

External and Internal Freight Transportation Demand for Mongolian Railway

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Abstract: A study of the prospects of the Mongolian railway freight market and a development perspective was proposed. This article examines the state of Mongolia's economic development since year 2000 and the development of the railway transport market. As a result of the study, the prospects for the development of the Mongolian railway transport market were hypothesized and some opportunities for joining the railway network of Northeast Asian countries were suggested.

Keywords: mining commodity, economic development, northeast Asian railway corridor

1. INTRODUCTION

Mongolia's economy is highly dependent on the participation and development of the mining sector, which has led to limited economic growth and limited opportunities for development results to shift to social indicators. In other words, the general pattern of the last 20 years is that every 3-4 years there is a cycle of ups and downs in the economy, which limits the ability to sustain the impact of growth on improving household livelihoods and social indicators.

This is mainly due to the lack of a foreign trade protection policy, and on the other hand, the economic structure is based on a few sectors, such as mining. Therefore, the need to diversify the economy is one of the most pressing development goals, and one of such pillars is the need to develop a competitive, internationally connected railway infrastructure.

At the same time, the priority of the mining sector in the short and medium term cannot be denied, but the introduction of infrastructure projects to support the development of this sector, including railway transport, will increase the sector's competitiveness and increase economic efficiency and growth in Mongolia. Umnugovi, Dornogovi and Dundgovi provinces have been transformed into regions with responsible mining, high-tech production and services, active construction of East Asian economic cooperation, construction of mining export railways and roads, transportation and logistics centers, it is recommended to develop border crossings and connect micro-regional centers.

Within the framework of this study we present the state of Mongolia's economic development since year 2000 and the development of the railway transport market and suggest some opportunities for joining the railway network of Northeast Asian countries. The research is based on the analysis of strategic documents, secondary data, including statistical data obtained from the Central Statistical Office in Mongolia, Statistical Office in railway companies, official sites of international organizations.

2. CURRENT STATE OF MONGOLIA'S ECONOMIC DEVELOPMENT AND MINERAL EXPORT

Mongolia's economic development since 1990, when it moved from a centrally planned system to a market economy, can be divided into the stages of 1990-2004, 2005-2012, 2012-2016, and 2017- after, depending on its economic growth trends.

Table 1. Real economic growth of Mongolia / percent /

Year	1990-1994	1995-1999	2000-2004	2005-2009	2010-2014	2015	2016	2017	2018	2019
GDP growth rate	-6.4	3.8	5.3	7.3	11.1	2.4	1.2	5.3	6.9	5.2

However, the steady increase in the share of mineral exports since 2005 has been a key feature of the second phase of economic recovery, as can be seen in the Table 2.

Table 2. Exports of Mongolian coal and copper concentrate / million tons /

Main mineral	1995	2000	2005	2010	2015	2016	2017	2018	2019
Copper concentrate	0.45	0.5	0.6	0.57	1.5	1.6	1.5	1.4	1.4
Coal	-	-	2.2	16.7	14.5	25.8	33.4	36.3	36.6

Although copper and coal began to be exported at a time when world commodity prices were rising, these price fluctuations eventually overstated GDP and export earnings, leading to economic instability. In addition, recent years have shown that this type of export is almost entirely dependent on the People's Republic of China (PRC), making it highly vulnerable to economic and national security.

Between 2012 and 2016, a period of slowing economic growth, governance instability deepened, a number of vital economic projects were halted, disputes over contracts with major mining companies, and restrictions on mineral licensing since 2014 have led to foreign investment. Investors were skeptical of Mongolia's legal and policy environment, which led to a decline in foreign direct investment. Since 2017, as the situation has improved and stabilized, Mongolia's gross domestic product has grown and the economy has recovered.

China's share in the Mongolian economy is growing significantly. Mongolia has pursued a policy of avoiding imposing more than 25 percent of its imports, exports, investment, loans and aid on China alone, and pursuing a policy of independence from any other country, in which case the country controls its economic, capital and financial independence. However, China accounted for 56.2 percent of Mongolia's total foreign trade turnover in 2010 and 66.2 percent in 2017, including more than 90 percent of Mongolia's total foreign trade turnover. In 2010, Russia accounted for 18.4 percent, but in 2018 it falls to 13.9 percent.

