

A Study on the Revitalization of Intermodal Transport for Increasing Intra-trade at North-east Asia

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Abstract

For years, Korea, China and Japan have been continuously increasing intra-trade. In addition, by concluding FTA (Free Trade Agreement) among Korea, Japan and China, the trade capacity will be increased. In this way, the increasing trade capacity will induce to change north-east Asian economy. This paper researches which method is more economical and efficient in the aspect of the transportation time and distance, after comparing the existing marine transportation network with new intermodal transportation network considering TKR.

Keywords: intermodal, transportation, TKR, TCR, intra-trade

1. Introduction

1.1 Study Background

The amount of intra-trade among Korea, China and Japan had been increasing continuously for the last decade. It contributes to improve the economic development in China where it is one of the biggest markets in the world. Since China joined WTO (World Trade Organization) in 2001, it has opened a market and free economy, and attracted foreign direct investment intensively.

The economy of Korea and Japan, is being activated, so it is getting out of the recession for a decade through the drastic investment of facilities and the advanced technology.

The first trade partner of Korea has been changed from U.S.A to China and 31% of national trade is conducted with China and Japan. By concluding FTA (Free Trade Agreement) among Korea, Japan and China, the amount of trade will be increased. If the single currency is carried out, it will build up the biggest market in the world as an economic bloc like EU.

Especially, this paper deals with the three provinces in northeast China(Jilin, Liaonig, Heilongjiang) that have an abundance of natural resources and close to Korea and Japan geographically. Also this region is suitable for intermodal transport through TKR (Trans-Korean Railway) and TCR (Trans-Chinese Railway). Recently, Chinese government and the enterprises of Korea and Japan invest in this region.

1.2 Study Object

The increasing trade capacity will induce the changes of north-east Asia and world economy. The low trade cost and short transportation time through various transportation networks is necessary to fulfill the national vision which is the logistics center of north-east Asia.

At present, the intra-trade is transported by air and sea, but most of freights are transported by sea. It is important to diversify transportation networks and construct and activate the railroad network of north-east Asia on the basis of transportation time and distance. The containers of Korea and Japan will be transported by TCR and TSR (Trans-Siberian Railway), transcontinental railroads, across TKR. It connects North Korea,

the three provinces in northeast China (Heilongjiang, Jilin, Liaoning), Russia and Europe. This study analyzes time and distance of each transportation on the basis of existing three countries. Finally, it aims to make plans for new transportation networks of Northeast Asia accrossing TKR after comparing each time and distance for transportation.

2. Economic and logistics market at North-east Asia

The trade between Korea and China has reflected a sudden increase up to the annual average of 21 percent from 1.17 billion dollars in 1994 to 7.93 billion dollars in 2004. Regarding Korean trade with Japan, the trade has reflected an increase up to the average of 5.7 percent from 38.9 billion dollars in 1994 to 67.8 billion dollars in 2004.

<table 1> The amount of trade among the three countries

Unit : a million dollar

Year	Korea - China			Korea - Japan			China - Japan		
	Export	Import	Total	Export	Import	Total	Export	Import	Total
1994	62	55	117	135	254	389	187	276	462
1995	91	74	165	170	326	497	219	360	579
1996	114	85	199	158	314	472	219	406	624
1997	136	101	237	148	279	427	218	421	639
1998	119	65	184	122	168	291	200	369	569
1999	137	89	226	159	241	400	233	429	662
2000	185	128	313	205	318	523	304	553	857
2001	182	133	315	165	266	431	311	581	892
2002	238	174	412	151	299	450	399	617	1,016
2003	351	219	570	173	363	536	572	752	1,324
2004	498	296	793	217	461	678	738	942	1,680
Increase rate	23.1 %	18.4 %	21.1 %	4.8 %	6.2 %	5.7 %	14.7 %	13.1 %	13.8 %

Source : Korea International Trade Association, 「trade returns」

Note : Cargo capacity is total of sea freight and air cargo

The industrial electronics, petrochemical, electronic components and steel products are exported from Korea to China. The electronic components, chemical products, steel products, industrial electronics and appliances are exported from Korea to Japan. The electronic machines, machinery, optical instruments measuring instruments, precision instruments and medical products are usually traded between China and Japan. According to the items for trade, it shows that the unfinished goods and the parts needed high technology are exported from Korea and Japan to China. After assembling in China, the finished goods re-exported to Korea and Japan. As many firms of Korea and Japan make inroads into China market, the mutual trade is considered to be good for mutual benefit.

