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A Strategy for Developing Heavy Industry in Mongolia

Mongolia

2024/25 KSP POLICY BRIEF

Presented by the MOEF, Republic of Korea

Ministry of Economy and Finance
KDI Korea Development Institute
KISME

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Preface

The Mongolian government is pursuing a policy of promoting heavy industry to transition from a mineral-export-oriented economy to a high-value-added, manufacturing-based economy. To benchmark Korean policy experiences, the 2024/25 KSP project, entitled "A Strategy for Developing Heavy Industry in Mongolia," is currently being implemented by the Korean Institute for Small and Medium Enterprises (KISME). Already, "Industrial and Technology Park Development Strategy with a Special Focus on Heavy Industry in Mongolia" was implemented as a KSP project in 2022/23, and the report was submitted to the Mongolian government.

As of 2022, the Mongolian manufacturing industry's GDP share is only 8.6% of the total GDP, and Mongolia's goal is to increase that share to 14.6% by 2030. However, considering the vulnerability of domestic supply capacity in the heavy industry sector and unfavorable global demand conditions, achieving this goal is not easy. Mongolia faces several factors that hinder the development of its heavy industry, including a lack of industrial infrastructure, unfavorable logistics and transportation conditions, insufficient electricity and water supply, limited capital, technology, and workforce. Although abundant resources are a significant advantage in procuring raw materials for the development of heavy industry, they can also act as a resource curse, hindering the growth of high-value-added manufacturing within this sector.

The Mongolian MIMR (Ministry of Industry and Mineral Resources) has requested knowledge transfer through the KSP project in 2024/25 to seek a strategy for promoting Mongolia's heavy industry by benchmarking Korea's heavy chemical industry development strategy in the 1970s. MIMR also successfully established a development strategy for industrial complexes linked to mines in 2022/23, building on the successful knowledge transfer experiences gained through this KSP project.

Korea has achieved economic development through aid from advanced countries and international organizations during the development period, and it will never forget the gratitude for that kind of aid. As Korea advances as an economic powerhouse, it is expanding its overseas aid projects to support developing countries in various ways, including the EDCF, ODA, and KSP, to promote the proactive economic development of these countries. Among them, the KSP project is a representative policy consulting project initiated by the Ministry of Strategy and Finance in 2004 to transfer Korea's economic development experience to developing countries. It has been in operation for over 20 years. Based on Korea's economic development experience and knowledge, the KSP project provides policy services tailored to the unique realities and situations of each

partner country, working closely with them.

The Mongolian KSP project for 2024/25, "A Strategy for Developing Heavy Industry in Mongolia," is being carried out in line with the Mongolian government's national implementation of "Vision 2050" and "Mega Project 14" and is also linked to the international supply chain reorganization movement, making it timely and strategically significant. The KISME, the implementing agency for this project, will address three key topics in collaboration with the KDI, the lead agency, and present policy alternatives.

I would like to express my gratitude to the researchers who were responsible for the research on each topic. The first topic is Mongolia's "Strategy and Plan for Heavy Industry Development Based on the Industry & Technology Park (ITP)," written by Professor Jangho Choi. The second topic was "Investment Attraction Plan for Heavy Industry," which was handled by Professor Youngho Youn. The third topic was the "Economic and Social Impact of Heavy Industry Development," which was written by Dr. Youngsoo Kim. The other researchers for this project, Professor Seunghee Baek, Expert Commissioner Dongmin Yoon and Professor Hyunsook Lee, should be greatly appreciated.

Additionally, I would like to express my gratitude to all the KSP research team members who contributed to the project's progress. First of all, Hoon Han (Former Vice Minister of Agriculture, Food and Rural Affairs), who played a leading role as the representative and senior advisor of the Korean research team from the beginning to the end of this project, took the lead in achieving the smooth cooperation with the relevant governments and organizations in Korea and Mongolia on behalf of our team. Dr. Yeongkwan Song (Senior Fellow) of KDI has provided in-depth and insightful advice and counsel throughout the entire research process. Research associate Jinhyeok Ha of KDI provided valuable administrative and operational support and cooperation, enabling the KISME research team to focus on this research without interruption. I cannot express my gratitude enough to both of them.

This project could not have been completed without the active cooperation and support of the Mongolian side. I extend my sincere gratitude to all who participated in its implementation. In particular, I wish to thank the officials from the Ministry of Industry and Mineral Resources who directly contributed to the project's progress: State Secretary Mr. Sereeter Javkhlanbaatar; Director of the Industrial Policy Department Mr. Sukhbaatar Sukhbat; Head of the Innovation, Partnership, and Cooperation Division Mr. Batchuluun Otgonkhuu; Senior Analyst of the Industrial Policy Department Mr. Oyunbold Tserendorj;

and Senior Specialist of the Industrial Policy Department Ms. Chimgee Bayartogtokh.

I am also deeply grateful to Mr. Batzorig Avarzed, Mr. Artagbat B., and Mr. Tugalagtamir Bold, who served as local experts. In addition, I would like to acknowledge the CEOs of Erdenes ITP LLC, Mr. N. Munkh-Ider, and Nalaikh ITP LLC, Mr. Choijinsambuu Radnaabazar, as well as their related parties, for their dedicated interest and cooperation throughout the project.

