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International Passenger Train Service in the Corridor between Seoul and Beijing

서울↔베이징간 국제 여객열차 운영의 수익성에 관한 연구

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Abstract

올해(2004년) 연말로 예정된 남북철도 연결이 동북아 지역의 물적교류에 미칠 영향에 관한 연구는 TSR, TCR, TMGR, TMR에 관한 연구와 함께 국내에 이미 상당한 수준 축척 되었지만 물적교류와 함께 동북아 교류협력에 또 한 축을 이루고 있는 인적교류 즉 여객수송에 관한 연구는 거의 없는 실정이다. 본 연구에서는 인구가 조밀하고 경제성장 속도가 빠른 서울↔북경 축에 국제 여객열차를 운행할 경우를 가정하여 기존의 항공·해운에서 철도로의 수요 전환량을 실제 설문조사를 통하여 구하고 이를 수송할 열차운행 계획을 세운다. 나아가 국제 여객열차 운영자의 입장에서 예상 수입 및 비용을 현실성 있게 분석하고 수익성 여부도 유동성, 순현재 가치, 내부수익율 세가지로 검토하여 한·중간 국제 여객열차 운행의 가능성을 검증한다.

1. Introduction

1.1 Purpose, Background and Scope

The inter-Korean railway is expected to be reconnected by the end of 2004, 60 years after its severance on September 11 in 1945. Once completed, it would facilitate human and goods exchanges among the North East Asian countries. There have been many studies on the reconnection of the two Korean railways and further on the Trans-China Railway (TCR), the Trans-Siberia Railway (TSR), the Trans-Manchurian Railway (TMR) and the Trans-Mongolian Railway (TMGR). While most of those studies mainly focused on goods transportation, studies on human exchange have been rare.

This study aims to estimate the demand shift from air to train when passenger train services are available in the corridor between Seoul and Beijing. Another purpose of the study is to establish a train operation plan based on the estimation. In addition, the study evaluates the profitability of offering passenger train services between Korea and China (Beijing and the major cities in the three Northeast states) from the standpoint of train operators.

To this end, the study estimates total passenger transportation demand in the corridor concerned. The estimate is followed by a calculation of demand shift from air to train based on survey results, assuming the operation of the international passenger train service. A train operation plan is then established for sales and costs estimates and profitability analysis which focuses on Net Present Value (NPV) and Internal Rate of Return (IRR).

1.2 Preceding Studies

The preceding studies on the operation of international passenger train services between South Korea and China through North Korea are "*Building Infrastructure for the Facilitation of Economic Cooperation in Northeast Asia in*

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the 21st Century: Focusing on Land Transport Linkages between Korea and China (Korea Research Institute for Human Settlements, 2001)", and "*Visions for a High-Speed Railway Network in Northeast Asia and Demand Estimates* (Keun-Yul YANG, 2003)". They have a significant meaning in that they are first of their kind to deal with human exchange among the three nations. However, they fell short of providing supporting evidence. Therefore, in this study, surveys are conducted to estimate demand for train transportation in the corridor based on those studies. Advice will be sought from experts to reflect the reality to the greatest extent possible in establishing train operation plans and analyzing profitability from the survey results.

2. Train Passenger Transportation Demand

2.1 Total Passenger Demand for the Routes between Korea and China

Inquiries are conducted on the number of passengers on the flights going between Korea and China during the six-year period from 1997 to 2002. The airports surveyed include the Gimpo Airport, the Incheon International Airport and the Korea Airport. For the purpose of the study, it is assumed that passengers increase until 2008 at the same rate as that of the six years surveyed and at half the rate from 2009 to 2013. The study also supposes that the passenger train service is offered from 2008, the year of the Beijing Olympics, since it needs some years of preparation: it takes four to five years to complete the necessary administration procedures, manufacture the rolling stocks required, and train human resource staff. The demand analysis is limited to the period from 2008 to 2013, because the North Korean railway will have reached its full capacity by 2013. The demand estimate is shown in the table below.

2.2 Demand Shift to Railway Travel

To predict modal shift triggered by the international train service, the study calculated utility functions for air, sea and railway transportation from survey results and used a logit model as a probabilistic choice model. According to logit model, probability $P_n(i)$ which a individual choose a alternative among all alternatives is as follows.

$$P_n(i) = \Pr ob(U_{in} \geq U_{jn},\ \forall_j \in C_n) = \frac{e^{V_{in}}}{\sum_{j=1}^{J} e^{V_{jn}}}$$

Surveys were conducted twice adopting a stated preference approach and the utility functions were calculated with LIMDEP 7.0 with NLOGIT.

