The Construction and Deployment of Land Port under the 'BRI' in China: Case Study of Lanzhou

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Abstract

In 2015, China launched the 'Vision and Actions on Jointly Building the Silk Road Economic Belt and 21st-Century Maritime Silk Road' and 'Intermodal Demonstration Project'. These actions were intended to improve the development of the Western economy through the construction and deployment of inland ports that transfer the remaining capacity for economic development of the East and strengthen land contact with neighboring countries. This paper aims to investigate and identify criteria to distinguish characteristics between land port and dry port, as well as clarify their concepts and functions under the transportation system, taking a case study of Xi'an and Lanzhou. The paper concludes that the construction and deployment of land port should be measured with indices such as freight volume, local economy, accessibility and port function. The findings of the study will provide reference for China and neighboring countries as they further implements the strategy of 'One Belt One Road'.

Keywords: *Land port, Inland port, Dry port, Deployment, Lanzhou*

I. Introduction

The world economy has undergone a massive shock since 2008, and the impacts of the financial crisis continue to unfold, thereby hindering the world economy from recovery. The International Monetary Fund (IMF) revised down the forecast of the world economy by 0.1 percentage point as 3.1% relative to the April 2016 World Economic Outlook Update, and a 0.2 percentage point downward revision relative to January 2016 [1]. Major macroeconomic realignments have also affected the prospects differentially across countries and regions, including the slowdown and rebalancing in China. With regard to the domestic situation, China's economy grew by 6.9% in 2015, the slowest in 25 years [2]. The Chinese government hopes to speed up the development of the Western region by relocating the remaining economic capacity of coastal areas and strengthening land links with neighboring countries. Thus, China launched the 'Vision and Actions on Jointly Building Silk Road Economic Belt and 21st-Century Maritime Silk Road' (Belt & Road Initiative, BRI) on March 28, 2015, which was followed by 'Intermodal Model Project (IMP)' on July 21, 2015 in a bid to promote the economic development of itself and related countries [3].

Among these projects, the construction of the Silk Road Economic Belt following the ancient Silk Road remains for deployment. The ancient Silk Road, which spanned the ancient capital Luoyang during the Eastern Han Dynasty, Chang'an (now Xi'an), passed through Liangzhou, Jiuquan, Guazhou, Dunhuang, to Central Asian countries, including Afghanistan, Iran, Iraq, Syria and the Mediterranean, with Rome as the destination, comprising a total length of 6440 km. This road was considered as the link to the Eurasian continent of the ancient East and West, and was named after silk as the most representative goods.

To promote the construction of the Silk Road Economic Belt, the Chinese government launched the IMP and deployed a series of key nodes along the Belt, forming a network with tight interaction [4]. To share this round of politic bonus, nodes named 'dry port', 'inland port', and 'logistic park', hindered the effective allocation of resources.

In view of this phenomenon, this article analyzes the concepts and functions of inland and dry ports under transportation. The conclusions could be helpful in carrying out effective resource allocation according to the regional conditions and resource endowments of each region, thereby leading a rational deployment of inland and dry ports, and enhancing the logistic ability in western part of China.

II. Concept and Function Analysis of Land Port

In the international transport of goods, the concept of sea and air ports are articulated while those ports in inland areas have not reached a consensus because of the overlap of their functions and resources, existing as ‘dry port’, ‘inland port’, ‘Inland Container Depot’, ‘Intermodal Freight Centre’, and ‘Inland Freight Terminal’, among others [5-7].