Japan has also become our third largest partner in foreign trade. Under the Mongolia-Japan Economic Partnership Agreement, Mongolia will exempt about 5,700 types of goods from 97 groups, and Japan will exempt some 9,300 types of goods from 97 groups, and will gradually reduce the tariffs on others. In the first two months of the two-year partnership agreement, the first half of 2018, the total trade turnover between the two countries increased by 71.2 percent compared to the non-implementation of the agreement and reached 264.2 million US dollars. The role of third countries in Mongolia's foreign trade is not very high. However, market changes in these countries have had a small but significant impact on the country's economy. Compared to 2010, the share of the United States in the structure of our foreign trade decreased by 1 point, the share of the European Union decreased by 7.5 percentage points, the share of South Korea decreased by 1.2 percentage points, and the share of Japan increased by 1.3 percentage points. In order to support this growth in the long run, one of the priorities of our

national security policy is to build a railway network that can be connected to the international transport network and to create an infrastructure environment to reach third neighbors.

3. ANALYSIS OF THE CURRENT STATE OF MONGOLIA'S DOMESTIC AND INTERNATIONAL RAIL FREIGHT MARKETS

In 2020, the Mongolian transport sector transported a total of 69 million tons of cargo by all modes of transport, of which 40.8 million tons were transported by road, 22.5 million tons by rail and 5.76 thousand tons by air. The railway earned 708.62 billion MNT out of a total of 2 trillion MNT in revenue.

As of 2020, there are a total of 1,943.1 km of railways in Mongolia, with a total length of 2,763.4 km. There are 6,572 freight cars, 159 locomotives and 276 passenger cars registered in Mongolia. The number of stations and crossings along the main road is 71. Currently, there are 2 main railway lines (Sukhbaatar-Zamiin Uud 1,110 km, Bayantumen-Ereentsav 238 km), 7 branch lines (Erdenet, Baganuur, Shariin Gol, Boldtumur Yeruu-Tumurtei, Bor-Undur, Zuunbayan 467 km). There is a 1,520 mm and unelectrified road, which transports about 22-30 million tons of freight per year and employs about 15,500 people.

Total freight transported by rail has been growing steadily in recent years.

Table 3. Cargo transported by rail, by type of cargo, thousand tons

Freight type	2015	2016	2017	2018	2019	2020
Domestic and international freight, thousand ton	14,869.	15,632.91	17,371.33	19,599.16	21,309.6	22,538.81
Mining product	11,890.7	13,844.83	15,038.06	16,596.28	17,721.5	18,769.77
Coal	6,461.13	6,693.73	8,176.99	8,821.54	8,550.3	8,625.04
Oil, oil product	142.5	232.79	599.09	641.	564.7	543.7
Fluorspar, fluorspar concentrate	278.29	249.68	315.79	543.73	679.7	667.2
Copper and molybdenum concentrates	611.76	664.78	659.88	657.87	651.8	650.14
Iron ore	4,201.51	5,737.07	5,129.76	5,780.1	7,111.6	7,922.29
Zinc concentrate	84.28	126.3	118.11	124.19	133.2	134.29
Other	111.24	140.48	38.43	27.87	30.1	227.12
Building materials	1,968.47	1,028.13	1,181.1	1,621.82	2,115.	2,264.06
Consumer food products	136.51	134.21	184.22	204.85	200.6	209.25
Perishable products	48.97	22.39	23.3	27.66	11.	9.1
Agricultural products	141.	73.02	253.38	245.3	313.5	201.75
Ferrous metals (scrap, rails, etc.)	149.59	78.84	118.75	183.69	258.2	329.34
Industrial machinery, equipment and tools	20.95	17.26	24.02	30.64	30.7	22.6
Other	430.91	356.94	458.32	574.05	535.6	623.63

There are more than 80 types of mineral resources in Mongolia and 2,661 licensed companies operating on them, of which 1,681 have mining and 980 exploration licenses. The total licensed area covers 6,488.8 thousand hectares and is dominated by companies operating in Dornogovi, Dundgovi, Dornod, Umnugovi, Tuv, Khentii provinces and Ulaanbaatar basins.

The following 6 types of minerals make up the majority of the identified mineral resources of these companies.