Travel time and fares are the most important factors that people consider when they select transportation mode. Keeping the fact in mind, the first survey was based on the assumption that the travel time was fixed when people choose to travel by air or sea. Thus, the variables were airfares, train and ship fares and travel time by train. A total number of 282 persons were surveyed at the Incheon International Airport and Incheon International Passenger Terminal on the 4th, the 5th, the 6th and the 26th of September in 2003. Those surveyed were travelers from or to China. The survey results garnered from the Incheon International Passenger Terminal were excluded from analysis, because the study aims to forecast demand for business travel or travel for sightseeing : most respondents there were hawkers. In the survey, train fares varied based on the standard ones calculated from the current fares for Korean express train Saemaul and Chinese first class sleeper Ruanwa. The standards for travel time differed depending on country: the high-speed railway and Saemaul in South Korea; the operation speed of 70km/h in North Korea; the fastest train in the applicable section in China. The first survey revealed the propensity of travelers, peoples preference for certain fares, modal share for different train fares and the most profitable fares on train operators. However, there was the need for a second survey.

In the second survey, the questionnaires were simplified and the fares were adjusted to be more reasonable. This time, 172 individuals responded to the survey conducted at the same Incheon International Airport for two days from December 6 in 2003. The respondents were those arrived from or departed for Beijing, Shenyang, Changchun, Harbin and Daeryun. The standard fare for the train service between Seoul and Beijing was set at the level of 190,000 won on the condition that a passenger uses a sleeper with

another person and is served with three meals on a trip. The standard fare was decided at the minimum of the fare range (190,000~220,000 won) which had turned out to be the most profitable for train operators as a result of the first survey. As for the other cities, the fares increased in proportion to travel distance. Also, in order to establish the utility functions, the standard fares for each service section increased or decreased by 10, 20 and 30 percent. In terms of the travel time, the same standards as that of the preceding survey were applied to the travel by train. Concerning the travel by air, the travel time included real flight time, travel time from and to airports, time for boarding procedure, and time for immigration formalities: five hours for the service between Seoul and Daeryun and six hours for the other routes. The survey data were processed with LIMDEP 7.0 with NLOGIT and the resulting modal shares are shown in the following table.

The Table 3 shows the demand shift to railway calculated from the values on the Table 1 and Table 2.

3. Train Operation Plan

In establishing a train operation plan, a train set is assumed to be composed of a locomotive and 17 passenger coaches. The composition is based on T21 and T22, the sleeper trains serving the section between Beijing and Shanghai. Among the 17 passenger cars, one is used as a crew service compartment and for luggage storage. A dining car is included in the arrangement as well. Therefore, when twenty beds are offered per couch, a train set can accommodate three hundred passengers. If we assume the occupancy rate to be eighty five percent, the annual passenger numbers amount to 93,000. In other words, one train set is needed to meet the round-trip demand from 93,000 passengers (186,000 passengers for one-way trip). In calculating the number of trains required, it is assumed

Table 1. Estimated passenger demand

Unit: Persons

Route	Seoul-Beijing	Seoul-Shenyang	Seoul-Changchun	Seoul-Harbin	Seoul-Daeryun	Busan-Beijing
2008	3,523,508	967,997	379,274	215,443	351,771	492,324
2009	3,902,285	1,014,945	428,580	241,403	365,842	555,834
2010	4,321,721	1,064,170	484,295	270,492	380,476	627,537
2011	4,786,373	1,115,782	547,253	303,087	395,696	708,489
2012	5,300,908	1,169,898	618,396	339,609	411,523	799,884
2013	5,870,755	1,226,638	698,788	380,532	427,984	903,069

Table 2. Modal share of passenger transportation demand

Unit: %

Route	Seoul-Beijing	Seoul-Shenyang	Seoul-Changchun	Seoul-Harbin	Seoul-Daeryun
Railway	36	82	67	69	22
Air	64	18	33	31	78

Table 3. Train passenger transportation demand (in both directions)

Unit: Persons

	Seoul-Beijing	Seoul-Shenyang	Seoul-Changchun	Seoul-Harbin	Seoul-Daeryun	Total
2008	1,268,463	793,758	254,114	148,656	77,390	2,542,381
2009	1,404,823	832,255	287,149	166,568	80,485	2,771,280
2010	1,555,841	872,619	324,478	186,639	83,705	3,023,282
2011	1,723,094	914,941	366,660	209,130	87,053	3,300,878
2012	1,908,327	959,316	414,325	234,330	90,535	3,606,833
2013	2,113,472	1,005,843	468,188	262,567	94,156	3,944,226