Finally, I must state that the contents of this report reflect the opinions of the researchers who conducted this project and do not represent the official opinions of KDI.

Dosung, Na
Chairman of KISME

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Summary

The Government of Mongolia aims to promote industrial diversification by shifting from a mineral export-oriented economy to a value-added, processing-based industrial structure. To achieve this, it has identified strategic industries based on the country's mineral resources and plans to develop core midstream facilities, including a one-million-ton-per-year steel plant, a 125,000-ton-per-year copper smelter, and a coal-chemical complex. These initiatives are being implemented under the 2021~2030 Mid-Term Development Plan and the 2024 list of 14 Mega Projects. Given both domestic and international market demand, these projects are considered economically feasible. To ensure successful implementation, concrete plans must be prepared for financing, the recruitment of skilled labor, and the development of essential infrastructure such as power supply and industrial water systems.

To successfully develop its heavy industry, achieve industrial upgrading, and thereby enhance value creation, generate employment, and accumulate technological capabilities, it is recommended that the Mongolian Government adopt the following eight implementation policies step by step.

- **Construct the anchor plants.** A small number of strategically selected high-impact industrial facilities. The focus should be on launching a few flagship projects, such as a copper smelter, steel mill, or coal chemical plant.
- **Establish the legal framework for heavy industry development.** A strong legal foundation will provide clarity, attract investment, and enable long-term policy consistency.
- **Promote industrialization through foreign capital and off-take models.** Mongolia should actively secure investment by leveraging its natural resources through resource-backed investment models and long-term supply agreements.
- **Establish a transborder industry belt with inner Mongolia.** This leverages the comparative strengths of both sides to create a mutually beneficial industrial system.
- **Focus on value chain integration, not just production.** The aim is to operate a selective and targeted supply chain, from resource extraction to smelting/refining, processing, and the production of intermediate materials, as well as possibly final products. For example, iron ore is used in steelmaking, then either exported to China or sold as rebar to Inner Mongolia.
- **Designate the low-carbon coal chemical industry as a strategic sector.** The strategy does not involve burning coal but rather chemically converting it. The process involves gasifying coal at high temperatures to produce syngas (CO + H2), which is then purified

and transformed into high-value products such as methanol, olefins, and synthetic fuels. The integration of Carbon Capture, Utilization, and Storage (CCUS) technology ensures that emissions are effectively managed and mitigated.

- **Implement an integrated water treatment system**, transitioning from isolated, enterprise-level water supply systems to a centralized, integrated water treatment and distribution model.
- Pursuing strategic cooperation on critical minerals (CM) positions of Mongolia as a vital link in regional and global supply chains while advancing its domestic industrial capacity.

1. Introduction

Mongolia has a mineral resource-based economic structure, with its industrial sector heavily concentrated in mining. Mining accounts for 25.1% of GDP, 99.4% of exports, and plays a dominant role in employment and government revenue, making it a critical pillar of the Mongolian economy. However, as Mongolia exports its mineral resources primarily in the form of ores or concentrates after mining and beneficiation, the national economy remains highly vulnerable to fluctuations in international commodity prices, resulting in economic instability.

Recognizing this challenge, the Mongolian government began emphasizing the need for industrialization in the 2010s and has since made efforts to lay the foundation for heavy industry. Despite these efforts, Mongolia, which has long relied on mining, recorded a manufacturing sector share of only 8.6% in 2023, comprising approximately 80% of light industries, such as textiles, apparel, and food processing. Compared to other countries, the proportion of heavy industry remains extremely low. This is particularly paradoxical given Mongolia's abundance of mineral resources, which provide essential raw materials for heavy and chemical industries. Nevertheless, the development of heavy industry has been hindered by limitations, including difficulties in securing investment and financing.

In response, the Mongolian government is working to increase the share of manufacturing—particularly heavy industry—beyond its traditional reliance on mining. Following the Vision 2050 plan, Mongolia is currently implementing a medium-term development strategy (2021–2030) and, as of 2024, is pursuing 14 Mega Projects. The medium-term strategy aims to transform Mongolia's mining-dependent economic structure into a more diversified industrial economy. Key projects under this strategy include the construction of an integrated steel plant, a copper smelter, and coal-chemical plants for the production of coke and methanol. These initiatives are accompanied by major infrastructure projects, including power grid expansion, industrial water supply systems, and railway development.

The core of industrial diversification lies in fostering manufacturing-led growth through heavy industry, which is expected to drive economic development and job creation. The main pillars include steelmaking plants that use iron ore, copper smelters based on copper concentrates, and coal-chemical plants that utilize coal resources. The scale of production capacity is estimated based on market demand while taking into account factors such as price competitiveness and infrastructure capacity. For each sector, two alternative scenarios are proposed to determine the optimal scale of supply capacity.

The feasibility of each heavy industry sector in Mongolia depends not only on supply and demand fundamentals but also on securing international cooperation to ensure viability. Key partner countries include China, Korea, Japan, and Russia. Based on current industrial relations, cooperation with China is essential for market access and investment, while Korea and Japan are critical for technology transfer and skilled workforce development. Russia plays a vital role in energy cooperation.

Furthermore, to advance heavy industry development, Mongolia must go beyond domestic financing mechanisms such as government bond issuance. It is also crucial to utilize financing models such as take-off agreements, BOT (Build-Operate-Transfer), and PPP (Public-Private Partnership). In parallel, comprehensive plans must be implemented for skilled labor training, the development of industrial technology parks, integrated water treatment systems, and the construction of combined heat and power (CHP) plants and other essential infrastructure.