<table 2.>The main trade goods(2004)

Unit : a million dollar

Rank	Korea - China		Korea - Japan		China - Japan	
	Item	Amount	Item	Amount	Item	Amount
1	Industrial electrons	13,993	Electronic parts	11,553	Electronic machine	45,199
2	Petrochemicals	10,306	Chemical industry's product	9,205	Machinery	37,312
3	Electronic parts	8,995	Steel manufactures	8,466	Optics, precision, medical supplies	10,977
4	Steel manufactures	6,933	Industrial electron	6,791	Spinning textile	9,071
5	Textile goods	6,214	Home appliance	2,632	Car / transport machinery	5,820
Total		46,411		38,647		108,379

Source : Korea International Trade Association, 「trade returns」 (www.kita.net) , Ministry of Finance Japan 「trade returns」 and the China Customs

The northeast three Chinese provinces, one of the four economic zone in China, are close to South Korea, Japan, North Korea and Russia. They have considerable geographical advantages compared with other economic zones. Moreover, the construction of infrastructures such as rail and port is in progress. The amount of trade with Korea has increased 22% from 5.4 billion dollars in 2004 to 6.6 billion dollars in 2005. Since the end of 1980, the foreign direct investment of Korean enterprise aiming at the three provinces of Korean enterprises has recorded 1.13 billion dollars totally accounting for 14% against all areas of China. According to the promotion plan of the northeast three provinces, they open foreign transactions to foreign countries. Korea and Japan are considered as the most important foreign countries to attract investment.

It appears that foreign direct investment will be more increased. Therefore it is expected that the development result will substantially influence economy of Japan as well as Korea. It is also expected that railway using TKR will have an effect on the opening economy and development of North Korea.

<table 3> Economic Development Zone's Trade with Korea

Unit : a million dollar

Development zone	2004			2005		
	Total	Export	Import	Total	Export	Import
Yangzi river	33,012	7,628	25,384	44,485	10,357	34,128
Bohai basin	12,179	3,096	9,083	15,307	4,083	11,224
North-east	5,429	2,983	2,446	6,636	4,073	2,568
Mid-west	480	264	216	571	314	257
Pearl river	18,677	4,167	14,510	20,726	4,505	16,221

Source : Four Economy Area Development project of China and our confrontation plan, 2006.03 , Korea International Trade Association

Note : Yangzi river(Zhejiang, Jiangsu, Shanghai), Bohai basin(Hebei, Beijing, Tianjin), North-east(Liaoning, Jilin, Heilongjiang), Mid-west(Sichuan, Chongqing), Pearl river(Guangdongsheng)

3. The present logistics Network condition in North-east Asia

As we saw earlier, the volume of trade has increased significantly in North-east Asia owing to China's remarkable economic growth for past 10 years. The trend of increasing trade will continue for the time being. Particularly, the trade of products among three countries (Korea, Japan and China) are industrial electron goods, components, electron goods for home use, common machines and steel manufactures. Most of the products can be containerized for transportation. The network of container transportation is quite simple on the other hand the volume of trade among three countries is steadily increasing. Although the network of transportation to China is being developed, it is not a systematic providing quick and on time service since usually car ferries and tramps are still used.

Japan is an island geographically and North Korea is located between Korea and three provinces in Northeast China, so the transportation is usually conducted by sea in Korea. If we look at the transportation network in Korea, Japan and China, the transportation by road or rail is made between a port and a final destination. In the present transportation of Korea, Japan and the three provinces of northeast China, major ports including Dalian, Busan, Kwangyang, Incheon, Kobe, Osaka, Tokyo and Yokohama are used. Although Inchoen port is close to Dalian, local cargoes are usually transported in Busan port. Because Busan port is a place to load transshipment cargo with ease and has more liners scheduled. Table 4 shows the features of each transportation route.