The dry port concept came from the requirements of sea ports to control their hinterland transports [8-11]. A ‘Dry Port’ was first clarified as ‘an inland terminal which is directly linked to a maritime port’ [12]. An ‘Inland Port’ is a port located inland with value-added services as a sea port [13]. An ‘Intermodal Freight Centre’ is ‘a concentration of economically independent companies working in freight transport and supplementing services on a designated area’. UN ECE (1998) defined the term ‘Inland Clearance Depot’ and ‘Inland Freight Terminal’ : an‘Inland Clearance Depot’ is ‘a common-user inland facility, other than a port or an airport, with public authority status, equipped with fixed installation and offering services for handling and temporary storage of any kind of goods (including container) carried under Custom transit by any applicable mode of inland surface transport’; an‘Inland Freight Terminal’ is ‘any facility, other than a port or an airport, operated on a common-user basis, at which cargo in international trade is received or dispatched’ [14]. The term dry port, inland port and other counterparts were used synonymously [15]. To simplify the question and coincide with the current situation in China, this article refers to these ports collectively as ‘land port’ with two typical categories as ‘dry port’ and ‘inland port’. ‘Dry port’, is derived from the water port, especially the affiliation of sea port. A dry port is an inland site connecting a water port. ‘Inland port’ was also classified into two parts: one is located in the inland frontier regions with two trunk modes of transport as road transport and rail transport; the others are inland areas of non-border regions, and the main mode of transport depending on rail transport.

Thus far, the concept of ‘land port’ was summarized as ‘dry port’ and ‘inland port’. The ‘dry port’ must be connected to the water port while the ‘inland port’ cannot connect to water and air transport. The construction of an inland port in China needs to clarify its definition and function so as to provide targeted policies and resources on that basis.

(1) Dry Port

In recent years, China’s coastal ports have battled fiercely on cargo volume because throughput was regarded as an important indicator on port business. Under these circumstances, sea port services, was extended to inland areas, which are closer to its hinterlands. Inland shippers share common interests with port operators, and both hope to improve their services through minimizing logistic costs while maximizing its efficiency. Therefore, in October 2002, the Beijing Chaoyang Terminal and Port of Tianjin came to an agreement, making the Chaoyang Terminal the first dry port in China, under a cross-customs clearance model. That means cargoes exporting at Tianjin is able to make customs clearance at Beijing. At this point, the so-called ‘dry port’ is a logistic node established in inland areas with customs clearance, inspection, and other port services as it is at a sea port. The dry port are customs, animal and plant quarantine, commodity inspection, health inspection, and other agencies that provide services for customs clearance in a dry port. In addition to coastal port enterprises, freight forwarders, shipping agents, and liner shipping companies have also set up branches in the dry port for efficiency of cargo delivery, container return and issuing of intermodal bills of lading. Inland importers and exporters, at the same time, can complete with the booking, customs declaration, inspection and other business procedures with great convenience.

The working mode of a dry port can be summarized as no waterway, ‘One-stop’ service, and rail or road connection to sea ports. A typical dry port is an inland intermodal terminal without water accessibility for ship calling. Cargoes

in a dry port can complete all booking, customs clearance, inspection and other procedures, where customers can leave/pick up their standardized units as if directly to a sea port [15], and then goods are transported to coastal port via road or railway saving a lot of time and transportation costs.

Given the function of the dry port, the location of the dry port is taken for granted as the backyard, canvassing point, terminal of a sea port, such as moving the sea port to inland areas. However, a dry port cannot be equated with an extension of a harbor yard. Cargo still need to be transported to coastal areas leading to a functional distinction between dry port and sea port. That is, during the physical transportation, cargo inside a sea port waits for loading/unloading, if all goes well, it can be taken on board as planned while in the dry port. They could not be sure its date of shipment because of the probability of unpredictable accidents occurring during the physical transportation, road or rail, is higher than at port. In many cases in China, the so-called 'One-stop' service at the dry port in many cases in China means the goods not completed paying tariffs and other formalities. Hence, there should be a regulatory difference for customs between dry port and sea port.