2. Current Status of Mongolia's Heavy Industry and the Korea Experience

2.1. Current Status of Mongolia's Heavy Industry Strategy

The Government of Mongolia, under its long-term development policy "Vision 2050", plans to develop the heavy industry sector and increase the share of manufacturing in GDP from 8.6% in 2022 to 14.6% by 2030, 20.3% by 2040, and 27.4% by 2050. As of 2023, mining accounts for 25.1% of GDP, followed by wholesale and retail trade at 16.1%, and agriculture and livestock at 13.0%. In contrast, manufacturing accounts for only 8.6% of the national economy.

Table 1.
Heavy Industry Production Amount

(Unit: Million MNT)

Industry	2020	2021	2022	2023	2024
Heavy Industry	1,598,356	2,072,062	2,542,602	3,028,684	3,402,313
Coke & refined Petroleum products	153,531	218,375	287,952	245,294	227,188
Chemicals & chemical products	177,235	310,280	413,895	604,597	973,119
Non-metallic mineral products	851,831	995,365	1,221,469	1,401,803	1,437,112
Basic metals	300,908	414,777	406,175	546,241	529,899
Fabricate metal products	106,083	128,392	207,344	223,819	227,490
Machinery & equipment, etc.	8,766	4,871	5,763	6,963	7,504
Manufacturing	10,401,889	11,027,476	13,572,585	16,163,810	17,212,311
Light Industry	8,803,532	8,955,413	11,029,983	13,135,125	13,809,997

Source: National Statistics Office of Mongolia (2024).

Moreover, within the manufacturing sector, approximately 80% is comprised of light industry, meaning that heavy industry represents just one-fifth of the total manufacturing output. This underscores the underdeveloped state of Mongolia's heavy industry and highlights the need for strategic investment and policy support to balance the industrial structure.

The key obstacles to the development of heavy industry in Mongolia include its geographical condition as a landlocked country, which leads to high logistics and transportation costs. Additionally, the country faces significant challenges related to

energy and water supply, including limited electricity generation capacity and industrial water infrastructure. Other major constraints include difficulties in securing financing, a shortage of skilled technical labor, a small population, and harsh climatic conditions.

The development of heavy industry in Mongolia also faces institutional and legal challenges. A basic Industrial Development Act has not yet been enacted, nor are there laws specifically dedicated to the development of heavy industry or sector-specific industrial support. The only relevant legislative measures currently in place are the 2021 Support Law for the Construction of the Oil Refinery and the revised 2022 Industrial Technology Park Law. On the policy side, a Heavy Industry Development Plan was established in 2018, followed by the inclusion of manufacturing development in the Vision 2050 strategy and the 2021–2030 Medium-Term Plan. In 2024, heavy industry development was incorporated into the 14 Mega Projects initiative. However, despite these efforts, a comprehensive legal and institutional framework for the development of heavy industry has yet to be established.

Mongolia's industrial development cannot be discussed without considering its relationship with Inner Mongolia. This is because the two regions have highly complementary industrial structures. Inner Mongolia serves as one of China's major hubs for heavy industry and imports a significant portion of Mongolia's mineral resources to support its own processing and manufacturing industries. Mongolia is economically and geopolitically linked to China—particularly to the geographically adjacent Inner Mongolia Autonomous Region—through a shared value chain structure.

2.2. Korea Experience

Korea began developing its heavy and chemical industries (HCI) in the 1970s under strong government leadership, despite having limited natural resources and a small domestic market.[1] The Korean government established legal frameworks such as the "Act on the Development of Heavy and Chemical Industries". It implemented strategic policies, including industrial park development, tax incentives, technology localization, and workforce training programs. Key sectors included steel, petrochemicals, shipbuilding, and machinery. Korea's model combined state-led planning with export-oriented growth, supported by large private conglomerates and foreign technology partnerships.

The success of Korea's heavy and chemical industry—which laid the foundation for the country's economic growth and emergence as an advanced manufacturing powerhouse—was primarily driven by strong government intervention and policy leadership. Key success factors included the strategic selection of core industries, focused capital investment, the establishment of large-scale industrial complexes, and aggressive expansion of infrastructure such as ports, roads, electricity, and water resources. The development of technical expertise and human capital, along with close cooperation between the government and private sector, also played a vital role. Favorable conditions in the global economic environment at the time further supported Korea's industrialization.

1 The promotion of heavy and chemical industries (HCI) in South Korea during the 1970s was closely intertwined with its political context. President Park Chung-hee, seeking to consolidate and extend his power, proclaimed the Yushin (Revitalizing Reform) system in 1972, dissolving the National Assembly and restricting political activities. In the same year, he secured constitutional legitimacy through a national referendum that ratified the Yushin Constitution. Subsequently, in his New Year's press conference in 1973, Park declared that national policy priorities would henceforth be centered on the development of heavy and chemical industries, and in June of that year he announced a detailed implementation plan. This shift led to a substantial revision of the existing Five-Year Economic Development Plan. Since the HCI sector had already been promoted to some extent prior to 1973, there remains debate over whether the 1973 declaration constituted the decisive turning point in its development. Many economists question its actual impact, noting that the growth rates of value added in the HCI sector did not differ significantly before and after the declaration. Specifically, HCI value-added growth stood at 23.2% between 1966 and 1970 and 32.2% between 1970 and 1973, compared to 25.0% from 1973 to 1975 and 31.2% from 1975 to 1978 (Stern et al., 1995, p. 69, Table 4-4).