<table 4> The present condition of the maritime transportation networks

Orignation	Destination	Voyage /Week	Distance (km)	Time (Day)	Freight (20ft, USD)
Busan	Dalian	17	1,035	1~5	150
	Kobe	13	664	2~3	270
	Tokyo	11	1,232	2~4	320
Incheon	Dalian	3	484	1~4	200
	Kobe	1	1,341	4	270
	Tokyo	3	1,908	5~6	270
Kwangyang	Dalian	7	978	1~5	160
	Kobe	4	797	2~4	400
	Tokyo	2	1,365	4	270
Dalian	Busan	11	1,035	1~4	180
	Incheon	2	494	1~3	200
	Kwangyang	2	978	1~5	200
	Kobe	1	1,593	1	120
Kobe	Busan	14	664	2~5	190
	Incheon	2	1,341	3	320
	Kwangyang	5	797	2~4	350
	Dalian	1	1,593	5	100
Tokyo	Busan	12	1,232	2~5	190
	Incheon	3	1,908	4~5	320
	Kwangyang	3	1,365	1~5	400
	Dalian	7	2,160	1~6	100

Source : Netpas Distance, www.Schedulebank.co.kr,
 Freight is the interior data of Shipping Companies and discount price..
 Note : 1) US\$1 = KRW 1,000,
 2) Other charges(THC, BAF, CAF, DOC etc.) are not included in Freight.

In the sea transportation, it takes 1 to 5 days from Busan to Dalian but 1 to 4 days from Incheon to Dalian, because it is possible for Busan port to reduce ports of call. In Busan port, there are much more transshipment cargoes from Japan than Incheon and Kwangyang and enough local cargoes. As a result, one or two days are reduced for transportation though the distance between Busan and Dalian is about 500Km longer than between Incheon and Dalian. Comparing with other transportation modes, however, it requires more time in comparison with distance. It is still difficult to be sure of the exact arrival time and short lead time. Although a number of cargoes can be loaded at once and get economy of scale.

4. The plans for north-east Asian multimodal network considering TKR

Most of freights are transported by sea when there is trade among Korea, China and Japan. If unexpected matters such as strikes and natural disasters are caused, logistics costs as well as transportation time will be increased. In the trade pattern among the three countries, the amount of freights such as electronics and parts is increasing. They are especially advantageous for short lead time because warehousing costs is increased according to safety inventory. To cope with the current tendency, it is necessary to plan a new pattern of northeast transport network

through North Korea apart from existing routes.