Table 4. Identified mineral resources

№	Type of mineral	Identified reserve
1	Coal	37.4 billion ton
2	Copper	84.1 million ton
3	Iron	1.08 billion ton
4	Lead	18.1 million ton
5	Oil	332.6 million ton
6	Uranium	74 million ton

In 2020, due to the global pandemic, mineral exports have declined to some extent, but mining products account for about 90 percent of Mongolia's total exports. Due to Covid-19 disease, the volume of coal exports decreased by 39 percent compared to the same period of the previous year to 15,175 thousand tons, the volume of copper concentrate exports decreased by 8 percent to 905 thousand tons, and the volume of iron ore exports increased by 0.6 percent to 5,589 thousand tons.



Figure 1. Domestic coal mining, sales and exports / thousand tons, 2017-2020 /

According to the survey, total coal production in 2019 was 57,128.8, an increase of 9.5 percent compared to the same period of the previous year. In the first 8 months of 2020, total production was 19,694.7, which is 51.3 percent less than the same period of the previous year.

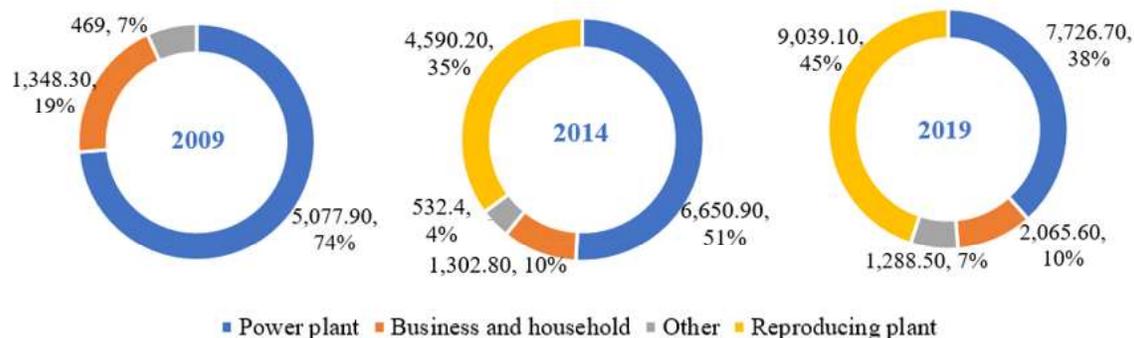


Figure 2. Coal consumption and sub-sector /thousand ton, percent/

PRC is the world's largest buyer of coal and iron ore, while Australia is the most successful competitor in the market. Therefore, the price of coal in China is mainly determined by the supply and demand of these countries. Due to the underdevelopment of the coal processing industry and the high cost of transportation by rail, Mongolia sells its coal across borders and supplies it to Inner Mongolia, Gansu, and Xinjiang Uyghur Autonomous Region up to 400 km south through intermediaries. In addition, Mongolian coal is exported unprocessed, which is low in value and expensive to transport by rail.

Figure 3. shows the amount of coal exported through ports of Mongolia such as Gashuunsukhait, Shiveekhuren, Khangai, Zamiin-Uud, Bulgan and Bichigt. Looking at the two main ports, the amount of coal exported through Gashuunsukhait has increased year by year, while the amount of coal exported through Shiveekhuren has decreased slightly since 2017.

