

Improvements Required to Enable the Trans-Manzhouli Railway to Meet the Demands of Land Bridge Transportation

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1. Introduction

The Trans-Manzhouli Railway (TMR) is an important railway corridor linking China with the outside world. Once the linkage of the Trans-Korea Railway (TKR) has been completed, the TMR will function as a railway corridor linking East Asia with the countries of Europe and Central Asia.

The following sections of the TMR may provide inter-continental railway transport services between East Asia and the countries of Europe and Central Asia: Manzhouli border station, Dandong border station, Tumen border station, Ji'an border station, the Harbin-Manzhouli line, the Harbin-Shenyang section of the Harbin-Dalian line, the Shenyang-Dandong line, the Meihekou-Ji'an line and the Siping-Meihekou line.

A direct railway corridor from the ROK to the countries of Europe and Central Asia via the Trans-Siberian Railway (TSR) can be established by utilizing the TKR and TMR. This would be a shorter route with a shorter overland transport element as far as Japan is concerned.

There are two preconditions for the establishment of this land corridor: i) expediting operations on the TKR, by facilitating direct transportation from the rail network of the ROK, via the rail network of the DPRK, to Chinese border stations of Dandong, Tumen and Ji'an; and ii) developing sufficient rail network capacity in Northeastern China and railway lines linked to the TMR. The paper will focus on the second point.

2. Traffic on the TMR

The freight carried by the TMR falls into one of three categories: i) domestic transport; ii) traffic generated by trade between China and the DPRK; and iii) traffic generated by trade between China and Russia.

2.1 Domestic traffic

With the growth of the Chinese economy and the implementation of the policy of revitalizing old industrial bases in Northeastern China in recent years, domestic transportation in Northeastern China has experienced rapid growth. In 2003, the volume of rail freight reached about 230 billion ton-km; if the current growth rate is maintained, this figure should reach about 300 billion ton-km in 2010 and 380 billion ton-km in 2020. Greater capacity will be required in the future, in order to respond to this growth in freight transport.

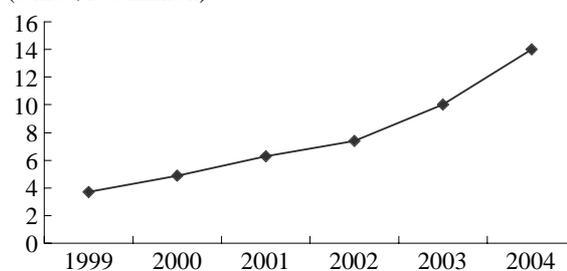
2.2 Traffic increases resulting from trade between China and the DPRK

Since 1999, Sino-DPRK trade has increased rapidly.

In 2000, trade between China and the DPRK was \$488 million, of which 7.6% was accounted for by imports and 92.4% by exports. In 2003, trade between China and the DPRK exceeded \$1 billion for the first time and reached \$1.4 billion in 2004, due to a growth rate in excess of 35%. The growth curve of Sino-DPRK trade since 1999 is shown in Figure 1.

Figure 1. Sino-DPRK Trade Growth Since 1999

(Unit: \$100 million)



In recent years, Liaoning and Jilin provinces have played an increasingly important role in Sino-DPRK trade. In 2000, Liaoning and Jilin accounted for 48% and 24% of total Sino-DPRK trade, respectively. Recently, these two provinces have accounted for as much as 80% of total Sino-DPRK trade. Obviously, the railway network of Northeastern China is vital to the transportation of cargo between China and the DPRK.

Overland transport of cargo between China and the DPRK mainly occurs via the border stations of Dandong, Tumen and Ji'an. Of these border stations, Dandong is the largest, handling about half of all Sino-DPRK trade. Only a small amount of Sino-DPRK cargo is sent via Ji'an border station, with 110,000 tons being handled in 1999. Although the volume of cargo handled by Ji'an border station has increased significantly in recent years, only 10,000-20,000 tons of freight are imported and exported via Ji'an each month. Tumen railway border station is opposite Namyang border station, in the North Korean province of North Hamgyong, and is an important freight corridor for Sino-DPRK trade. The border stations of the two sides are linked by a railway bridge.