<table 5> The time and distance by the existing transportation routes

Route		Distance (km)	Time (Day)	Freight(20ft, USD)		
TCR Section	Sea Section			TCR	Sea	Total
Harbin ↔ Dalian ↔ Incheon		1,438	2~4	134	200	334
Harbin ↔ Dalian ↔ Kwangyang		1,922	2~6	134	200	334
Harbin ↔ Dalian ↔ Busan		1,979	2~5	134	180	314
Changchun ↔ Dalian ↔ Incheon		1,196	2~4	99.7	200	299.7
Changchun ↔ Dalian ↔ Kwangyang		1,680	2~6	99.7	200	299.7
Changchun ↔ Dalian ↔ Busan		1,737	2~5	99.7	180	279.7
Shenyang ↔ Dalian ↔ Incheon		891	2~4	56.4	200	256.4
Shenyang ↔ Dalian ↔ Kwangyang		1,375	2~6	56.4	200	256.4
Shenyang ↔ Dalian ↔ Busan		1,432	2~5	56.4	180	236.4
Harbin ↔ Dalian ↔ Incheon ↔ Kobe		2,779	6~8	134	470	604
Harbin ↔ Dalian ↔ Incheon ↔ Tokyo		3,346	7~10	134	470	604
Harbin ↔ Dalian ↔ Kwangyang ↔ Kobe		2,719	6~10	134	600	734
Harbin ↔ Dalian ↔ Kwangyang ↔ Tokyo		3,287	7~12	134	470	604
Harbin ↔ Dalian ↔ Busan ↔ Kobe		2,643	4~7	134	450	584
Harbin ↔ Dalian ↔ Busan ↔ Tokyo		3,211	4~9	134	500	634
Changchun ↔ Dalian ↔ Incheon ↔ Kobe		2,537	6~8	99.7	470	569.7
Changchun ↔ Dalian ↔ Incheon ↔ Tokyo		3,104	7~10	99.7	470	569.7
Changchun ↔ Dalian ↔ Kwangyang ↔ Kobe		2,477	6~10	99.7	600	699.7
Changchun ↔ Dalian ↔ Kwangyang ↔ Tokyo		3,045	7~12	99.7	470	569.7
Changchun ↔ Dalian ↔ Busan ↔ Kobe		2,401	4~7	99.7	450	549.7
Changchun ↔ Dalian ↔ Busan ↔ Tokyo		2,969	4~9	99.7	500	599.7
Shenyang ↔ Dalian ↔ Incheon ↔ Kobe		2,232	6~8	56.4	470	526.4
Shenyang ↔ Dalian ↔ Incheon ↔ Tokyo		2,799	7~10	56.4	470	526.4
Shenyang ↔ Dalian ↔ Kwangyang ↔ Kobe		2,172	6~10	56.4	600	656.4
Shenyang ↔ Dalian ↔ Kwangyang ↔ Tokyo		2,740	7~12	56.4	470	526.4
Shenyang ↔ Dalian ↔ Busan ↔ Kobe		2,096	4~7	56.4	450	506.4
Shenyang ↔ Dalian ↔ Busan ↔ Tokyo		2,664	4~9	56.4	500	556.4
Harbin ↔ Dalian ↔ Kobe		2,537	2~7	134	120	254.0
Harbin ↔ Dalian ↔ Tokyo		3,104	9~13	134	120	254.0
Changchun ↔ Dalian ↔ Kobe		2,295	2~7	99.7	120	219.7
Changchun ↔ Dalian ↔ Tokyo		2,862	9~13	99.7	120	219.7
Shenyang ↔ Dalian ↔ Kobe		1,990	2~7	56.4	120	176.4
Shenyang ↔ Dalian ↔ Tokyo		2,557	9~13	56.4	120	176.4

Note : 1) On the assumption on that average speed of train is 60km/h.
 2) Harbin ~ Changchun ~ Shenyang ~ Dalian = 944Km (Harbin ~ Changchun : 242km, Changchun ~ Shenyang : 305km, Shenyang ~ Dalian : 397km)
 3) Freight tariff of TCR and TKR(North Korea) is USD0.142/km per 1TEU.
 4) Freight tariff of TKR(South Korea) is USD0.408/km per 1TEU.
 5) Other charges(THC, BAF, CAF, DOC etc.) are not included in Freight.

The existing freights between Japan and the three provinces of northeast China which are Jilin, Liaoning and Heilongjiang are transported by rail or road after they are transported from Korean or Japanese ports to the Yellow Sea and Dalian. It is so unreasonable route in view of distance and time that goes a long way round. When freights are transported by sea, they can be transported in large quantities at once. As a result, economies of scale are achieved so the unit transportation costs are reduced. However it takes longer time than other ways to transport and it is substantially weak for climatic conditions.

For example, the net sailing takes 1 to 6 days from Tokyo in Japan to Dalian in China. If there are problems with congestion or bad climatic conditions, transportation time is longer than normal. The freights between Korea and the three provinces of northeast China are transported by rail or road after they are transported through the South Sea and the Yellow Sea to Dalian. It takes 1 to 5 days for sailing from Busan Port to Dalian Port.

