1534 \quad 0.3701 \quad 0.3068 \quad 0.1317 \quad 0.0380] \cdot \begin{pmatrix} 95 \\ 85 \\ 72.5 \\ 57.5 \\ 25 \end{pmatrix} = 76.79$$

In the same way, the competitiveness comprehensive score of Xi'an dry port is 76.46, Nanning 73.16 and Shijiazhuang 76.69. By the corresponding relationship between scores and comment assemblies, we can get that the competitiveness of the four inland dry ports belongs to general level, but close to good and in the sorting, Chengdu > Shijiazhuang > Xi'an > Nanning.

Combined with the qualitative analysis in the above section, we can know that the four inland dry ports being selected in the evaluation research now are in the early stages of the construction and development. Some of them have completed stage construction and have begun to play a role in the subsequent construction at the same time. Some have completed all the construction tasks, but they also have a shorter operating time. So although we can see their further development potential and prospects, at present, their competitiveness is not enough to meet the requirements of new model. Therefore the result "General" obtained by quantitative evaluation is scientific, objective and reasonable. It can also fully indicate the development phase and the expected target of China's inland dry ports.

From the view of transverse comparison, the development and operation situation of the four typical dry ports to be chosen in this paper is in a leading position among the domestic numerous dry ports. In the meanwhile, each of them has a comparative advantage in different aspects. This can also reasonably explain the phenomenon that the scoring of the four ports is approximate. To further analyze, the diversity analysis for the four dry ports can be more clearly gotten by membership degree vector. To consider with the maximization principle, it is obviously that the "Excellent" membership degree of Chengdu is highest and the competitiveness of Chengdu is strongest and the rest in the order is Xi'an, Shijiazhuang and Nanning. If we determine the evaluation results directly according to the

membership degree vector, the membership degree of the four dry ports for “Good” is all highest and the results are all “Good”. Sorted by this membership degree, there is Shijiazhuang > Xi’an > Chengdu > Naning.

Combined with the performance of evaluation objects for specific indexes to see, Chengdu and Xi’an which are deep in the interior and far from seaports, the advantages of Chengdu are more obviously. The distance from Shijiazhuang to Tianjin, Qinhuangdao, Jingtang and Caofeidian these ports is short. Shijiazhuang’s location advantage is obvious and its transportation function is powerful. Although its dry port scale is less than the above two ports, its comprehensive competitiveness is strong. Nanning has invested most in the aspects of regional economy and dry port construction in the southwest area. But compared with other three ports, there still exists a certain gap in foreign trade and construction scale.

5.4 The countermeasures and suggestions of the development of China’s inland dry ports

Combined with the existing problems analysis of China’s inland dry ports development at this stage and comprehensive competitiveness evaluation results, in this paper, under the new model, we put forward the countermeasures and suggestions which take the scale and the independence of inland dry ports as the target to construct and develop.

(1) From a macroscopic view, national and regional governments and relevant departments should make overall plan for the development of dry ports on a nation scale, making overall plan and key development objects in sub-areas, auditing land use index, arranging financing and paying attention to the integration of supporting system these key links, to realize the optimal allocation of resources, to overcome the redundant construction and resource waste these possible defects in the construction.

(2) The combination of static construction and dynamic programming. For the development of each inland dry port, in the process, we should not only attach great importance to the construction of dry port hardware facilities, but also should according to the policy adjustment and economic situation change, make and adjust the dynamic

development plan of dry port. In the process of constructing dry port, we should not only give full play to urban and regional strength, focusing on building dry port production operation facilities, but also contact with coastal ports actively, forming regional cooperation, planning sea-rail multimodal transport construction scheme, making the operation of dry port to complete the qualitative leap as soon as possible.

(3) Actively promote the construction of the software facilities and the soft environment of inland dry ports. The main body of dry port construction should work closely with universities and research institutions, with reference to the laws, regulations and customary practices of the coastal ports, formulating and complementing related laws, regulations and administrative rules which are suitable for inland dry ports. And it should strive to pass international certification institutions to be further popularized in the international transportation. At the same time, it should actively promote the soft environment construction of dry port, formulating the preferential policies which can promote foreign trade, taking measures to attract diversified investment channels, cultivating more number of logistics professionals and enhancing the management level and the ability to serve customers.

(4) Promote the integration and reengineering of inland dry port logistics system. The construction of inland dry ports for inland cities' logistics development is a chance in reform and adjustment. When constructing and developing the inland dry port, we should complete comprehensive logistics park location, integrating port-surrounding industrial district, railway container terminal, cargo storage area, "one customs office with three inspection projects" related institution, logistics and agent and other related industries. We should also take inland dry port as the center, centralizing service function, making clear the position and the tasks of the main body in the process of development, avoiding conflict in the process of construction and development and ensuring the benign development of inland dry port.