(2) Inland Port

Inland port, as a transport node in international transport system, has the same basic functions as a sea port and airport. Usually located in inland areas and frontiers, inland ports maintain connection with other ports through several kinds of transport mode. Geographically, an inland port located at frontiers can connect completely with foreign ports. Its port function can also be developed easily, whether on the road or through the railway. However, for those far from sea or have boundaries and cargoes requiring extra transport process may suffer from risks, such as economies of distance, supervision, and traffic unpredictable accidents. Hence, one of the most important issues for the 'One Belt One Road' strategy is to solve the function realization of those inland ports. Three specific differences are discussed as follows.

First, geographically, the location of inland ports determines its distinction with sea ports. In that case, cargoes for exports do not immediately leave the country after delivery at an inland port, while those for importing still need to be transported to the destination after entry.

Second, on the regulatory front, although shippers at the place of dispatch (inland ports located in inland areas) have gone through local regulatory procedures, such as inspection and customs clearance, the cargoes are still in the country. On the contrary, cargoes may leave immediately after these procedures at inland ports (located at frontiers), sea ports and airports. Hence the intense of supervision varies among these situations.

Third, in commercial services, inland ports located in inland areas can only be treated as a port under some conditions such as having its own port code. For inland ports (located at frontiers), sea ports, and airports, they can serve a wider range of commercial contracts under trade terms as FOB (Free on Board), CFR (Cost and Freight) and CIF (Cost, Insurance and Freight), which account for a great proportion in China's import and export, while the inland ones are restricted in trade terms such as FCA (Free Carrier), CPT (Carriage Paid to) and CIP (Carriage and Insurance Paid to), otherwise, they may be excluded from trading [16-18].

Therefore, the regulatory, trade and transport modes involved in inland ports (far inland) are the key factors to improving the transport efficiency.

III. Classification and Deployment of Inland Port

The dry port concept is well known and developed in a number of previous studies [6, 7, 15, 19-25]. However, studies should also focus on the inland port concept. As mentioned above, inland ports can be categorized into borderline and interior inland ports. Differentiated by geography and port function, the borderline inland port is closer to being a sea port while the interior one has more restrictions in terms of regulation, terms of trade, and transportation environment.

The relationship among sea port, dry port and inland port is shown in Figure 1. The dry port concept is derived from the sea port, connecting the sea port directly with road or rail transport. The inland port can not only interact with the sea port mainly through rail transport but also conduct its independent port function, to jointly serve the world trade with its counterpart (foreign inland port).