International transit via Tumen border station began in 1954. Freight cars can cross the border to Rajin in the DPRK without the need for transshipment, and can be further connected to Russia's Far Eastern railway network via Rajin. Tumen Station is a Class I marshalling yard, containing 35 marshalling sidings with a marshalling capacity of 1200 cars per month. The station dispatches

more than 90 passenger and freight trains monthly. Tumen is the second-busiest border station in Sino-DPRK trade, with a handling capacity of 3.5 million tons per year. The volume of Sino-DPRK trade has been far lower than capacity for many years, with cargo passing via Tumen border station totaling just 0.5-1 million tons, so there is a huge surplus in the cargo handling capacity of the border station.

Despite the rapid growth in freight transiting the border stations of China and the DPRK, the railway network of Northeastern China will still be able meet the demand generated by Sino-DPRK trade because the volume of freight is small at present. However, once the linkage of the TKR is completed and services begin operating, freight between the ROK and Northern and Northeastern China will pass through the three border stations, as will some South Korean freight being transported to/from Russia, China, Europe and Central Asia via the TKR and TMR. This will present a major challenge to the capacity of Northeastern China's railway network.

2.3 Traffic increases resulting from trade between China and Russia

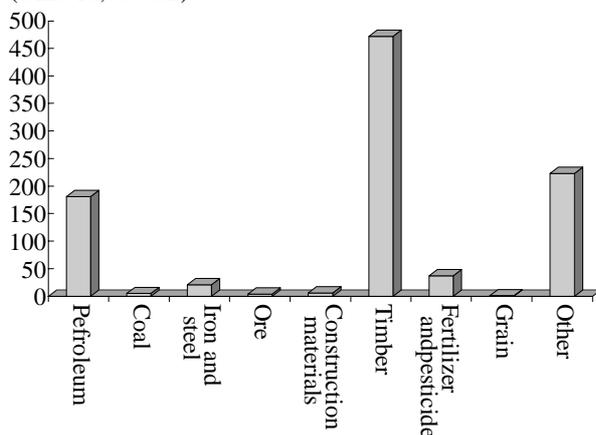
Trade freight between China and Russia is mainly transported through the border stations of Manzhouli, Suifenhe, Erenhot and Alashankou; of these, Manzhouli is the longest established, largest and most important in terms of Sino-Russia trade. In the past five years, the volume of freight between China and Russia increased four- or fivefold. Railway traffic to/from Russia was nearly 10 million tons in 2003. It is predicted that the volume of freight will reach 18 million tons by 2008.

In recent years, the volume of rail freight transported via Manzhouli border station has been increasing by 20-25% and the proportion of imports and exports has been utterly transformed. In 2000, imported freight accounted for only 10.8% of the total trade volume at Manzhouli border station, but by 2003, it vastly exceeded exported freight, accounting for as much as 95.8% of the total volume.

Timber occupies largest proportion of freight handled by Manzhouli railway border station, followed by petroleum, iron and steel, and other cargoes. The volumes

Figure 2. Transport Volumes by Commodity in Manzhouli (2003)

(Unit: 10,000 ton)



of commodities transiting Manzhouli railway border station in 2003 are shown in Figure 2.

According to the growth rate of 20-25% forecast by Chinese Vice-Premier Yi Wu and Russian Deputy Prime Minister Alexander Zhukov, by the year 2010, trade volumes on both sides will increase by 200-300% on 2004 levels. All of this will greatly increase demand on the railway capacity of China's railways. The volume of cargo handled at border stations between China and Russia will increase threefold to 60 million tons from the present volume of 20 million tons. The volume of cargo handled at Manzhouli border station will increase to 30 million tons, while at both Suifenhe and Erlian border stations it will increase to 15 million tons.