Table 4. Number of service trains required

Section	Seoul-Beijing	Seoul-Shenyang	Seoul-Changchun	Seoul-Harbin	Total(one-way)
2008	6	5	1		12 (24)
2009	7	5	1		13 (26)
2010	8	5	1	1	15 (30)
2011	9	5	2	1	17 (34)
2012	10	5	2	1	18 (36)
2013	11	5	2	1	19 (38)

that trains operate only in the sections with the annual demand of more than 186,000. The numbers after the point are discarded for risk management purpose. The results are shown in the Table 4.

The year 2014 is excluded from the analysis, because the North Korean railway is considered to be already at its full capacity before or in the year without the possibility of additional services. In the study, the Norths railway capacity equates to half that of the South Korean Jungang Line, fifty times.

4. Estimated Sales of International Train Operators

In calculating train operators sales, applied fares vary from section to section: 190,000 won between Seoul and Beijing; 170,000 won between Seoul and Harbin; 150,000 won between Seoul and Changchun; 130,000 won between Seoul and Shenyang. A one-way train carries 93,075 passengers annually, so the sales from a train service between Seoul and Beijing amount to 17,684,250,000 (93,075 x 190,000) won. The sales for the year 2008 can be calculated by multiplying the per-train sales with the number of train required (17,684,250,000 x 12). The same logic is applied to the other service areas as well. For the train operations between Seoul and Daeryun, sales are not calculated because the demand is so low that one train is not fully occupied still in 2013.

5. Operational Costs

5.1 Assumptions for Cost Analysis

The cost analysis is based on some assumptions: train operators collect fares from customers for their services and to meet the expenses; the operators pay facility use fees to the infrastructure owners.

Firstly, the study estimates the costs for rolling stock purchasing and maintenance and crew salaries.

The labor cost rates of the Korean National Railroad (KNR), the highest among the three countries involved, are used in order to minimize the risk assumed by operators. From the same reason, the Korean standards are applied when calculating the material costs.

Then, electricity costs are calculated for train operation. As mentioned above, facility use fees are paid to the infrastructure owners, the applicable governments. Using

Table 5. Annual sales from international passenger train operations

Unit: Billion won

	Train Operation Frequencies (one-way)				Estimated Total Sales
	Seoul-Beijing	Seoul-Shenyang	Seoul-Changchun	Seoul-Harbin	
2008	12	10	2	0	361.13
2009	14	10	2	0	396.50
2010	16	10	2	2	463.31
2011	18	10	4	2	526.80
2012	20	10	4	2	562.17
2013	22	10	4	2	597.54

KNR data is regarded as the most accurate method for costs estimate at the time of the study.

Lastly, the study covers the costs for offering various services including food and beverage service on the train.

5.2 Costs for Rolling Stock Purchasing

The rolling stock costs consist of the depreciation cost and the opportunity cost of purchasing trains. Regarding the train types, the tracks pose no problems since the three nations adopt the same standard gauge of 1435mm. The signaling system should be able to support multi-signaling considering the train operations as an international service. As for the power system, it should support both AC and DC environments. In addition, if we include the operation speed exceeding 200km/h in the conditions, such electric locomotive costs approximately four billion won. Considering that the passenger coaches are high-quality sleepers with the price tag of one billion won per each, the price for a train set totals 21 billion won. The depreciation cost for a train set is 780 million won, since the service lives of the locomotive and the passenger coaches are 40 and 25 years respectively. In terms of the opportunity cost, it is 1.26 billion won when the interest rate of six percent slightly over the 3-year corporate bond rate is applied. That makes the total costs of purchasing a train set 2.04 billion won. With the travel time longer than 12 hours for a one way trip, a train set can run only one time a day for the three service sections: 19 hours between Seoul and Beijing, 18 hours between Seoul and Harbin and 15 hours between Seoul and Changchun. For the route connecting Seoul and Shenyang, a train is able to make a round trip within a day, taking 11 hours for each run. When train operators decide the numbers of trains to be purchased, they should add an extra 30 percent for maintenance and backup purposes. Given the assumptions above, the purchasing costs are as follows.