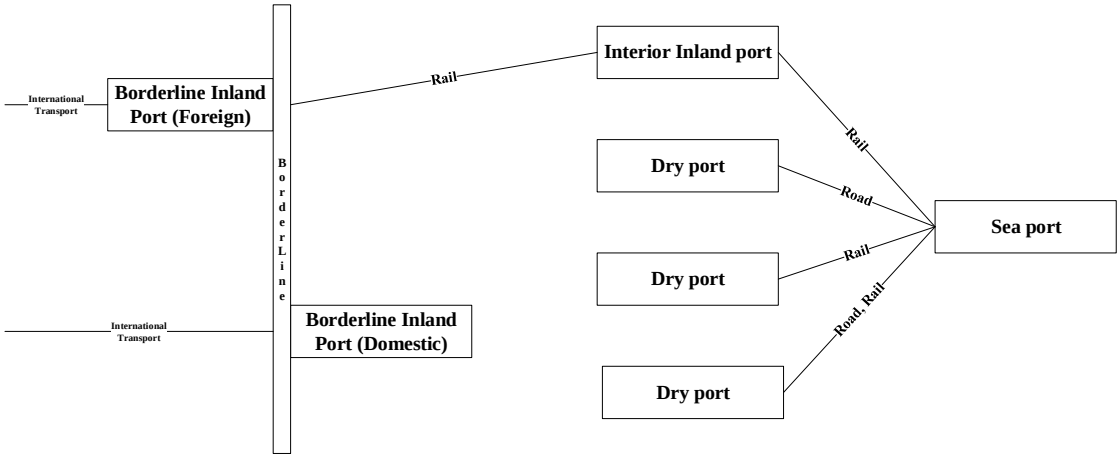

Fig 1: Relationship among sea port, dry port and inland port

Source: Author's research

The rise and deployment of land port concept is interrelated with the 'One Belt One Road' strategy, and thus, the construction of land ports should serve and comply with the development of 'One Belt', to address the goal of strengthening the inland transport and improving the connection among China and neighboring countries. On the one hand, the development of inland and dry ports is similar to the Overland Common Point transport in America in terms of its purpose and mode. On the other hand, the modern intermodalism mode under containerization enables delivery of goods at inland destinations. However, from the perspective of customs regulation (efficiency and cost), the land port is required to play its role in rail-centered inland transport system where rail collecting and distributing system could make all the difference. At the same time, if the road–rail it connected directly with the sea port may gradually fade out. (See Table 1)

Table 1 Comparison among sea port, dry port, and inland port

	Sea port	Dry port	Inland port
Connecting mode	water-water, water-road, water-rail	Road-road, road-rail	Road-rail, rail-rail
Node role (Function)	Ocean shipping coordination and dispatch	Delivery of goods from sea port	Cargo distribution and supply goods for rail department
Transport mode	Ocean shipping	Ocean shipping	Rail transport
Customs supervision cost	low	high	low
Port function	complete	partly	complete
Physical pattern	Seaside logistic nodes that support safe berthing for ships and cargo loading/unloading	Logistic nodes that directly connect to sea ports through road/rail transport and canvass	Inland rail-side logistic nodes which is equipped with transport organizing functions as loading/unloading, packing and consolidation

Source: Author's research

IV. Case Study of Lanzhou

The land ports in China, as per the 'Intergovernmental Agreement on Dry Ports' [26], were deployed in coastal and borderline provinces such as Tibet and Zhejiang province. In the 'Vision and Actions on Jointly Building Silk Road Economic Belt and 21st-Century Maritime Silk Road' launched on March 28, 2015, Zhengzhou in Henan province and Xi'an in Shanxi provinces were listed as next generation of land ports in China. However, inland provinces, such as Gansu, Hunan, and Sichuan, do not have land ports but leave ample space for the development of local logistics. Problems are highlighted to determine whether these areas should deploy inland ports and how to make it. Comprehensive key factors that ought to be considered are location, local economy, freight volume, infrastructure, policies and regulations, natural resources, among others.

Lanzhou, which is located in the middle of Gansu, northeast part of China, is a strategic industry basement and hub city, which used to be an important node on the Old Silk Road. (See Figure 2)

This section will discuss the potential of Lanzhou to become a member of inland ports. The conclusions in this section can be can be used as a model case for measuring the deployment of other inland ports.

Fig 2: Lanzhou on the silk road

Source: http://www.silkroutes.net/Orient/MapsSilkRoutesTrade.htm

First, site selection of a land port is based on its freight volume, that is, the cargo needed for transportation as the demand side. On the supply side, regional advantages, such as local economy, accessibility, and port function affect site selection. (See Figure 3) Therefore, the demand side, as a premier and decisive part, values more than supply side for a land port which highlights the evaluation of its freight traffic (generation) volume.