With regard to petroleum, Russia is gradually expanding its energy diplomacy strategy, in order to boost its economy. China implemented an energy supply strategy because of its rapid industrial growth and energy shortages, leading to an increase in crude oil transport between Russia and China. An oil pipeline between Angarsk - Manzhouli - Daqing had been planned, but this project has now been put on ice. Instead, Russia has decided to transport more crude oil by railway. In November 2004, talks took place in Beijing between the Chinese Ministry of Railways and the Russian Railways Joint Stock Company; the two parties guaranteed that the amount of crude oil imported from Russia and transported by railway would be no less than 10 million tons in 2005, hence the volume of crude oil transported by rail via Manzhouli border station will increase steadily. In addition, Manzhouli border station adjoins the Siberian region of Russia, which is plenty of oil resources. In addition, Manzhouli border station adjoins the Siberian region of Russia, which has plentiful oil resources. Furthermore, Manzhouli border station is close to the old industrial bases of Northeastern China, which have solid industrial foundations and are being revived. It is also located at a key point in the northern route of the Eurasia land bridge. In recent years, capacity has been expanded through the upgrading of facilities at Manzhouli border station, so transporting petroleum via Manzhouli is quick and relatively economical. Thus, the volume of petroleum handled by Manzhouli border station is increasing rapidly: the volume handled in 2004 was nearly 7 million tons and is forecast to be 10 million tons in 2005, reaching no less than 15 million tons in 2006. Therefore, the number of petroleum trains will increase by 43%, rising to 20 pairs from the current 14 pairs.

3. The Situation at Manzhouli Border Station

Manzhouli border station is the communications hub of the TMR, as well as being the largest land border station in China. The station is located in the western part of the Hulunbuir Grassland, adjoining the Russian town of Zabaikalsk, and occupies a key position in the northern route of the Eurasia land bridge. It is the main international corridor between China and Russia, as well as European countries.

Manzhouli border station was established in 1901, with 41 broad and standard gauge sidings laid from east to west in the station; two standard and broad gauge lines run to the country gates and are directly connected to the

TSR, linking the station with both Europe and Asia. The daily deposit capacity of the station is up to 2020 cars, making it the largest railway border station in terms of car deposits. The station has perfect storage facilities and a good overall layout, providing multiple services, such as storage, transfer and transshipment. Its main warehouses and storage facilities include a bulk cargo yard, foreign trade warehouse, military material warehouse, international transit cargo warehouse, railway storage base, international container storage base, import and export transfer station and a grease storage house, all equipped with industrial railway sidings. The storage facilities cover an area of 600,000m².

There are also four border transshipment facilities, covering an area of 135,000m², which are equipped with gate lifts, bridge lifts, truck lifts, magnet lifts and a hydraulic pressure seizer for transshipping logs, as well as an irradiation monitor and a cobalt-60 train inspection system. The Ministry of Railways and the Harbin railway administration have invested RMB655 million in upgrading and expanding the capacity of Manzhouli border station. At least 20 engineering projects have been completed, bringing the transshipment capacity of the station to 13.2 million tons.

Along with the development of the Chinese economy, the demand for Russian raw and processed materials has been increasing, and the gradual recovery of the Russian economy has led to purchases of Chinese consumer goods. All of the above have brought about sustained growth in the volume of cargo handled by Manzhouli border station, giving it increased status with regard to its importance in foreign trade, especially Sino-Russian trade.

4. Problems Currently Affecting the TMR

The following issues should be resolved in order to expand capacity to meet future demand on the TMR

4.1 Capacity of the Harbin-Dalian line

Depending on the route it takes, all cargo travels along the whole or a part of the Harbin-Dalian line, whether it is imported from Dandong, Ji'an and Tumen via the TKR, or brought by sea to Dalian Port. The Harbin-Dalian line will carry the majority of domestic freight, apart from cargo to Russia, Central Asia and Europe via the railways of Northeastern China and Siberia. The utilization rate of the line is 80% or more at present, with some sections already at saturation point.

The Harbin-Dalian line has been electrified in order to solve the capacity problem on this, the most important railway line in Northeastern China; the capacity of the line could increase by 25% once electrification work has been completed, extending the capacity of the saturated sections and enabling the route to meet requirements within a short period of time. From the period of the 11th five-year plan onwards, rapidly increasing demand for rail transport will exceed the limited capacity, rendering the line unable to respond to the requirements of economic development.