Table 2.
Lessons from Korea's Experience for Mongolia's HI Development

	Korea's Experience	Implications for Mongolia
Strategic Industry Selection Based on National Strengths	Strategically selected six key industries. Prioritized industries that had strong interconnections.	Resource-based heavy industry. Develop a step-by-step industrialization roadmap.
Government-Led Industrialization and Policy Consistency	The governmentplayed a leading role. Protected and nurtured infant industries.	Strong industrial policy framework with a centralized agency (similar to Korea's Ministry) empowered with greater authority. Policy incentives such as tax breaks, low-interest loans, and export support.
Securing Financial Resources for Industrial Development	Secured foreign loans and aid. Policy banks (Korea Development Bank, Export-Import Bank.	Foreign loans, international development funds (ADB, World Bank, AIIB), and strategic foreign partnerships. State-backed financial institutions.
Developing a Skilled Workforce for Industrialization	Strong education system. Korea established vocational training centers, industrial universities.	Expand vocational training programs Partner with foreign institutions. Encourage foreign technology training.
Building Industrial Infrastructure & Supporting Industries	Industrial parks with Supporting infrastructure (roads, power, ports, logistics). Supply of energy, water, and transportation networks.	Infrastructure development before the heavy industry can take off. Develop special industrial parks, strong industrial policy framework, and stable electricity and water.
Promoting Technology Transfer & Innovation	Actively imported foreign technology and localized it. Government-funded R&D centers.	Partner with foreign companies for technology transfer. Joint ventures with the global industry leaders.

Source: Author.

Under the leadership of President Park Chung-hee, the government took the lead in setting the direction of industrialization. It directly formulated plans (e.g., the 10-Year Industrial Development Plan, 1973–1981), mobilized financial resources, and oversaw the development of infrastructure. By designating key industries for intensive development, the government actively attracted capital and technology. It made extensive use of policy finance institutions such as the Korea Development Bank and the Export-Import Bank of Korea.

Korea's success in building a competitive heavy industry sector was driven by strong government leadership, robust legal frameworks, industrial clustering, skilled workforce development, an export-oriented approach, and the effective use of external financing. For Mongolia, the combination of abundant resources and strategic policymaking—supported by sound legislation—offers a unique opportunity to transition from a resource exporter to an industrial producer and exporter in the heavy industry. The key lessons that Mongolia can draw from Korea's successful experience in developing the heavy and chemical industries are as follows.

3. Challenges for Mongolia's Heavy Industry Development

3.1. Heavy Industry Supply Expansion and Development Strategy

3.1.1. Steel Production Capacity (Proposal) and Feasibility

Mongolia's planned steel plants, including the one proposed under the framework of the 14 Mega Projects and by Erdenes Mongolia, envision a production capacity of one million tons per year. Domestic steel demand is currently estimated to be around 600,000 tons to 700,000 tons, meaning that such a facility would need to export 100,000 to 200,000 tons annually to operate at full capacity. Considering future growth in domestic demand, the required export volume may decrease. Nevertheless, given the global steel overcapacity and increasingly competitive international markets, large-scale exports may be difficult in the near term.

There are two strategic approaches under consideration for the proposed 1 Mt steel plant in Mongolia:

- Phased Development Strategy
  Construct the steel plant with a total design capacity of one million tons, but implement it in two phases. The first phase would establish a 500,000-ton facility, with the second phase—an additional 500,000 tons—added depending on market conditions and demand growth.
- Flexible Operation Strategy
  Build the steel plant at full one million-ton capacity from the outset, but adjust the operating rate based on domestic demand and export opportunities. This provides production flexibility while avoiding overinvestment in early stages.

Given these developments, any new steel project in Mongolia must be strategically positioned to ensure a stable raw material supply, capture market share, and differentiate itself through product specialization or cost advantage.

The construction of a one-million-ton-per-year steel plant is considered feasible, given that Mongolia's domestic steel demand is currently estimated at 600,000 to 700,000 tons annually and is expected to grow in line with economic development. The development of a one-million-ton-per-annum steel plant would not only meet the entirety of domestic demand, but also create the potential for selective exports—particularly to nearby markets such as northern China.

Table 3.
Comparative Scenarios for Iron and Steel Plant Construction

	Scenario 1: Stepwise Expansion Strategy	Scenario 2: Full-Scale Investment at Once
	• Phase 1: Build a 500,000-ton/year steel plant. • Phase 2: Add another 500,000 tons, depending on market demand and supply conditions.	• Construct a one-million-ton/year steel plant from the beginning. • Adjust operational rate based on actual demand (e.g., run at 70%–100%).
Advantages	• Lower initial capital investment. • Greater flexibility to respond to uncertainty. • Enables earlier revenue generation.	• Integrated facility design • Provides long-term operational flexibility. • More appealing for securing long-term raw material and offtake agreements.
Disadvantages	• Potential integration issues when expanding to Phase 2. • Lower economies of scale. • Risk of missing future market opportunities due to the delay capacity expansion.	• Requires significantly higher upfront capital. • Potential for overcapacity. • Heavier fixed cost burden.