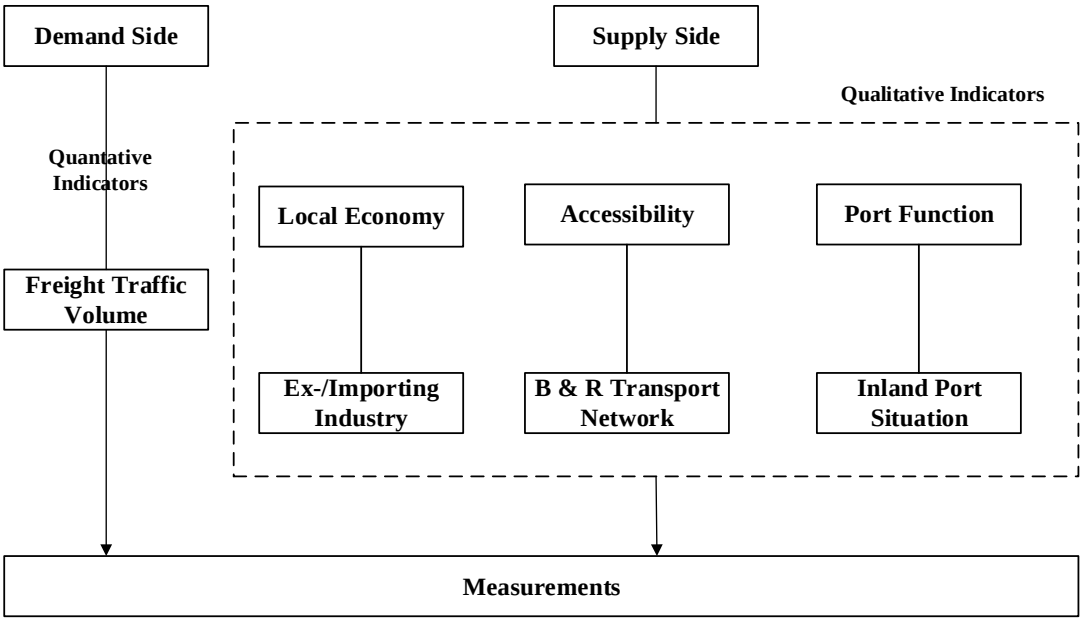

Fig 3: Key measurements for land port

Source: Author's research

Freight traffic volume is derived from the development of the local economy, value of trade, industrial structure, etc. It is also highly affected by secondary and tertiary industries [27]. Table 2 lists some important economic indices between Lanzhou and Xian. Compared with Xi'an, which has been listed in the dry port agreement, Lanzhou's freight volume is nearly 23%–24% of that of its counterpart. However, it is worth noting that, taking year 2008 as an example, Xi'an's freight volume witnessed a rapid growth twice that of two times of Lanzhou. Moreover, due to political support, the gap between the two cities has continued to grow.

Table 2 Comparison between Lanzhou and Xi'an on some economic indices

	Year	2007	2008	2009	2010	2011	2012	2013	2014	2015
Lanzhou	Gross Domestic Product (100 MRMB)	732.76	846.28	926	1100.4	1360.03	1563.8	1776.28	2000.94	2095.99
	Primary Industry	26.09	28.1	30.55	33.8	40	44.6	49.12	52.44	56.22
	Secondary Industry	336.08	398.25	433.62	529.2	656.55	744.7	820.43	824.88	882.65
	Tertiary Industry	370.59	419.93	461.82	537.4	663.48	774.6	906.74	1123.61	1257.11
	Population (10,000)	319.28	322.28	323.59	323.54	323.29	321.52	321.43	321.64	321.9
	Freight Traffic (10,000 tons)	6840	7207	7332	8032	8882	9728	10531	11147	12711
	Total Exports and Imports (M USD)	715	715	488.2	1060	1879.43	3397.21	4056.71	4556.49	5059
Xi'an	Gross Domestic Product (100 MRMB)	1763.73	2190.04	2724	3241.5	3864.21	4366.1	4884.13	5492.64	5801.2
	Primary Industry	82.51	103.45	110.38	140.1	173.14	195.6	217.76	214.55	220.2
	Secondary industry	772.51	987.7	1144.75	1409.5	1697.16	1881.8	2117.66	2194.78	2126.29
	Tertiary Industry	908.71	1098.89	1468.95	1691.9	1993.91	2288.8	2548.71	3083.31	3454.71
	Population (10,000)	764.25	772.3	781.67	782.73	791.83	795.98	806.93	815.29	815.66
	Freight Traffic (10,000 tons)	15124	13312	30613	34332	39239	44924	50119	42039	46270
	Total Exports and Imports (M USD)	5360.69	7040.29	7254.78	10392.73	12579	13014	17982.46	24982.97	2828479