Table 6. Annual costs for train purchasing
Unit: Hundred million won

Year	2008	2009	2010	2011	2012	2013
Train Purchasing Costs	510.0	571.2	637.2	775.2	836.4	877.2

5.3 Train Maintenance and Cleaning Costs

According to the data from KNR, a locomotive requires 4.2 maintenance staff, while a passenger car needs 1.4 personnel for maintenance. Therefore, 28 maintenance personnel are required for a train set. The 2002 data indicate that KNR paid a monthly salary of 3.25 million won to each maintenance staff. When adding the expenses for maintenance material and cleaning, the annual maintenance costs amount to 50 million won per locomotive and 30 million won per passenger car. In other words, a train set needs 560 million won for its maintenance on a yearly basis. These calculations yield the following results in the Table 7.

5.4 Crew Labor Costs

Train crew refers to drivers, assistant drivers, passenger directors, conductors, and inspecting personnel. As for the personnel on a dining car, they are excluded from the train crew requirements on the assumption that they strike the balance between revenue and expenses for themselves.

It would be reasonable to assume that a driver runs a train for four hours a day since he or she needs preparation or arrangement time before and after driving. Therefore, one Man Day (MD) is four hours in the study. Given the travel time (see the previous page), about five teams composed of a driver and an assistant driver are required for a one-way trip for the sections between Seoul and Beijing, between Seoul and Harbin, and between Seoul and Changchun. It means that ten drivers, main and assistant combined, should be dispatched for a train service between Seoul and Beijing. When we include night shifts, an additional 30 percent should be added, totaling the number to 13 MD.

Each passenger car needs to be attended by 0.5 passenger directors or conductors. Therefore, the 15 passenger cars require a total of 7.5 crew personnel. Two inspecting staff should be counted as well. If we assume that there are two

Table 7. Annual costs for train maintenance and cleaning
Unit: Hundred million won

Year	2008	2009	2010	2011	2012	2013
Maintenance & Cleaning Costs	413.0	462.6	545.2	627.8	677.3	710.4

work shifts on a one-way trip and the crew on duty take a day off the next day, the number comes to 38 (9.5 x 4). Therefore, the conclusion is that 51MD (13MD drivers and 38MD crew) is needed to operate a one-way service between Seoul and Beijing. Despite the shorter travel time, the service between Seoul and Changchun is regarded as requiring the same number of crew as the service between Seoul and Beijing and the service connecting Seoul and Harbin.

As for the section between Seoul and Shenyang, eight train crews need to be dispatched on a train: three teams of two drivers and an additional 30 percent for night shift. Since the travel time is 11 hours, 1.5 teams are on duty a day and off duty the next day on a one-way train. That is 29 (9.5x1.5x2) crew per train in one direction. As a result, operating a service in the section needs a total number of 37MD.

In calculating annual labor costs, the study adopted KNRs average salary (4,110,000 won per month) as a standard, taking into account the business trip allowances.

5.5 Energy Costs

In estimating the energy expenditure, adopting the Chinese electricity charge rates is considered to be reasonable due to the fact that most of the international train services are offered on the Chinese territory. Also, the electricity rates are similar to those of South Korea. When taking the Chinese electric locomotive model SS9 as a standard, the electrical costs are 20 yuan per kilometer. Multiplying the annual operating distance by the electricity costs yields the annual electricity costs like the following.

Table 8. Annual labor costs drivers and crew

Unit: Hundred million won

Year	2008	2009	2010	2011	2012	2013
Labor Costs	542	593	644	797	848	899

Table 9. Annual energy costs

Unit: Hundred million won

Year	2008	2009	2010	2011	2012	2013
Energy Costs	319.3	354.6	418.5	477.3	512.6	547.9

5.6 Facility Use Fee

Train Operators should pay usage fees for the facilities which are not under their ownership. Using the KNRs applicable performance data is considered to be reasonable here again. The calculation will be made based on the 2002 operational costs of Saemaul going between Seoul and Busan. However, since the costs do not include the track maintenance costs, those of the Jungang Line are referred to. Taking all the expenses into account, the facility use fees amount to 2,290,000 won when operating a train service between Seoul and Busan with the distance of 444km. In other words, facility use costs per kilometer are 5,162 won. When the costs per kilometer are multiplied by annual operational distance, the annual facility use costs can be identified as shown in the Table 10. While the facility use fees are expenses for train operators, they are income for the facility owners, the governments concerned.

5.7 Costs for Meals Service and Other Supplies

In this estimation, train operators are assumed to offer three meals with the same quality as those served on airplanes considering the long travel time (e.g. 19 hours from Seoul to Beijing). In the case of the route to Shenyang taking 11 hours for a trip, three meals still need to be served except the night trains. By adding the costs for other supplies on the trains, the costs per passenger can be assumed at the level of 30,000 won. These estimates result in the following figures.