6. Conclusion

Under the direction of global economic integration, the demands of the development of ports and inland cities, and the needs of container multimodal transport, promote the construction and development of inland dry ports together. On the one hand, the increasing import-export volume makes coastal ports need the inland hinterlands and efficient transit nodes more urgently. In the meanwhile, inland areas also try to complete the formalities and business of foreign trade in local areas, to promote the development of the economy, seeking new growth mode to create opportunities. On the other hand, from the external factors, the rapid development of container transport requires adaption development of multimodal transport system. This also makes the construction and development of inland dry port which is being the important node in the international container multimodal transport becomes the key to improve the ability of comprehensive transport. In this situation, the nationwide construction measures of inland dry ports increased rapidly in recent years. In order to adapt the development needs of inland dry ports in the new situation and to overcome the problems existing in the process of constructing China's dry ports, raising a new development pattern of inland dry port is very necessary. At the same time, this has a scientific, reasonable and clear judgment on its existing competitiveness, to ensure that inland dry ports will have a more benign development under the new mode.

The domestic and abroad relevant theories for inland dry port and the construction and practice research are taken as the breakthrough point in this paper. First we introduced the concept, specific functions and operation mode of dry port these related contents. And then we take the construction and development of China's inland dry port as the research object, expounding its formation and development power, analyzing the present three development modes and the existing problems. We take overcoming the problem and promoting the development as the purpose, putting forward the new development mode of China's inland dry port, analyzing the characteristics and how to implement it. And then we embodied the research objects, selecting Chengdu, Xi'an, Nanning and Shijiazhuang these four typical inland dry ports, analyzing their own development situation guided by the new pattern, and then use SWOT method to analyze their strengths, weaknesses,

opportunities and threats, preliminarily making clear each dry port's competitiveness performance from the qualitative aspect. Finally we considered the internal and external factors affecting the development of inland dry port, building competitiveness evaluation index system, integrating the AHP method and Fuzzy comprehensive evaluation method to evaluate the competitiveness of inland dry port. We drew the conclusion that the competitiveness of four dry ports is all "General" in their early stage and close to "Good". And on the basis of analyzing evaluation results, we made countermeasures and suggestions for the construction and development of China's inland dry ports for reference.

In this paper, the main work performs in the following:

(1) The current domestic and abroad research status for dry port and the specific practice for the construction and development of China's dry port are combined in this paper. We put forward the new development mode of inland dry port, which both considered the scale and independence of inland dry port and focused on the overall social and economic development. The thought that combines theory and practice to analyze a certain question has a realistic significance to the development of inland dry port. At the same time, the raising of new mode will also have certain guidance and reference impact on the future development planning of dry port.

(2) In the process of the study of evaluating inland dry port's comprehensive competitiveness, we combined the qualitative indexes and quantitative indexes and comprehensively considered the internal and external factors, combining more mature system and methods which are applied in the seaport's competitiveness evaluation with inland dry port to make reasonable adjustment and correction. Then we got the new evaluation model and made the evaluation more detailed and comprehensive by selecting the representative dry port, which provided the new mode of scanning dry port's competition potential for potential investors and provided useful countermeasures and suggestion for main construction body to develop dry ports.

As the quantitative researches for dry ports so far are mainly focused on the site selection and there is lack of competitiveness evaluation researches to be referred. What's more, because the author's level is limited and the time is hasty, so the study depth and breadth

of this paper is not enough. There exists some shortcomings and some further researches should be done in many aspects in the future.

(1) On the choice of competitiveness method, the AHP method and the Fuzzy comprehensive evaluation method are integrated in this paper. This combined evaluation can well reflect the comprehensive performance of evaluation objects, but determining weights and counting membership degree are based on expert scoring. Despite we have made adequate quantitative calculation to make the method more objectively, but the method in a certain extent still focuses on the determination of indicators, which ignores the peculiarity of the quantitative data. So the competitiveness evaluation research of dry port is still worth to be expanded from other angles and choosing the method of stronger data dependence.

(2) The dry port research content is extensive. From site selection to evaluation, and from construction and investment feasibility analysis to the network layout formed between dry ports and seaports, the contents are worth further study. We just take dry port competitiveness evaluation as the main research content in this article. In each part of the thesis, we also analyzed the contents related to competitiveness, but the other contents for dry port are less. In the process of analyzing and evaluating, we didn't fully consider the relations and influence between other contents and the competitiveness. This aspect of defect need to be strengthened in future studies.

In conclusion, in this thesis, the author takes the development and competitiveness of China's inland dry ports as the research objects, on the basis of various factors, proposing new development pattern and integrating and evaluating competitiveness. But how to apply the new pattern to guide the development of dry port in practice needs more detailed consideration and further studies. How to promote the evaluation system and whether the model can effectively applied in practical decision making are need to be inspected and perfected in practice.

