Research on Competitiveness Evaluation of International Inland Port

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Abstract: With the rapid development of inland areas and the foreign economic relations，asacrucial transit node between inland areas and coastal ports, inland port play an important role in improving the logistics services, customs clearance efficiency and promote regional economic growing. Xi'an is located in the core area of the Silk Road economic belt, as a logistics transit hub for the central region;the construction of Xi'an international inland port has great significance to the expansion of China's western region. In this paper, comprehensive evaluated the competitiveness of Xi'an international inland port, both qualitative explained and quantitative analysis was used, and proposes suggestions for the future development of Xi'an international inlandport.

Introduction

With the continuous development of China's foreign economic, international trade is increasing in inland areas, The harbor, in order to broaden the radiation area as possible, strive for more supply and the broader economic hinterland, inland port came into being. International inland ports isopening international commercial port, based on thedry port and set up in economic center of the city railway, highway interchange of inland areas, in accordance with relevant international transport regulations, treaties and conventions [1]. It is the logistics nodes of having container distribution, freight forwarders, third party logistics, port supervision and other comprehensive functions, and is the gathering place with perfect coastal port functions and convenient outward transport operating system [2].

Based on the above definitions can be concluded that key elements of the "international inland port”: Firstly, the international inland port established in the central cities, whichhave strategic position. Secondly, the international land port is relying on the international logistics channels; internet of things, linked by effective connection of railway, highway, aviation and waterway, to become logistics node which have comprehensive function of Container terminal, the third party logistics, freight forwarders and port regulations. Thirdly, Internationalinland port for international cargo transport, has a perfect function of coastal ports and outbound operation system, is the industry cluster of inland modern service.

Establish the competitiveness evaluation system of international inland port

Inland port competitiveness evaluation is a multi-level, multi-objective decision problem,in order to make scientific and comprehensive evaluation, paper need comprehensive analysis and comparison of the conditions of the infrastructure, regional economic level, the policy environment and many other factors.Due to various factors ranging uncertainty, and the interaction mechanism is not very clear [3].In this paper, will combine the Analytic Hierarchy Process (AHP) and Fuzzy Comprehensive Evaluation (Fuzzy) to evaluate the Competitiveness of International inland port, to make the results clearer, higher accuracy and more operational.

Establish hierarchical model. This paper, on the basis of existing research results, makes telephone and face-to-face interview with experts and scholars in this field.After careful screening and selection, according to the index system design principles (scientific, practical, representativeness, systematic, comprehensive, evaluative),establish a evaluation index system of

development level of China's inland.As shown in the Fig. 1.

Guidelines layer	Sub-criterion level	Index layer	Selection Parameters
Internal Evaluation	Equipment and service Conditions of inland port（U1）	scale	Planning area / hectare
		Facilities and equipment level	Total fixed asset investment / billion
		Storage capacity	Storage area, container yard area / square meter
	Logistics industry level（U2）	Carrier service level	Added value of logistics industry（transportation, storage, postal） / billion
	Inland port efficiency（U3）	Customer satisfaction	Added value of the tertiary industry / billion
		Inland port capacity	Customs Tax Gross / billion
	Inland port management level（U4）	Information management level	Degree of information
		Service level	Freight (rail integrated freight) Yuan / TEU
External Evaluation	Level of Region economic development（U5）	National economy level	Area GDP / billion
		Foreign trade level	Total imports and exports / billion
		Industrial base level	Industrial output / billion
	Transportation Infrastructure（U6）	Air Traffic Conditions	Distance to airport / Kilometer
		Highway traffic conditions	Transit highway
		Railway traffic conditions	Transit Railway
		Scale of regional traffic	Freight amount in the whole society / Million tons
	Policy environment（U7）	Preferential policy	Industry and land preferential policies
		Government attention	Government support