Source: Compiled by the author based on Mongolian Economy (2020) and Mongolia Inc. (2020).

The following factors support the industrial feasibility of the Darkhan Steel Plant. Most importantly, Mongolia possesses abundant iron ore reserves, including deposits such as Tumurtei and Bayangol, which are well-suited for blast furnace operations. Additionally, high-quality coking coal is available domestically, particularly in the Tavan Tolgoi region.

Meanwhile, the project must also address energy and infrastructure challenges. The estimated electricity demand for a one-million-ton-per-year steel plant is approximately 500 GWh per year, and the water requirement is around 2 to 3 million cubic meters annually. Given the limitations of the national power grid and regional water infrastructure, practical solutions include establishing on-site power generation—such as captive coal-fired combined heat and power (CHP) plants or solar-plus-ESS (energy storage system) hybrids—as well as developing groundwater sources combined with water recycling systems.

3.1.2. Copper Production Capacity (Proposal) and Feasibility

Mongolia exports most of its copper in the form of concentrate, which captures limited value domestically. Copper concentrate production in Mongolia is led by two major sources: Erdenet Mining Corporation (EMC), which produces approximately 500,000 tons per year, and Oyu Tolgoi, which produces around 214,000 tons annually. Meanwhile, Achit Ikht and Erdmin produce a combined total of 12,800 tons of copper cathode annually using the SX/EW (solvent extraction and electrowinning) method. These companies operate on a small scale, utilizing low-grade ore from the Erdenet mine.

Under the "14 Mega Projects" initiative, the proposed copper smelter is designed to process 300,000 tons of copper concentrate per year, while Erdenes Mongol has presented a plan for a 125,000-ton smelting facility. To reach a production capacity of 125,000 tons per year, the planned Erdenes Mongol copper smelter would need to utilize the entire annual copper concentrate output of EMC (approximately 500,000 tons). In contrast, one of the proposals under the 14 Mega Projects envisions building a smelter that would process only 300,000 tons of concentrate per year.

EMC plans to address sulfuric acid handling by benchmarking the case of Korea's LS MnM, which has successfully implemented an integrated system for sulfur dioxide recovery and sulfuric acid production. Copper sulfide ores (e.g., chalcopyrite) are smelted, during which sulfur dioxide (SO_2) gas is generated as a byproduct. Instead of emitting this gas into the atmosphere, it is captured, purified, oxidized, and absorbed to synthesize sulfuric acid. This process not only reduces environmental pollution but also converts waste emissions into a high-value industrial byproduct. The resulting sulfuric acid is then utilized across a range of downstream sectors, including phosphate fertilizer production, battery materials (e.g., lithium and nickel leaching), rare earth and non-ferrous metal refining, and high-purity acid for semiconductors. As of 2024, the market price of sulfuric acid in East Asia is approximately RMB 615 per ton.

Under the "14 Mega Projects" initiative, the proposed copper smelter is designed to process 300,000 tons of copper concentrate per year, while Erdenes Mongol has presented a plan for a 125,000-ton smelting facility. To reach a production capacity of 125,000 tons per year, the planned Erdenes Mongol copper smelter would need to utilize the entire annual copper concentrate output of EMC (approximately 500,000 tons). In contrast, one of the proposals under the 14 Mega Projects envisions building a smelter that would process only 300,000 tons of concentrate per year.

The construction of a 125,000-ton copper smelter is considered to be industrially feasible. This is primarily driven by the increasing global demand for copper, fueled by the rise of electric vehicles, renewable energy, and the AI revolution. There is strong export potential, particularly to China, Korea, and Japan, where demand for low-carbon copper is growing rapidly in response to ESG requirements and RE100 commitments. Moreover, copper is recognized globally as a critical material in the energy transition, playing a vital role in the development of electric vehicles, solar panels, and wind power systems.

Meanwhile, the construction of a 125,000-ton copper smelter in Mongolia is being considered as part of a broader strategy to enhance national value addition and promote domestic manufacturing. Two policy options are under review: Scenario 1, which focuses on producing 100% copper cathode, and Scenario 2, which proposes producing 50% copper cathode and using the remaining 50% for downstream wire and cable manufacturing. A comparison of the two scenarios is provided below.

Table 4.
Comparative Scenarios for Copper Smelting Plant Construction

	Scenario 1: 100% Copper Cathode Production	Scenario2: 50% Copper Cathode + Wire & Cable Manufacturing
Strategic Validity	• Highly effective for building • technical capacity, operational expertise, and core infrastructure. • By producing only copper cathodes, • Mongolia can generate export revenue quickly. • Optimal use of the Erdenet mine's concentrate output	• Value-added manufacturer specializing in high-value products, including wires and cables. • Power grids, smart cities, telecom networks, and renewable energy installations. • Regional export to Central Asia, Russia, and China.
Outcomes	• Infrastructure setup (power supply, sulfuric acid handling, logistics, waste heat recovery) • Early capital recovery and improved investment credibility	• Job creation and technical workforce development, Industrial diversification • Shift in Mongolia's position in the global value chain

Source: Compiled by the author based on information from ICSG (2024) and IFC (2020).