Table 10. Annual facility use costs

Unit: Hundred million won

Country	2008	2009	2010	2011	2012	2013
China	328.3	370.6	443.8	508.0	550.4	592.7
N. Korea	194.4	210.6	243.1	275.5	291.7	307.9
S. Korea	26.2	28.4	32.8	37.2	39.2	41.5

Table 11. Yearly costs for meals and supplies

Unit: Hundred million won

Year	2008	2009	2010	2011	2012	2013
Costs for Meals & Supplies	670.1	726.0	837.7	949.4	1,005.2	1,116.9

5.8 Total Operational Costs for the Passenger Train Service

To calculate the annual operational costs, all the aforementioned items are combined: rolling stock purchasing costs, maintenance and cleaning costs, crew labor costs, energy costs, facility use costs, and costs for meals services and supplies. The Table 12 identifies the detailed costs which should be undertaken by train operators if they operate international train services.

6. Profitability Analysis

In this section of the study, the profitability of the international passenger train service is analyzed by comparing operating profit (or sales) with net income without considering the time value of money. Then, the profitability is determined through the net present value (NPV) and the financial internal rate of return (FIRR).

6.1 Assumptions for Profitability Analysis

The base year is January 1, 2005 assuming that the inter-Korean railways are complete by the end of 2004.

The analyzed period is limited to the period from 2008 to 2013 due to the capacity problem of the North. As already mentioned before, the capacity of the North Korean railway will not be sufficient enough to meet the transportation demand in the corridor between Seoul and Beijing in 2014. Therefore, a different approach should be adopted when determining the profitability from the year of 2014.

The straight-line method is used to calculate the depreciation, as in other railway investment projects.

The discount rate, the most important precondition, is set at the level of six percent based on the 3-year corporate bond rate.

6.2 Annual Operating Profit

The ratio of net income to sales is calculated based on the estimated total income and the costs corresponding to

Table 12. Annual operational costs for the international train service

Unit: Hundred million won

Items	2008	2009	2010	2011	2012	2013
Rolling Stocks	510.0	571.2	673.2	775.2	836.4	877.2
Maintenance & Cleaning	413.0	462.6	545.2	627.8	677.3	710.4
Labor Costs	542.0	593.0	644.0	797.0	848.0	899.0
Energy	319.3	354.6	418.5	477.3	512.6	547.9
Track Use	548.9	609.6	719.7	820.7	881.3	942.1
Meals & Supplies	670.1	726.0	837.7	949.4	1,005.2	1,116.9
Total	3,003.3	3,317.0	3,838.3	4,447.4	4,760.8	5,093.5

Table 13. Annual net profit and the ratio of net income to sales

Unit: Hundred million won

Category	Estimated Total Income	Train Operational Costs	Net Profit	Net Profit/Total Sales
2008	3,611	3,003	608	16.8%
2009	3,965	3,317	648	16.3%
2010	4,633	3,838	795	17.2%
2011	5,268	4,447	821	15.6%
2012	5,622	4,761	861	15.3%
2013	5,975	5,094	881	14.7%

the operation of the passenger train service. The ratios ranging from 14 to 17 percent indicate that operating passenger trains between Korea and China would be highly profitable.

6.3 Net Present Value (NPV)

A. Annual Cash Inflow and Cash Outflow

In the subsection 5.2, the rolling stock costs were estimated by combining the depreciation and the opportunity costs for purchasing train cars. For the purpose of profitability analysis by the Net Present Value method, the annual costs for rolling stocks should be regarded as cash outflow, while the residual value of the rolling stocks in the late 2013 should be considered as cash inflow. Cash outflow and cash inflow for each year could be derived by replacing the rolling stock item in the annual operational costs, with the annual costs for train acquisition (the cash outflow above) and the residual value of the trains at the end of 2013. In calculating the cash flows illustrated in the Table 14, it is assumed that cash outflow for train purchasing occurs early in the year and that cash flows out to pay for train operational costs late in the year. Regarding cash inflow, the assumption was made that cash inflow comes late in every year.

B. Net Present Value (NPV)

In order to obtain the net present value of operating the international passenger train service as of January 1 in 2005, a discount rate of six percent is applied to the following equation.

$$\text{NPV} = \sum_{i=1}^{n} \frac{Ri - Ci}{(1+0.06)i} = 394.66 \text{ Billion Won}$$

The resulting NPV shown above indicates that the passenger train service between Korea and China is profitable enough to operate.