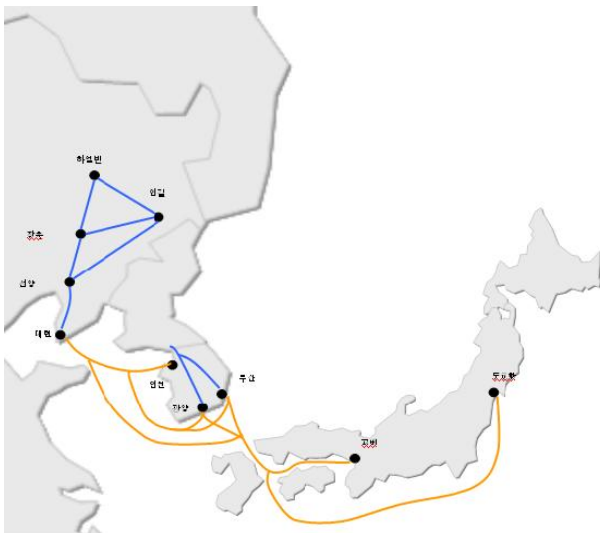
<table 6> The time and distance by transportation routes considering TKR at North-east Asia

Route			Distance (km)	Time (Day)	Freight (20ft, USD)			
TCR Section	TKR Section	Sea Section			TCR	TKR	Sea	Total
Harbin ↔ Changchun ↔ Shenyang ↔ Sinūiju ↔ Busan			1,785	1~2	117	254	0	371
Harbin ↔ Changchun ↔ Shenyang ↔ Sinūiju ↔ Kwangyang			1,765	1~2	117	246	0	363
Harbin ↔ Changchun ↔ Shenyang ↔ Sinūiju ↔ Incheon			1,374	1	117	87	0	204
Harbin ↔ Changchun ↔ Shenyang ↔ Sinūiju ↔ Busan ↔ Kobe			2,449	3~5	117	254	270	641
Harbin ↔ Changchun ↔ Shenyang ↔ Sinūiju ↔ Busan ↔ Tokyo			3,017	3~6	117	254	320	691
Changchun ↔ Shenyang ↔ Sinūiju ↔ Busan			1,543	1~2	83	254	0	337
Changchun ↔ Shenyang ↔ Sinūiju ↔ Kwangyang			1,523	1~2	83	246	0	329
Changchun ↔ Shenyang ↔ Sinūiju ↔ Incheon			1,132	1	83	87	0	170
Changchun ↔ Shenyang ↔ Sinūiju ↔ Busan ↔ Kobe			2,207	3~5	83	254	270	607
Changchun ↔ Shenyang ↔ Sinūiju ↔ Busan ↔ Tokyo			2,775	3~6	83	254	320	657
Shenyang ↔ Sinūiju ↔ Busan			1,238	1	40	254	0	294
Shenyang ↔ Sinūiju ↔ Kwangyang			1,218	1	40	246	0	286
Shenyang ↔ Sinūiju ↔ Incheon			827	1	40	87	0	127
Shenyang ↔ Sinūiju ↔ Busan ↔ Kobe			1,902	3~5	40	254	270	564
Shenyang ↔ Sinūiju ↔ Busan ↔ Tokyo			2,470	3~5	40	254	320	614

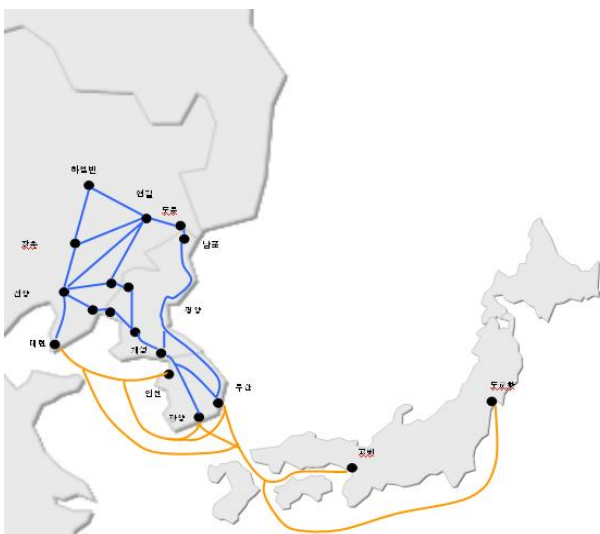
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In case of TKR, connecting Busan and Sinūiju, it takes 3 to 6 days, and 194km are reduced from Harbin to Tokyo. In the case of the freights from Harbin to Busan, 1 to 3 days are reduced.. Adding to that, 194 km is reduced from 1,979 km to 1,785 km.