4.2 Capacity of east-west railway lines

Depending on the way in which transport is organized, freight the ROK to Russia, Central Asia and Europe should

first enter China via Dandong border station, being carried to Shenyang via the Shenyang - Dandong line, to Harbin via the Harbin - Dalian line, and then to Manzhouli and the TSR via the Harbin - Manzhouli line. Alternatively, it will enter China via Ji'an border station, travel to Siping via the Meihekou - Ji'an line and the Siping - Meihekou line, to Harbin via the Harbin - Dalian line, and then to Manzhouli and the TSR via the Harbin - Manzhouli line. The third alternative for freight exchange between the ROK and China is entering China via Tumen border station.

Currently, the Siping - Meihekou line and the Meihekou - Ji'an line are single track. The Shenyang-Dandong line, which runs from the capital of Liaoning Province to the border station of Dandong, is a trunk railway line in eastern Liaoning Province, with a track linked directly to Sinuiju in the DPRK. This line is the main route for integrated rail transport between China and the DPRK, as well as being the most important railway for linking the Chinese railway network with the TKR. The Shenyang - Dandong line is single track in some parts and double track in others. Although the capacity of these two lines is sufficient to meet the requirements of the volume of Sino-DPRK cargo transported so far, the capacity is still not adequate, as the utilization rate in certain sections is 90% or more. If freight from the ROK is to be transported via this line, its capacity has to be strengthened.

4.3 Container transportation

Recently, container volumes on this route have been increasing quickly; for example, the volume of containers handled at Manzhouli border station has multiplied, exceeding 36,000 TEU in 2003. If domestic containers are included, the transport facilities for containers are insufficient to meet the growing demand.

4.4 Hailar-Manzhouli

The Hailar-Manzhouli section of the Harbin-Manzhouli line is still single track and has limited capacity. Capacity will cease to be adequate once transport volumes reach 10 million tons.

5. Remedial Measures

The following measures are planned, in order to resolve these problems.

5.1 Three New Container Depots

Three central container depots are to be constructed in the northeastern Chinese cities of Dalian, Shenyang and Harbin, in order to alleviate the shortage in container transport facilities.

Compared with ordinary transfer stations, central container depots are more advanced in terms of both speed and safety. Dalian will be established as the shipping hub of Northeast Asia, with 90% of containers to/from inland areas passing through Dalian Port. To enhance transit speed and promote the development of Dalian Port, a central container depot will be established in the Dayao Bay area. 37 container berths are planned, with an estimated handling volume of 10 million TEU, of which rail freight will occupy 2.64 million TEU. Central container depots will also be established in Shenyang and Harbin. Dedicated

container trains will be operated between Dalian, Shenyang and Harbin central container depots. The central container depots are due to be completed before 2010.

5.2 Upgrading Lines and Diverting Traffic to Other Lines

To solve the capacity issue of east-west railway lines, Shenyang-Dandong line and Siping-Meihekou-Ji'an line should be strengthened. Alternatively, traffic could be shunted from these lines to other, less congested lines.

In order to alleviate the strain on railway transportation in Northeastern China, promote economic development in the border areas, further open the country up to world, and support the revitalization of old industrial bases in Northeastern China, the construction of an eastern railway route in Northeastern China - the so-called "border-easing railway line" - is planned.

In this project, three new railway lines will be constructed: the Helong - Baihe line, the Xin Tonghua - Guanshui line and the Dandong - Zhuanghe line. These will be linked to 13 existing lines, including the Harbin-Dalian line, the Jinzhou - Chengzitan line, the Dandong - Dadonggang line, the Shenyang - Dandong line, the Fenghuangcheng - Changdian line, the New Tonghua line, the Meihekou - Ji'an line, the Yayuan - Dalizi line, the Hunjiang - Baihe line, the Helong - Longjing line, the Chaoyangchuan - Kaishantun line and the Changchun - Tumen line. All of these will form a north-south railway corridor along the Sino-Russian and Sino-DPRK border, starting from Mudanjiang city in Heilongjiang Province, passing through Tumen and Tonghua cities in Jilin Province, and Dandong and Zhuanghe cities in Liaoning Province, and terminating at Dalian city in Liaoning province (See Figure 3).