3.1.3. Methanol Production Capacity (Proposal) and Feasibility

In Mongolia, the methanol industry is still in its early stages, with no existing production facilities or established methanol-based chemical infrastructure. However, the Inner Mongolia Autonomous Region of China, which borders Mongolia, has seen rapid growth in methanol production, particularly in renewable-based green methanol. This trend could have a significant spillover effect on Mongolia. Therefore, methanol production is particularly well-suited for Mongolia, as its plentiful lignite resources can be locally processed to generate added value through downstream chemical conversion. Methanol plays a central role as an intermediate feedstock in the coal-to-chemicals (CTC) value chain. It serves as a platform chemical, enabling the conversion of coal into a wide array of downstream organic chemical products While syngas itself is not a high-value product, it is a crucial hub in the value chain, enabling the transition from raw coal to versatile platform chemicals such as methanol, and ultimately to olefins, which are essential raw materials for plastics, textiles, and synthetic rubber.

The methanol value chain follows a transformation process in which coal is converted into syngas, which is then processed into methanol and subsequently transformed into olefins (ethylene and propylene). Each stage represents substantial economic upgrading. For example:

- Coal: Approximately USD 30/ton
- Refined Syngas: Approximately USD 90/ton
- Methanol: Approximately USD 250/ton
- Olefins (Ethylene, Propylene): Over USD 1,200/ton

Among Mongolia's mineral resources, coal is the most abundant, but it is a low-value-added resource, priced at around USD 30 per ton. Just as China has developed its coal chemical industry to drive the growth of its heavy industry, Mongolia must also advance its coal chemical sector to foster manufacturing and promote economic development. Even though coal is a fossil fuel and its global supply is being curtailed, Mongolia has little choice but to pursue coal chemical industrialization.

The construction of a methanol plant represents the first critical step in developing Mongolia's chemical industry. Two development options are under consideration: Scenario 1 constructs a plant with an annual production capacity of 1 million tons of methanol. This would require building a 1.8 Mt syngas processing facility and a 1.0 Mt methanol synthesis plant. Scenario 2 constructs a plant that produces 0.5 million tons (Mt) of methanol and 0.5 Mt of syngas annually. This would require a 1.5 Mt syngas processing facility and a 0.5 Mt methanol synthesis plant.

Scenario 1 aims to maximize export volumes and industrial development, while Option 2 pursues a dual goal of exports and supplying heating gas to Ulaanbaatar. The two scenarios are summarized by comparison criteria in the following table (See Table 5).

Scenario 2, the planned construction of a dual-purpose plant —producing 500,000 tons of syngas for domestic heating and 500,000 tons of methanol for export— presents a balanced and strategic investment opportunity. The syngas component will significantly improve Ulaanbaatar's air quality by replacing raw coal with cleaner fuel in the city's heating system, enhancing public health and energy security. Meanwhile, methanol production targets export markets, particularly China, generating foreign currency and advancing Mongolia's shift toward value-added chemical industries. This dual-market approach diversifies risk, ensures steady revenue, and aligns with both national development goals and international climate agendas. It also promotes regional development through job creation and infrastructure improvements. Overall, the project contributes to Mongolia's energy transition, industrial growth, and economic resilience.

Table 5.
Comparative Scenario for Methanol Plant Construction

	Scenario 1: 1 Mtpa Methanol Plant	Scenario 2: 0.5 Mtpa Methanol + 0.5 Mtpa Syngas Plant
Objective	Maximize exports and develop downstream chemical industries	Balance exports with domestic energy supply (Ulaanbaatar heating)
Export Revenue Potential	High (100% methanol export)	Moderate (methanol export only, syngas used domestically)
Industrial Impact	Strong stimulus for chemical cluster formation	Limited industrial ripple effect
Energy Security	No direct benefit to the domestic heating supply	Supports energy security for Ulaanbaatar
CAPEX Efficiency	Higher investment, better long-term return through industrial integration	Moderate investment, quicker return through public utility supply
Strategic Positioning	Establishes Mongolia as a methanol exporter in global markets	Strengthens domestic energy self-sufficiency

Source: Compiled by the author based on information from Nisson *et al.* (2022) and OECD (2024).

3.1.4. Coke Production Capacity (Proposal) and Feasibility

Mongolia possesses over 37 billion tons of coal reserves, including significant quantities of high-quality coking coal suitable for metallurgical coke production. Rather than exporting raw coking coal, processing it into coke before export can increase its value by two to three times. Coke is a critical material in steel production, specifically used in blast furnaces (BF) to reduce iron ore into molten iron. China, as the world's largest steel producer, has a very high demand for coke. Although the global steel market is currently experiencing overcapacity, Mongolia's geographic proximity to China provides a logistics advantage, enabling it to position itself as a strategic supplier of coke with low transportation costs.

Coke is an essential raw material for the steel industry and is closely tied to steel mills. It is also used in the smelting of non-ferrous metals. In addition, by-products such as ammonia water, recovered during coke production, are utilized as inputs in the organic chemical industry and as fertilizers.

The coke value chain encompasses coal blending and preparation, carbonization (coking) in high-temperature ovens, coke production, and the recovery of by-products, including coal tar, ammonia water, and coal gas. Coke is positioned in the midstream of the value chain.