Although maritime transportation is cheaper than rail transportation, the new intermodal transportation network considering TKR has competitiveness against the existing maritime transportation network when time value is calculated in



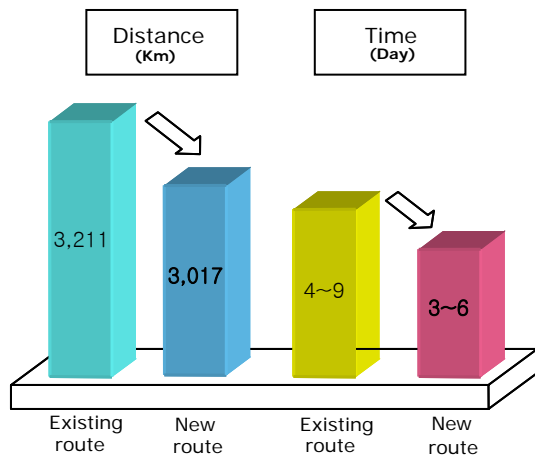
<fig. 1> existing transport network



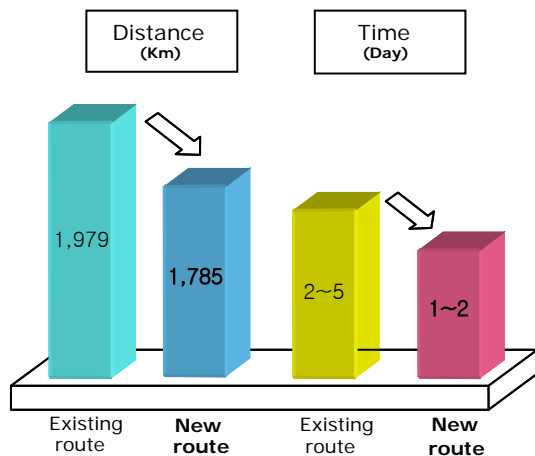
<fig. 2> a new pattern of transport network

terms of cost.

The problem caused in multimodal node such as transshipment, clearance and freight system as well as rail problem such as lagging behind equipment and limited capacity have to be solved to connect TKR and TCR for a transcontinental railway. Furthermore, it is suggested to operate Container Block Train through a specialized container transport company organized by three countries(China, Japan, Korea) to have competitiveness of rail freight.



<fig. 3> From Harbin to Tokyo



<fig. 4> From Harbin to Busan

5. Conclusion

This paper researches which method is more economical and efficient in the aspect of the transportation time and distance. After comparing the existing marine transportation network with new intermodal transportation network considering TKR, it was found that the new intermodal transportation network can reduce time as well as distance.

The intermodal transportation connecting sea and land couldn't be revitalized because of political issues in Northeast Asia. Recently, there are many changes in order to promote the intermodal transportation and the development of distribution system.

If South Korea and North Korea construct the cross-border transport links according to the economic cooperation,

transportation market is expected to be growing in North-east Asia and the effort for integrated transportation system can get driving force to utilize transportation market efficiently.

It is expected for Korea to be located as a logistics center in North-east Asia after TKR starts operating

It is also needed to connect rails between North Korea and South Korea, and revitalize Asian transcontinental railway at the same time.

The comparison between real logistics cost and transportation time couldn't be conducted because TKR isn't connected. We would be able to get better results by reducing real transportation cost and time when TKR is connected in the future. Besides we need to research on the economical ripple effects on new intermodal transportation network.

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