Fig. 1 Inland port competitiveness evaluation index system

Construct judgment matrixand determine the index weight. After the establishment of the hierarchy, to enhance the objectivity of the evaluation, invites authoritative experts in the field of inland port.The factors at different levels make pairwise comparison，obtained the important degree of various indicators. Through expert consultation, make the judgment matrix become quantitative [4].According to the above to establish evaluation index system, calculate the index heavy weight level,using the Delphi method, construct judgment matrix:

$$R_1 = \left(r_{ij}\right)_{7\times7} = \begin{bmatrix} 1 & 2 & 2 & 1 & 1/4 & 1/3 & 2 \\ 2 & 1 & 2 & 2 & 1/3 & 1/2 & 3 \\ 1/2 & 1/2 & 1 & 1 & 1/3 & 1/2 & 3 \\ 1 & 1/2 & 1 & 1 & 1/4 & 1/3 & 2 \\ 4 & 3 & 3 & 4 & 1 & 2 & 5 \\ 3 & 2 & 2 & 3 & 1/2 & 1 & 4 \\ 1/2 & 1/3 & 1/2 & 1/2 & 1/5 & 1/4 & 1 \end{bmatrix}$$

The following use the summation method to calculate the weight, relative weight of each index value criterion can be obtained under the single criterion of the target layer: W=（0.0944，0.1433，0.0850，0.0820，0.3311，0.2155，0.0487）.Next, making consistency test for the feature vectors,application of Matlab language conclusion:$\lambda_{max} = 7.0712$，Continue to test consistency, obtain results: $C.R = \frac{C.I}{R.I} = \frac{0.0119}{1.32} = 0.0090 < 0.1$，Shows that the judgment matrix has satisfactory consistency, indicating the weight coefficient distribution reasonable. Similarly, the secondary

indicatorsalso use 1-9 scaling method to build judgment matrix。comprehensive weight of Index system as shown in table 1.

Table 1 Comprehensive weight of inland port evaluation index system

Sub-criterionlevel	Weight	Index layer	Weight
Equipment andserviceConditionso finlandport	0.0944	Scale	0.1408
		Facilitiesandequipmentlevel	0.3340
		Storage capacity	0.5252
Logisticsindustrylevel	0.1433	Carrier servicelevel	1
Inland portefficiency	0.0850	Customer satisfaction	0.2491
		Inland portcapacity	0.7509
Inland portmanagementlevel	0.0820	Information managementlevel	0.3333
		Service level	0.6667
Level of Region economicdevelopment	0.3311	National economylevel	0.2311
		Foreigntradelevel	0.6653
		Industrial baselevel	0.1036
Transportation Infrastructure	0.2155	Air Traffic Conditions	0.1235
		Highway trafficconditions	0.2029
		Railwaytrafficconditions	0.5982
		Scaleof regional traffic	0.0754
Policyenvironment	0.0487	Preferentialpolicy	0.7509
		Governmentattention	0.2491

Fuzzy comprehensive evaluate. Letcomment sets$V=\{V_1,\ V_2,\ V_3,\ V_4,\ V_m\}$, the $V_i$represent all levels of reviews，i=1，2，…，m，is the number of reviews Sets.Taking m＝5, China's inland dry port of reviews set for competitiveness evaluation model V＝{V_1（worse），V_2（poor），V_3（General），V_4（Good），V_5（Excellent）}.The basic method of determining index membership of this article is according to reviews set, requested eight experts and port-related business personnel respectively score of each object. Contrast score interval, and then through the frequency, to obtain the corresponding membership degree.As unified index of horizontal comparability and vertical consistency,use data of Xi 'an, Beijing, Shijiazhuang, Zhengzhou in 2013 as an expert rating criteria.

According to AHP, each expert scoring result will have the index system weight combination,take the arithmetic average of all combinationsA=（a1，a2，…，an），$\sum_{i=1}^{n} a_i = 1$.Through it can get the final weight of evaluation index system，Form the weight vector, through the processing of expert rating data, get the membership degree of each index for the evaluation set.According to the formula

$$B=W\circ R=(W_1,\ W_2,\ \ldots W_n)\circ\begin{bmatrix} r_{11} & r_{12} & \cdots \\ r_{21} & r_{22} & \cdots \\ \cdots & \cdots & \cdots \\ r_{n1} & r_{n2} & \cdots \end{bmatrix}=(b_1,\ b_2,\ \ldots,\ b_m) \quad (1)$$

and based on the weight of table 2 and expert scoring acquire the fuzzy evaluation matrix, make primary evaluation to seven factors of Guidelines layer that affecting the development of Xi 'an inland port, Composed of B1 - B7 indicators for evaluation of total target single factor evaluation matrix B as follows:

$$Y_1 = W \circ B = W \circ \begin{bmatrix} B_1 \\ B_2 \\ B_3 \\ B_4 \\ B_5 \\ B_6 \\ B_7 \end{bmatrix} =$$

$$(0.0944\ 0.1433\ 0.0850\ 0.0820\ 0.3311\ 0.2155\ 0.0487) \begin{bmatrix} 0.0481 & 0.1250 & 0.2324 & 0.5000 & 0.1008 \\ 0 & 0.375 & 0.5 & 0.125 & 0 \\ 0.2189 & 0.3750 & 0.2811 & 0.1250 & 0 \\ 0.0833 & 0.2083 & 0.5833 & 0.1250 & 0 \\ 0.0832 & 0.3880 & 0.4039 & 0.1250 & 0 \\ 0 & 0.0502 & 0.3102 & 0.4493 & 0.1903 \\ 0 & 0.3127 & 0.2189 & 0.3434 & 0.1250 \end{bmatrix}$$

$$= (0.0569 \quad 0.2690 \quad 0.3766 \quad 0.2409 \quad 0.0566)$$

Similarly, Beijing, Shijiazhuang, Zhengzhou's evaluation results as follows:

Y_2=(0.0079 0.0310 0.2077 0.3934 0.3600)

Y_3=(0.1151 0.2666 0.4073 0.2110 0)

Y_4=(0.0563 0.2253 0.4026 0.2601 0.0557)

According to the above evaluation results, through comparison of evaluation level to obtain the superiority of competitiveness evaluation object. For example, Xi 'an international inland port, competitiveness results belongs to worse,poor, general, good, excellent respectively account for 5.69%,26.9%,37.66% ,24.09% ,5.66%.To make the fuzzy evaluation result more concrete, take the comment set assignment method.Because at the time of grade evaluation set corresponding is interval number, so take the median of each interval as the corresponding comment value，That "poor" count as 25, "worse" countas 57.5, "General" count as 72.5, "good" count as 85, "excellent" count as 95. Get scores rank matrix:M=［25，57.5，72.5，85，95］，Transpose the membership vector and rank matrix and make product, can get inland port competitiveness composite score，thereby performing horizontal contrast level of competitiveness. Competitive comprehensive score of Xi'an International inland port as follows:

$$V = Y_1 \cdot M^T = (0.0569，\ 0.2690，\ 0.3776，\ 0.2409，\ 0.0566) \cdot \begin{bmatrix} 25 \\ 57.5 \\ 72.5 \\ 85 \\ 95 \end{bmatrix} = 70.047$$

Similarly, Competitive comprehensive score of Beijing Chaoyang inland port is 84.677, Shijiazhuang is 65.671，Zhengzhou is 70.951.From the corresponding relation between grading and evaluation set，Beijing Chaoyang inland port competitiveness is close to a good level，Xi 'an international land port ,Zhengzhou inland port and Shijiazhuang inland port in the general level. The order：Beijing>Zhengzhou>Xi'an>Shijiazhuang.

Summary

As freight growth of China's central inland region,Shortcomings of the traditional way of import and export goods has become increasingly prominent,After declare in native land,export goods also need the secondary declaration in seaport, inspection and handover procedures are complex,Long time required and the cost is relatively high.By the above inland port competitiveness evaluation known that China's International Port land is in its infancy,neither mature theoretical foundation nor standardized system of laws and regulations, need to learn from other advanced inland port, from the following several aspects to improve and perfect.

Firstly, improve the logistics infrastructure equipment, services and construction of international inland port.Currently, planning and development of China's international inland port has not yet formed a complete and standardized system. Reducing of customer satisfaction leads to lower logistics industry development level.So in the process of the future development of international inland port, government should increase investment for logistics infrastructure and inland port equipment and service.

Secondly, pay attention to the level of development of the local economic and logistics. Development of international inland port closely related to the local economic level, traffic environment and logistics level. Economic development of the region and its openness is positively correlated, more economically developed areas, the greater demand for logistics. Therefore, the local need a transit platform to complete the docking with coastal ports.

Thirdly, establish the perfect electronic commerce port.At present, China's inland port information platform construction has great results.In order to continually improve the customs clearance efficiency and service level of international inland port,continue to strengthen the information platform construction is necessary.So as to realize electronic clearance,create efficient international inland port logistics information system.

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