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Appendix Experts Scoring Table for Competitiveness Evaluation

The core part of the article "The Development Pattern and Competitiveness Evaluation Research of China Inland Dry Ports" is making comprehensive evaluation for the competitiveness of the construction and development of China's typical inland dry ports. We will choose the integrated evaluation method which is constituted of AHP method and Fuzzy comprehensive evaluation method. This method need to invite experts (1) determining evaluation index weights and (2) scoring for various indexes in different schemes these two aspects.

First Part The determination of index weights

The AHP method will be used in this paper to determine the index weights. The basic data of the AHP method is that experts form the judgment matrix according to the importance degree between each index in the index system. The principle of scoring is shown in Table 1, which makes pairwise comparison for all indexes to get the judgment matrix as basis of the calculation in the next step. Table 2 is the judgment between the first-grade indexes. Table 3, Table4 and Table 5 are the judgment between the first-grade indexes which contain two or more than two secondary class indexes.

Table 1 1-9 scaling method instruction table

Scaling	Meaning
1	The two factors to be compared have the same importance
3	Of the two factors to be compared, one factor is slightly more important than another factor
5	Of the two factors to be compared, one factor is obviously more important than another factor
7	Of the two factors to be compared, one factor is strongly more important than another factor

9	Of the two factors to be compared, one factor is extremely important than another factor
2, 4, 6, 8	The average value of above two adjacent judgment
Reciprocal	The judgment of comparing factor i and factor j is a_{ij} , then the judgment of comparing factor j and factor i is $a_{ji} = 1/a_{ij}$

Table 2 Importance degree evaluation table for first-grade indexes

First-grade Index	Dry port equipment service conditions	Dry port execution efficiency	Dry port benefit level	Regional economic environment	Transportation conditions	Legal policy measures
Dry port equipment service conditions	1					
Dry port execution efficiency		1				
Dry port benefit level			1			
Regional economic environment				1		
Transportation conditions					1	
Legal policy measures						1

Table 3 Importance degree evaluation table for secondary class indexes under dry port equipment service conditions

Dry port equipment service conditions	Dry port construction scale and level	Dry port management level
Dry port construction scale and level	1	
Dry port management level		1

Table 4 Importance degree evaluation table for secondary class indexes under regional economic environment

Regional economic environment	National economy overall level	Hinterland industrial basis	Foreign trade level
National economy overall level	1		
Hinterland industrial basis		1	
Foreign trade level			1

Table 5 Importance degree evaluation table for secondary class indexes under transportation conditions

Transportation conditions	The accessibility to seaports	Regional transport volume scale	Inland transportation situation
The accessibility to seaports	1		
Regional transport volume scale		1	

Inland transportation situation			1

Part Two Scoring for evaluation objects' index performance

Chengdu, Xi'an, Nanjing and Shijiazhuang these four dry port cities will be selected in this paper as the evaluation objects. The basic idea of evaluation is inviting experts according to centesimal system to score for the performance of above four evaluation objects in the evaluation index system. The experts should not only consider the actual performance of the evaluation object in a certain index, but also transversely and comprehensively consider its position in the four evaluation objects. For example, if experts think the construction scale and level of Chengdu dry port is higher, which is ahead of other three ports, they can score 95 or similar scores. If they think that Nanning dry port is underdeveloped level of foreign trade in the economic environment, they can score 65 or lower scores.

For the "national economy overall level", "hinterland industrial basis", "foreign trade level" and "regional transport volume scale" these four quantitative indexes, the actual data in Table can be taken as the decision basis for experts scoring. Experts can determine their performance according to the actual value and increase ratio of 2010.

Table 6 The basic data of quantitative indexes

The performance of indicators	**Chengdu**	**Xi'an**	**Nanning**	**Shijiazhuang**
GDP(hundred million yuan)/ The growth rate	5551.3/15.0%	3241.49/14.5%	1800.43/14.2%	3401.0/12.2%
Total industrial output value(hundred	2062.8/20.5%	1006.38/18.1%	1502.68/28.99%	1340.1/16.5%

million yuan)/ The growth rate				
Import-export value(hundred million dollars)/ The growth rate	246.6/38.6%	103.82/43.2%	22.13/-20.62%	109.7/99.3%
Freight volume(thousand tons)/ The frowth rate	53140.4/18.9%	34331.68/13%	19171.05/23.76%	13900/14.7%

Table 7 Scoring table for the index performance of evaluation objects

First-grade index	Secondary class index	Chengdu	Xi'an	Nanning	Shijiazhuang
Dry port equipment service conditions	**Dry port construction scale and level**				
	Dry port management level				
Dry port execution efficiency	**Dry port customs clearance efficiency**				
Dry port benefit level	**The development level of cities' logistics industry**				

Regional economic environment	**National economy overall level**				
	Hinterland industrial basis				
	Foreign trade level				
Transportation conditions	**The distance from coastal ports**				
	Regional transport volume scale				
	Inland transportation conditions				
Legal policy measures	**The degree of policy degree**				