The coke plant in Mongolia is not only feasible—it is strategically essential to support the development of downstream steel and chemical industries. This project leverages

Mongolia's abundant coal resources, aligns with the country's national industrialization goals, and presents opportunities in both domestic and export markets. With proper integration, environmental management, and infrastructure development, it can yield high returns and support long-term economic resilience.

The construction of a coke plant is considered feasible given the current supply and demand conditions. Accordingly, two options are proposed: one with an annual capacity of 1 million tons and another with a capacity of 1.5 million tons. This recommendation is based on market value considerations:

- Clean coking coal typically sells for USD 100–150 per ton.
- Coke, as a processed product, commands a market price of USD 350–450 per ton.

This indicates that coke processing increases the product's market value by approximately 3.0 to 3.5 times. Such a significant value addition underscores the strategic advantage of domestic coke production over exporting raw coal.

Table 6.
Comparative Scenarios for Coke Plant Construction

	Scenario 1: 1 million tons per year capacity	Scenario 2: 1.5 million tons per year capacity
Advantages	• Moderate initial investment • Adaptable to uncertainty demand • Lower environmental and infrastructure burden in coal logistics • The plant can be expanded based on future market demand	• Economies of scale • Enhanced export competitiveness • Prepared for demand growth • Facilitates energy recovery and efficient utilization of by-product gases
Disadvantages	• Limited economies of scale • Higher transportation cost and weaker price advantage • Additional investment required if demand increases	• Higher initial capital burden: low utilization rate leads to high fixed cost burden • Stricter environmental compliance

Source: Compiled by the author based on IEA (2020), World Steel Association (2021), and OECD (2020).

Scenario 2, which increases the coke plant capacity to 1.5 million tons, takes into account not only the 3.3 million tons of coke that Erdenes Mongol plans to build in Tavan Tolgoi, but also the assessment that there is sufficient demand for coke in China and other countries. Despite a global oversupply of steel, Mongolia's domestic steel demand is expected to reach 1 million tons by the 2030s. Given that Mongolia possesses high-quality coking coal, the country is considered to have competitive export potential for at least 500,000 tons of coke.

3.2. Demand Expansion and Investment Attraction

3.2.1. Challenges to Demand Expansion

The development plan for the heavy and chemical industries pursued by Mongolia faces different market environments and structural challenges for each industrial sector.

The steel and coke industries face a common challenge: finding a breakthrough for survival amidst the massive currents of oversupply in a market that has already reached maturity, as well as the global transition to decarbonization. Mongolia's limited domestic market size makes it challenging to achieve the Minimum Efficient Scale (MES), which is crucial for cost competitiveness. Furthermore, direct competition with China, which accounts for over 50% of global production, is a significant burden for a new entrant like Mongolia. In addition, the coke industry is absolutely dependent on its customer, the steel industry, making independent market creation impossible. The spread of "green steel" technology, driven by carbon neutrality goals, structurally reduces long-term demand for coke, creating a risk that large-scale investments could become "stranded assets." Environmental trade barriers, such as the EU's Carbon Border Adjustment Mechanism (CBAM), pose a serious threat that could block future export routes for these two industries.

On the other hand, the copper industry has a very bright long-term demand forecast as a key material for the "green transition" era; however, the barriers to market entry in the initial stages of realizing projects are high. The biggest hurdle is how to finance the astronomical initial capital expenditure (CAPEX) of several billion dollars required for smelter construction. Securing advanced foreign technology and global partnerships throughout the entire process, from smelter design to operation, is also essential. Moreover, the high price volatility tied to international commodity markets and the need to meet ESG standards, which have become a prerequisite for attracting global investment, are key challenges that must be managed to ensure business stability.

Finally, for the coal chemical (methanol) industry, securing economic viability itself is the greatest challenge. A critical task is to overcome the fundamentally disadvantageous cost structure in competition with products from North America, which is based on cheap shale gas, and the Middle East, which is based on natural gas. Due to its process characteristics, which result in the highest carbon emissions, the coal chemical industry faces the greatest risk of becoming a 'stranded asset' under global decarbonization pressure. Furthermore, with the absence of a domestic downstream industry to consume its products, almost the entire output must be exported. However, securing

sales channels is also a major challenge, as global companies strengthening their ESG management are likely to exclude coal-based "grey methanol" from their supply chains.

One of the greatest challenges facing Mongolia is creating sustainable domestic demand. At the core of this challenge is the need to establish a virtuous cycle of supply and demand. This requires not only manufacturing products but also developing a domestic downstream demand base, which entails fostering a manufacturing sector and expanding infrastructure investment.

Above all, the most urgent task is to nurture a manufacturing sector that can consume the basic materials produced. Mongolia has a very weak downstream (demand) industrial base for making construction equipment or agricultural machinery from steel or producing electrical wires and components from copper. Therefore, alongside the construction of heavy and chemical industry plants, Mongolia faces the challenge of simultaneously fostering machinery, parts, and materials-related manufacturing companies that will consume these products.

Another significant challenge is the expansion of fixed asset investment to boost domestic demand. While Mongolia's ratio of gross fixed capital formation to GDP (GFCF/GDP) is not low, the absolute investment amount is insufficient (CEIC, 2025; World Bank, 2024). Domestic demand for heavy industry is driven by the downstream construction sector and infrastructure investment, including roads and railways. A major challenge, therefore, is how to expand this infrastructure investment and finance the required resources. It is necessary to expand the road and railway networks to transport products to domestic consumers efficiently and to foster an ecosystem of small and medium-sized enterprises (SMEs) that supply parts and services for plant maintenance. Without such related infrastructure, high domestic operating costs will lead to higher product prices, which the domestic market could reject.