The total length of the eastern railway in Northeastern China is due to be 1389km, consisting of 411km of newly constructed railway lines, 21km of newly constructed linkage lines, and 957km of upgraded existing lines. RMB6.86 billion will be invested in the newly constructed railway lines, which works out at about RMB16.7 million per kilometer. Total investment in the project is estimated at RMB12.743 billion.

The construction of this eastern railway corridor in Northeastern China will surely play an important role in linking Liaoning Province to Jilin and Heilongjiang provinces in Northeastern China and establishing the area as a major hub of Northeast Asia.

Beginning with this strategy, the Ministry of Railways, the state council bureau for the revitalization of the old industrial bases of Northeastern China, and the governments of Liaoning, Jilin and Heilongjiang provinces conferred regarding the construction of the eastern railway corridor in Northeastern China and signed an agreement that surveying and construction work on this corridor will begin this year.

5.3 A Dedicated Passenger Railway Line

The Harbin - Dalian line is one of the railways with the heaviest transport burden in the Chinese railway network. Along with the implementation of a strategy of revitalizing old industrial bases in Northeastern China, the economy of Northeastern China will be developed continuously and

steadily. Significantly increased demands will be made on the main arteries for freight transport in Northeastern China, especially the Harbin - Dalian line, the most important north-south trunk line. Even though it has been upgraded and electrified, the shortage of capacity cannot be solved entirely; the only way to resolve the capacity issue completely is to construct a dedicated Harbin - Dalian passenger railway line, transferring all passenger trains to the dedicated passenger line and ensuring that only freight trains run on the existing line.

The length of the planned dedicated Harbin - Dalian passenger railway is 902km. The maximum train speed will be no less than 200km/h, and may even reach 300km/h or more.

This dedicated passenger railway, which passes through a plain in Northeastern China and will cost an estimated RMB80 billion, will be a highly advanced modern railway. It will make a significant contribution to alleviating the strain on the railway network in Northeastern China, improving service quality and supporting the revitalization and development of old industrial bases in Northeastern China.

The line will pass through three provinces and nine cities. The construction of a dedicated Harbin - Dalian passenger railway will greatly alleviate congestion on the north-south railway in Northeastern China, as well as promoting economic development in that region. It will have an impact in key areas of Northeastern China, stimulating the development of the market economy, promoting cooperation between enterprises and cities, discouraging negative competition between regions, preventing the wasting of resources on irrational construction projects, promoting economic development in areas along the line, revitalizing old industrial bases and generally supporting the development of the national economy.

Once the operation of the dedicated Harbin - Dalian passenger railway begins, the total capacity of the existing line will be significantly in excess of 100 million ton-km/km. Currently, the majority of cargo traveling along that line is bound for Beijing (upwards), while the majority of cargo destined for the TKR and TMR travels away from Beijing (downwards). Based on the present growth rate of railway freight transport, the downward traffic density is forecast to be 25-30 million ton-km/km in 2010 and 35-40 million ton-km/km in 2020. It is easy to see that a large amount of surplus capacity will be available for transporting freight from the ROK, the DPRK and other East Asian countries to Russia and European countries, thereby solving the problem of limited capacity in the existing railway network.

5.4 Increasing the storage and transshipment capacity of Manzhouli border station

In 2004, RMB400 million was invested in upgrading freight storage and marshalling yards and doubling the transshipment capacity of the border. The new border inspection yard was put into service in May and the pressure on the capacity of the broad gauge arrival/dispatch yard has been alleviated considerably. The sidings in the throat area of broad gauge marshaling yard were lengthened

in July, to enhance the capacity of the throat area. Three sidings in the western standard gauge yard were put into operation in October, increasing the number of storage wagons in the standard gauge marshalling yard by 180 wagons. Two sidings in the broad gauge arrival/dispatch yard were put into operation in December, increasing the number of storage wagons in the broad gauge yard by 160 wagons.