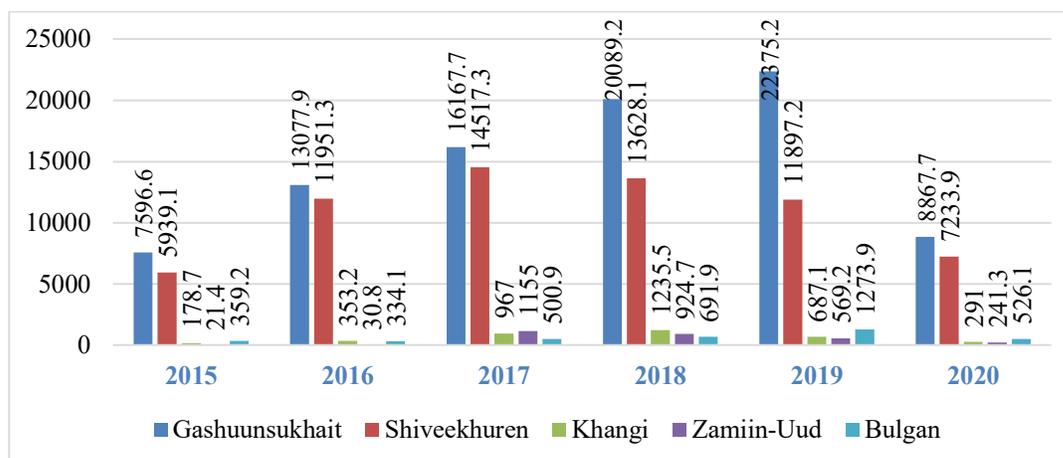


Figure 3. Coal export volume through ports / thousand tons /

Mongolia's coal exports are classified by type of coal and border crossing points, called as ports. 60635.8 thousand tons of raw coking coal was transported through Gashuunsukhait port, 47580.3 thousand tons of loose coking coal was transported through Shiveekhuren port and 18160.6 thousand tons of thermal coal was transported. Exports through the ports are represented by the following figure by type of coal.

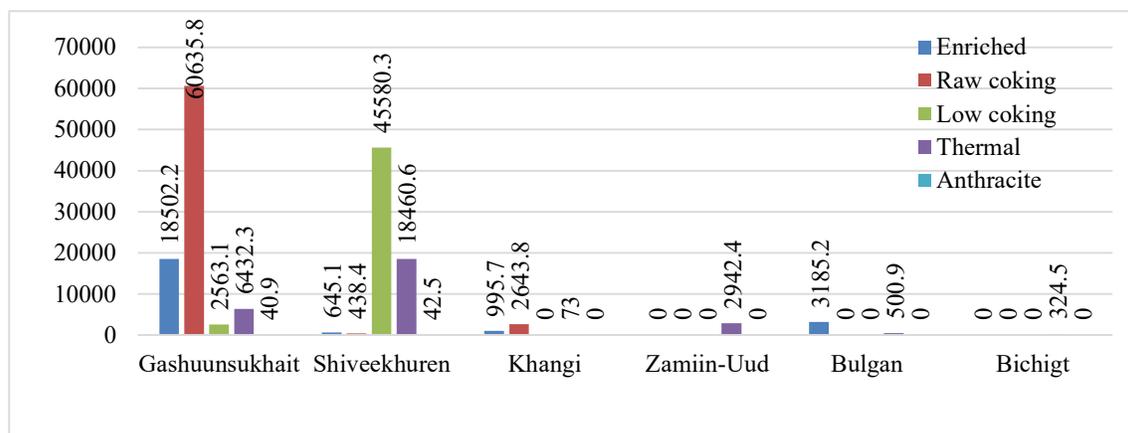


Figure 4. Exports in the last 5 years, thousand tons, by type of coal

According to the survey China's coking coal imports will increase upcoming 3 years at least. According to the General Administration of Customs of China, 74.6 million tons of coking coal was imported last year, an increase of 15.3 percent from the 2018 figure of 64.7 million tons. The increase in imports was mainly due to the relatively low price of imported coking coal. China's coking coal imports from Australia reached 30.9 million tons, up 9.69 percent from 2018, while 33.8 million tons of coking coal imported from Mongolia in 2018, increased by 22 percent.

Analysts have speculated that China's tight import policy will offset the decline in Australian coking coal imports by increasing coking coal imports from Mongolia. Since China restricted coal imports from Australia, the country's end users, including factories in the northeastern province of Hebei, have increased their coal imports from Mongolia.

4. PROSPECTS AND FORECASTS FOR THE DEVELOPMENT OF RAILWAY SECTOR IN MONGOLIA

One of the key concepts of economic development reflected in the long-term policy document “Vision - 2050” approved by the Resolution No. 52 of the Parliament of Mongolia is to prioritize limited economic resources as it is not possible to develop every sector at the same time. By focusing on relevant sectors and developing export-oriented industries, it is possible to ensure long-term sustainable economic growth and generate domestic savings. Therefore, transport and logistics sector are not only one of Mongolia's economic priorities, but also provides the necessary foundation for the development of other priorities.

Researchers, based on the main stages of Mongolia's long-term policy, provide an overview of the development of the national transport infrastructure and the railway sector for raw commodity export.