Source: National Bureau of Statistics of China

To exploit Lanzhou's potentialities on being a land port, predicting the freight traffic volume so as to quantify the problem. The method of forecasting regional freight traffic volume or logistics requirement is multifold, in this section, a Grey Model Algorithm was applied which has been proved to be to be an efficient tool to estimate the

freight traffic volume because it needs less data and is accurate for middle and short periodic forecast, especially under China's circumstances [28-31]. The problem is multi-parameter and have several variations, thus a Multi-parameter Grey Model Algorithm was applied to predict its Freight traffic volume.
The formula of the GM (1, n) Model is:

$$\hat{X}_1^{(1)}(k+1) = [X_1^{(0)}(1) - \frac{1}{a}\sum_{i=2}^{n} b_i X_i^{(1)}(k+1)]e^{-ak} + \frac{1}{a}\sum_{i=2}^{n} b_i X_i^{(1)}(k+1) \quad (1)$$

This article chooses Total Exports and Imports and proportion of Tertiary Industry as the two variations [30, 32]. A GM (1, 3) Model was built and the correlation among Fright traffic, Total exports and imports and Proportion of Tertiary Industry is shown in Figure 4, fitting with the Grey Model.

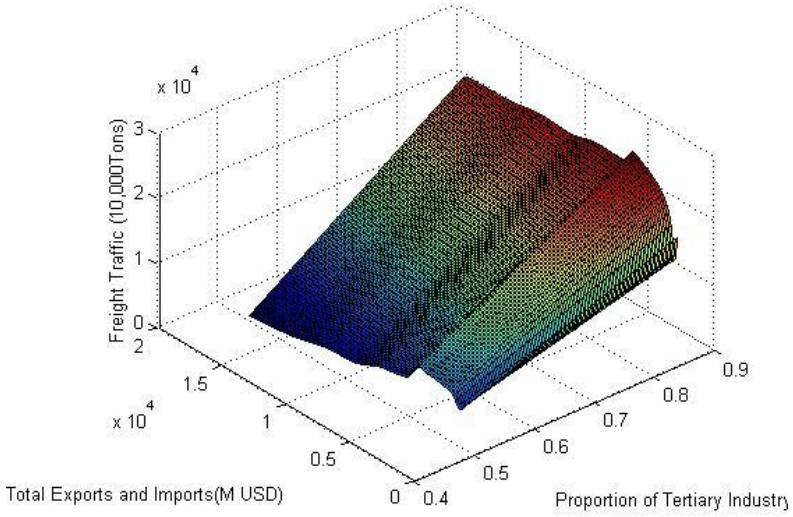

Fig 4: Correlation among fright traffic, total exports and imports, and proportion of tertiary industry

After calculating in Matlab 2011a, it was proven to be effective in producing criteria $C = 0.0367$, which means good under 0.35 [33].

Hence, the Grey Model in this case is stated below, if we put the value of the calculated coefficients into formula (1):

$$\hat{X}_1^{(1)}(k+1) = [X_1^{(0)}(1) - \frac{1}{2}(29755X_2^{(1)}(k+1) - X_3^{(1)}(k+1))]e^{-2k} + \frac{1}{2}[29755X_2^{(1)}(k+1) - X_3^{(1)}(k+1)] \quad (2)$$

The predicted value of Freight traffic volume of Lanzhou is shown in Table 3.