6.4 Financial Internal Rate of Return (FIRR)

Financial internal rate of return (FIRR) is the discount rate that equates the present value of future net revenue streams to the cost of the investment. Therefore, FIRR (r) could be derived from the following equation:

$$\sum_{i=1}^{n} \frac{Ri - Ci}{(1+r)i} = 0$$

where,
Ri = Yearly Cash Inflow
Ci = Yearly Cash Outflow

The FIRR for the passenger train service is 25.0 percent when the based date is January 1, 2005. The figure is well above the present market interest rate.

7. Conclusion

To operate passenger trains connecting Korea and China is more than a simple economic issue. Since the severance of the inter-Korean railways about 60 years ago, South

Table 14. Cash outflow and cash inflow

Unit: Hundred million won

	Cash Outflow			Cash Inflow	Net Cash Flow
	Rolling Stock (R/S) Purchasing	Train Operational Costs (R/S Costs Not Included)	Total		
Early 2008	3,990.0		3,990.0		-3,990.0
Late 2008	420.0	2,493.3	2,913.3	3,611.0	697.7
Late 2009	840.0	2,745.8	3,585.8	3,965.0	379.2
Late 2010	840.0	3,165.1	4,005.1	4,663.0	657.9
Late 2011	420.0	3,672.2	4,092.2	5,268.0	1,175.8
Late 2012	420.0	3,924.4	4,344.4	5,622.0	1,277.6
Late 2013		4,216.3	4,216.3	5,975.0 5,697.6 (R/S Residual Value)	7,456.3

Korea has been geographically isolated from the continent. Constructing Steel Silkroad through the connection to the TCR, the TSR, the TMR and the TMGR would facilitate human exchanges with the continent, thereby enhancing Koreans understanding of the rest of the world. In other words, it could serve as the best opportunity for the nation to be incorporated into the continent.

Before the colonial period under the Japanese rule, the nation did have exchanges with the continent, but it was never free from the influence of China and Japan. Also, the train runs during the Japanese Imperial period were to transport the Japanese military supplies to the continent. However, the nation now stands on an equal footing with the other two nations in the economic and political terms altogether. Given that, it is not a wishful thinking for Korea to take a lead in improving the economic and political status of the North East Asian region by offering international passenger train services.

As explained before, the trilateral train operation is profitable enough for the all operators involved and would help South Koreas development in every aspect. Needless to say, North Korea would be one of the beneficiaries. There is no need for the Pyongayng Government to worry since train operations can be easily controlled with no harm to its system unlike the case of allowing vehicle passages from the South. The study did not address transportation demand for the inter-continental service from the part of the North due to the difficulties associated with data acquisition and the inter-Korean relations. However, South Korean and Chinese tourists getting off the international trains would boost the Norths tourism industry. Furthermore, the capital and the technology introduced from the South with the train operation should serve as a foundation for the development of special economic zones in Gaeseong and Sinuiju. To be more specific, the North can receive approximately 19.4 billion won and 30.8 billion won in 2008 and in 2013 respectively for its railway lease. Not only that, there is more cash to flow in from the employment of the locals, electricity use and so on. That amounts to twice that from charging foreign operators railway usage fees. From the long-term perspective, involving with the train operation will offer the North an opportunity to significantly advance its economy as a whole.

China has more to gain from the service operation than the North. First of all, China can participate in manufacturing the rolling stocks needed. Since the large part of the service areas is on the Chinese territory, the Beijing government will be able to charge train operators 32.8 billion won for track use in 2008, and a whopping 59.3 billion won in 2013. The amount of salaries received by those involved would reach twice the income from railway lease. In addition, Chinese goods can be used for rolling stock maintenance. Human and goods exchanges with the two Koreas would boost the economies of the regions served by the inter-continental railway. By further enhancing cooperation with South Korea, China could play a major role in the development of the North East Asian region.

As repeatedly mentioned in the study, the operation of the international passenger train service is a very precious opportunity for the two Koreas and China. A close cooperation and commitment from the three nations should make the railway operation successful. Although a lot of studies have explored the possible goods exchanges with the European continent through the reconnected inter-Korean railways, it has been hard to find the studies focusing on human exchanges in the North East Asia, especially between Seoul and Beijing. The paper intended to encourage such studies by showing that the project is beneficial for the three nations involved in both a direct and an indirect way, not to mentioning its business profitability for train operators. The writer hopes that the purpose has been served.

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