Table 6. National transport infrastructure and railway sector development stages by key stages of Mongolia's long-term policy

Stages of development	The main strategy for the development of national transport infrastructure	Amendments to the railway transport development strategy
1 st stage 2021-2025	Improve competitiveness, develop an integrated transport network in priority areas, and integrate it with the logistics structure	Focus on the construction of vertical and eastern corridors in the Gobi region and a network of horizontal roads connecting them
2 nd stage 2025-2030	Establish and develop a mixed transport and logistics system covering priority areas and axes	Complete construction and renovation of the Khuut-Nömrög railway from Tavan Tolgoi and the central and eastern vertical corridors
3 rd stage 2030- 2040	Develop a mixed transport system covering the main economic corridors	The central and eastern corridors will be fully utilized, while the focus will be on the construction of the western and northern corridors
4 th stage 2040- 2050	Establish and develop a world-class transportation and logistics system that will serve the country and the region	Electrification, digital technology, high-speed trains

Mongolia already has a railway line north of Ulaanbaatar for mining development. However, the Tavan Tolgoi-Zuunbayan and Tavan Tolgoi-Gashuunsukhait railway projects, based on the Tavan Tolgoi mines in the south and large-scale mining projects such as Oyu Tolgoi, have laid

the groundwork for connecting the line to the Eurasian railway network.

Since 2010, the issue of establishing a transnational economic corridor covering three countries in the region has already gone beyond the state policy, planning and research of Mongolia, Russia and China, and is taking more and more practical steps. In this context, the development of transport infrastructure connecting Mongolia with neighboring countries is not only limited to the central region, but also the possibility of developing the eastern and western corridors is being discussed.

Since the most suitable mode of transportation for mining commodity is railway transportation, the development of railway transport and tourism infrastructure in the eastern region of Mongolia is becoming increasingly important due to practical reasons.

The eastern economic zone of Mongolia consists of Khentii, Dornod and Sukhbaatar provinces, which are located close to the rapidly developing regions of Northeast Asia, especially China, and are rich in natural resources and mineral resources. The following table shows number of deposit spots and identified reserves of minerals in eastern Mongolia, hence the demand for the developing the East Vertical Railway line, which is inextricably linked to the transportation of minerals in the region to China's industrial zones. A separate railway line exists in the east of the country between Choibalsan and the Trans-Siberian at Borzuya is closed to passengers. This line used to have a spur line to the uranium mine at Mardai, however this spur line was torn up and sold in the late 1990s.

The amount of freight transported by rail at a time is 30 times larger than that of trucks, making it more cost-effective, environmentally friendly and economically viable.

The following three basic conditions need to be considered when designing a railway route for mining transportation. This includes:

- Ability to connect the strategic deposit to the border of the neighboring country by the nearest road;
- Second, it is connected to the railway network near the border of the neighboring country and it is easy to export minerals to third countries;
- Ability to connect to existing rail networks

Table 5. Researched mineral resources of the eastern region of Mongolia (as of 2017)

No.	Type of mineral	Number of deposit spots	Identified reserve, million ton
1.	Coal	19	4,639.20
2.	Iron ore	7	56.6
3.	Tungsten	1	10.5
4.	Zinc	1	0.9
	TOTAL	28	4,708.5

The eastern region has been transformed into an ecosystem of eastern Mongolia, actively involved in Northeast Asia's economic integration, infrastructure, green technology-based agriculture, manufacturing and tourism, and export-oriented railways have been built in Ereentsav, Sumber and Bichigt, Khavirga and Bayan Khoshuu border crossing points need to be expanded.

Minerals in northern Mongolia need to travel about 4,000 km through Ulan-Ude to the eastern port of Russia to be exported to third countries via Russia. Exports from the northern region via China to third countries will take 2,500 km through Ulaanbaatar-Zamiin-Uud to the Chinese sea port. From the south of Mongolia, a total of 1,680 km will pass through Tavan Tolgoi, Oyu Tolgoi-Gashuunsukhait and Gantsmod to the port of Qinhuangdo in China, and a total of 5,800 km from Tavan Tolgoi through Sainshand, Darkhan, Sukhbaatar and Ulan-Ude to the eastern port of Russian Federation. There is a need to build a new railway from Tavan

Tolgoi to Sainshand on the Russian route, but this is far from the Chinese route, so there is little justification for transportation. There is also a way to build a new railway from the Tavan Tolgoi mine to Khuut and Nomrog in Dornod province of Mongolia and export it to the North Korean port of Rajin.