The Hailar railway sub-administration has established a crude oil transshipment line with a capacity of 12 thousand tons per day, in five months. The number of bogie transfer decks at Manzhouli vehicle depot was increased by 25% from eight to ten. The bogie transfer capacity has been increased to 240 wagons per day. With the enlargement and upgrading of these yards, the capacity of the border station has been increased to allow it to handle 20 Russian trains per day, equivalent to more than 15 million tons of freight annually; thus, the foundations have been put in place to respond to a rapid increase in import and export freight.

To improve the efficiency of the border station, the railway department has been integrated with the customs, immigration and border inspection departments. Customs officers now implement a one-stop inspection and discharging procedure for timber, crude oil and other commodities that fall within the scope of the relevant policy, and the second inspection for chemical fertilizer, paper pulp and other commodities has been abolished, thereby greatly reducing the inspection time. The immigration department increases the number of staff dealing with inspections and quarantine according to the situation with regard to increasing imports of timber and crude oil, thereby reducing the inspection time. Timber inspection time has been reduced to 10 hours from the previous 12 hours. The border check and customs departments now share information, reducing inspection times by two-thirds from 30 minutes to 10 minutes.

To ensure the steady increasing in capacity of Manzhouli border station, a 5000-ton heavy load freight train is operated between Manzhouli and Sanjianfang Station. In addition, a train with 100 empty wagons is operated between Sanjianfang and Manzhouli Station, thereby alleviating such problems as the shortage of empty wagons, overstocking of loaded wagons and overly long operating times at the border station. Manzhouli station has reduced the waiting time by improving the quality of transport organization and operation planning. The wagon setting time was reduced by 2.4 hours. The station has coordinated with Zabaikalsk Station in Russia to improve the situation with regard to the returning of empty wagons, reducing the operating time to 32 hours from 41 hours.

5.5 Upgrading the Harbin-Manzhouli line

RMB 8.4 billion was invested by the Ministry of Railways in enlarging capacity and increasing speeds during the period of the 10th five-year plan.

The total length of the Harbin-Manzhouli railway is 935km and it was established in 1901. It is an important east-west trunk line in China, a crucial international railway corridor, and a major international trade corridor for the exchange of freight between China and Russia. This line passes through Manzhouli border station and is the major

route on the northern route of the land bridge in China.

The Hailar-Manzhouli section of the Harbin-Manzhouli line is still single track. This is the main factor limiting the capacity the whole line. The Hailar-Manzhouli section will begin to be upgraded to double track in 2005, and the Hailar-Biketou section will also be upgraded. Items to be upgraded include:

- (1) Enlarging the capacity of Manzhouli border station, include the construction of a second passenger platform and a cloverleaf junction on the east path. Total budget: RMB440 million.
- (2) Improving speed on the Harbin-Qiqihar section, including the replacement of all switches on the trunk line with speed-enhancing switches, adding two arrival/dispatch sidings at Qiqihar Station, building a fifth passenger platform and lengthening the underground section. In addition, the track bed is to be reinforced, the gradient reduced, the line straightened and sleepers replaced on certain sections of the track. Total budget: RMB1 billion.
- (3) Constructing a third Songhua river bridge and the 33km Wanggang-Wanjia link line, thereby enabling passenger and freight trains to run on separate lines in Harbin terminal. Total budget: RMB1.4 billion.
- (4) Constructing a new central container depot in Harbin in the next two years that will be the second-largest container depot in Northeastern China, after Dalian. Total budget: RMB350 million.
- (5) Upgrading train performance controlling signals between Qiqihar and Manzhouli to an automatic blocking system, as well as reducing the gradient and straightening curves on certain sections of the track.
- (6) Upgrading the single-track section between Hailar and Manzhouli to double track, at a total cost of no less than RMB1 billion. After this upgrade, the transport capacity of the Harbin-Manzhouli line will be greatly increased and the maximum speed of passenger trains between Qiqihar and Manzhouli will reach 140 km/h, reducing the travel time of passenger trains from Harbin to Manzhouli to no more than 10 hours.

The aforementioned projects will significantly ease the strain on railway transportation in Northeastern China, as well as providing excellent conditions for overland freight transport from the ROK and other East Asian countries to China, Central Asia, Russia and Europe.

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Figure 3. Map of Railways in Northeastern China