Table 3 Prediction on Lanzhou's freight traffic volume

		Real									Predicted				
Year		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Lanzhou	Total Exports and Imports	715	715	488.2	1060	1879.43	3397.21	4056.71	4556.49	5059	6995	8747	10938	13677	17102
	Proportion of Tertiary Industry	0.5057	0.4962	0.4987	0.4884	0.4878	0.4953	0.5105	0.5615	0.5998	0.6377	0.6969	0.7285	0.7898	0.8472
	Freight Traffic	6840	7207	7332	8032	8882	9728	10531	11147	12711	14261	16420	18291	21038	24261

Source: National Bureau of Statistics of China (GDP: Billion RMB; Freight Volume: Million Ton)

It can be concluded Lanzhou has to undergo considerable development before it can becoming a member of land

ports depending on its own freight volume, which in the year 2020 would be nearly half of current Xi'an. Fortunately, on June 1, 2016, the Chinese government announced the first of the 16 program selected by the 'Intermodal Demonstration Project' and Lanzhou was on the list. Led by the national company as Lanzhou International Trade & Logistic Park Co., Ltd. and supported by Kaida International Freight Service Co., Ltd., the 'South Asia International Block Train' with road-rail intermodal transport was developed for travel from Lanzhou to South Asia. Moreover, in Lanzhou's 13th Five-Year Plan (covering the years 2016–2020), the annual increment of its GDP was approximately 14% [34]. The number for Xi'an is 8% in its government report [35]. Hence, the local economy of Lanzhou will highly likely overtake that of Xi'an one day. The prospect of Lanzhou's freight volume is positive because it may capture neighboring cargoes that may help Lanzhou to reach the necessary volume as an inland port in the near future.

On the supply side, as the provincial capital of Gansu, Lanzhou contributes significantly to Gansu's economy, with nearly 31% of Gansu's GDP coming from Lanzhou in 2015 [36]. Geographically, the four trunk railways named Longhai (From Lanzhou to Jiangsu province), Lanxin (From Lanzhou to Xinjiang Province), Lanqing (From Lanzhou to Qinghai province), and Baolan (From Inner Mongolia to Lanzhou) are joined at Lanzhou, and connect to other main railways that have access to most of the inland areas in China. The favorable location made Lanzhou a vital node on the Silk Road and an obligatory stop for cargoes heading to West Asia and Europe. From the perspective of its port function, Lanzhou has a good environment on customs service and bounded regulation. Under the operation of Lanzhou International Trade & Logistic Park Co., Ltd., the key business of Lanzhou International Trade & Logistic Park (LITLP) is to provide port services, bounded storage, international procurement, and distribution and transit shipment, among others. LITLP set up customhouses, entry and exit inspection and quarantine areas, and other related functions in three parts of the Park: the 'Land Port Joint Inspection Center' integrated administration offices for inspection with the aim of building a 'One Stop' service platform; a special customs supervision zone located in the 'Bounded Logistic Center' to support the export-oriented economy; and a 'Railway Container Logistic Center' equipped with open port function to enable one time customs clearance.

In summary, fundamentally, Lanzhou has the foundation and condition, both on the demand and supply sides, necessary to become a member of land ports with its attempts on freight volume, local economy, accessibility, and port function. Hence, this study recommends that Lanzhou be part of the next generation in terms of the construction and deployment of inland ports. Additionally, cities, such as Ningbo in Zhejiang province and Chengdu in Sichuan province also have considerable location and resources superiority, and hence could potentially become a member of the land ports. The construction and deployment of such kind of land ports will drive the 'One Belt One Road' strategy and form an impeccable transport network system.

V. Conclusion

This article purposed the concept of land port and its categories as dry and inland ports. The difference and association between dry and inland ports were discussed. The division and cooperation between these types of port were clarified under the transport system and from the perspective of function and mode. Inland port was also emphasized to introduce classification and deployment. Through a comparison between Xi'an, which is currently under construction as a land port and Lanzhou, a conclusion can be reached that the construction and the deployment of land port should be measured with indices, such as freight volume, local economy, accessibility, and port function. The study can provide reference for China in the further implementation of the strategy of 'One Belt One Road' and 'Intermodal transport demonstration project'. However, for other countries, to the mechanism for deploying land port docking with 'One Belt One Road' initiative and their deployment on land ports remains to be measured.

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