Figure 5. Exits from the mining center to third countries

Considering that exports from the east of Mongolia to third countries pass through Russian Federation, PRC, and North Korea, the 1,470 kilometer route from Choibalsan-Khuut-Bichigt to China's East Khatavch to Jinzhou is the shortest route to export minerals from the Choibalsan mine to China. The total length of the transit through Russia from the mines near Choibalsan city to Ereentsav in Mongolia, Skovorodino and Khabarovsk in Russia to the seaport is 3,580 km. In the direction of North Korea, it will travel 1,850 km from Choibalsan to Khuut, Nomrog in Mongolia through China's Arshaan, Daan, and Changchun to reach the port of Rajin of North Korea. In order to export minerals by rail, it is important to conduct research and negotiations on the use of neighboring ports and joint investment in new railways.

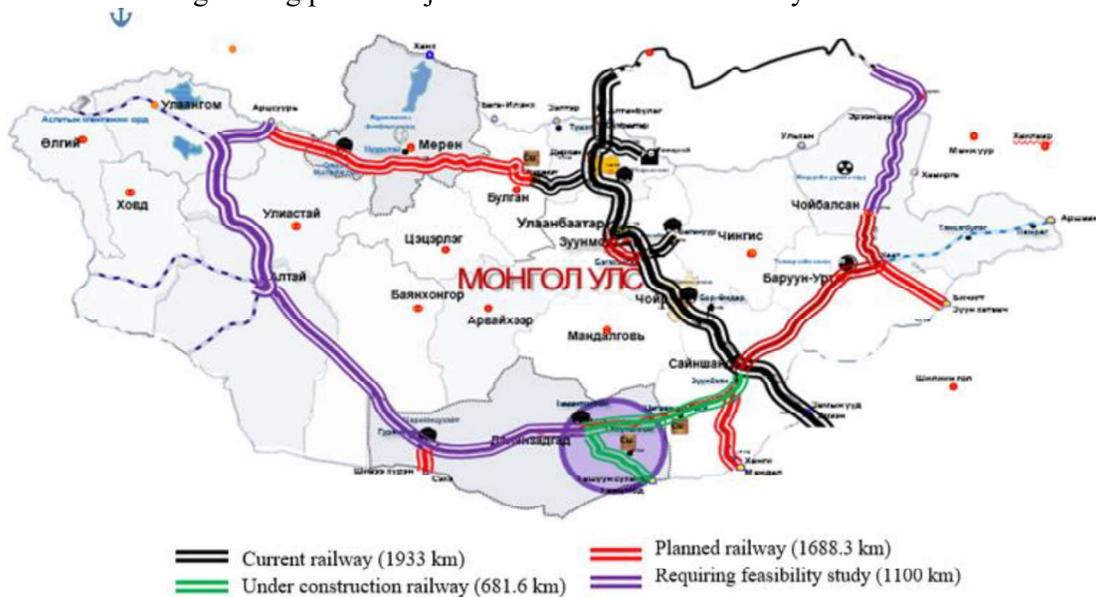


Figure 6. Possibilities to expand railway transport infrastructure

5. CONCLUSION

The following conclusions are drawn from the study on the future development of the Mongolian railway freight market. These include:

1. Mongolia's transition from a centrally planned economy to a market economy in 1990 ensured economic growth in four phases: 1990-2004, 2005-2012, 2013-2016, and 2017, through the liberalization of the economic structure, the privatization of social property, and structural reforms.
2. As the Mongolian economy grows, the GDP per capita increased from 174.5 thousand MNT in 1990 to 10159.3 thousand MNT in 2019, an increase of 58.3 times in nominal terms. Mongolia's transport sector generated revenue of 2 trillion MNT in 2019, of which the railway sector generated 708.62 billion MNT.
3. In 2020, the railway sector of Mongolia transported 6,572 freight wagons and 159 locomotives on a total of 1,943.1 km long road, transporting 22.5 million tons of freight in 2020 and earning 708.6 billion MNT. There are more than 50 types of mineral resources in Mongolia, which increases the demand for railway freight.
4. Mining products, including coal, iron ore, tea, and tungsten, account for about 30 percent of rail freight exports, and has increased in recent years, with China being the largest buyer of such freight. Cooperation between Mongolia, Russia and China in establishing economic corridors is increasing the demand for rail freight.
5. Mongolia has declared the transport and logistics sector, especially the railway transport sector, to be a priority of economic development, and it is important that it directs government policy for further expansion and development.
6. As researchers, we are proposing to develop the Mongolian railway sector in four stages. Mongolia believes that the construction of 2,370 km of new railways on the existing railway network will allow it to connect to the Northeast Asian railway network, transport freight to third countries, and increase exports rapidly.

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