Finally, a key challenge is how to secure price competitiveness to overcome the "diseconomies of scale." Mongolia's small domestic market fundamentally constrains the achievement of "economies of scale," which relies on large-scale production to reduce costs. This inevitably leads to higher production costs. However, Mongolia faces the challenge of lowering its prices to at least match those of Chinese products, which would serve as a viable import substitute, setting a difficult standard for price competitiveness.

3.2.2. Challenges to Logistics

- Landlocked Geography and Geopolitical Constraints: As a landlocked country surrounded by major powers like China and Russia, Mongolia faces various geopolitical limitations on its export logistics for heavy chemical industry products.

These include issues with logistics capacity, transportation routes, transportation speed, and increasing costs, which could hinder adherence to modern Just-In-Time (JIT) inventory and supply chain management (SCM) requirements.

- Infrastructure Limitations: Severe railway bottlenecks, insufficient transport capacity, and single-track rail lines hinder the large-scale transportation of heavy industry products. Bottlenecks are particularly problematic on the main export route towards Tianjin Port.
- Route Dependence and Vulnerability: Mongolia's export logistics are almost entirely dependent on the Zamiin-Uud-Tianjin Port route in China. This reliance makes it highly vulnerable to customs delays, logistics controls, and political or diplomatic variables imposed by China, leading to uncertainty in export schedules.
- High Logistics Costs: The lack of a dedicated berth in Tianjin Port results in lower priority, increased waiting times for cargo handling, and additional costs, negatively impacting export competitiveness. Due to the high weight-to-value ratio of heavy industry products, logistics costs comprise a substantial portion of total export costs.
- Geopolitical Risks: The ongoing strategic competition between the U.S., China, and Russia poses a constant risk of Mongolia becoming a casualty. China and Russia's "weaponization of resources" strategy could lead to border controls, posing a severe threat to Mongolian exports.

3.2.3. Challenges to Investment Attraction and Financing

- Underdeveloped Domestic Capital Market: Mongolia faces substantial difficulties in raising large-scale capital domestically due to an underdeveloped capital market, high market interest rates, and a low national credit rating.
- Limited Fiscal Capacity: Structural fiscal constraints and unstable foreign exchange procurement make it challenging for the government to secure sufficient self-financing for large-scale infrastructure and industrial complex development.
- Governance Issues: Weaknesses in governance, particularly concerning regulatory quality, political stability, control of corruption, and rule of law, undermine institutional trust for foreign investors. Issues like contract non-compliance, legal violations, delayed dispute resolution, and frequent regulatory changes increase investment risk.

3.3. Challenges to Domestic Financing and Workforce Supply in Mongolia

3.3.1. Financing Challenges for Heavy Industry in Mongolia

Mongolia faces systemic challenges in mobilizing capital for heavy industry due to structural weaknesses in its financial system, limited development of capital markets, and persistent policy uncertainty. The domestic banking sector, which serves as the primary source of finance, is fundamentally ill-equipped to support long-term, capital-intensive industrial investments. Banks rely heavily on short-term deposits, making them averse to offering long-term loans. As a result, most commercial loans are limited to 3 to 5 years, while heavy industry projects typically require financing over 7 to 10 years or more (Mongolian Bankers Association, 2024). The absence of long-term funding sources has become more pronounced since the Development Bank of Mongolia (DBM) curtailed lending after 2022. Without viable alternatives, industrial projects are either underfinanced or depend on costly and risky foreign loans.

Beyond the banking sector, Mongolia's capital market remains small and illiquid. The domestic stock exchange has a limited market capitalization and trading activity, and the bond market is virtually nonexistent, except for government securities. Institutional investors such as pension funds and insurance companies are either inactive or absent, leaving little room for private firms to raise substantial funds through IPOs or corporate bonds. Most heavy industry firms are compelled to rely on bank loans or secure foreign partners, as domestic capital markets are unable to absorb their large fundraising needs. Investor confidence in the market is also low, stemming from past scandals, such as failed privatization efforts and early bond defaults, which have discouraged both issuers and investors. Regulatory complexity and high compliance costs further disincentivize participation, even as recent reforms—like bank IPOs—have shown potential (World Bank, 2023).

Compounding financial constraints is the high level of uncertainty surrounding government policy. Mongolia's legal and regulatory environment has undergone frequent changes, particularly in laws related to mining and investment. For example, shifting definitions of strategic deposits and royalty structures have repeatedly altered the investment landscape. Moreover, changes in government administration often result in the reversal or delay of previously approved projects. The collapse of the Darkhan steel plant concession and delays in energy infrastructure projects highlight how political shifts can derail industrial initiatives. Investors and lenders respond to such unpredictability by demanding higher returns, insisting on government guarantees, or avoiding Mongolia altogether. Perceived issues with governance, including corruption scandals and a lack of transparency in public finance, exacerbate these concerns.

3.3.2. Challenges in Technological Capabilities and Workforce Supply

Mongolia's heavy industry is still in its early stages of development, with technological capabilities primarily focused on primary processing and limited downstream production. In the steel sector, the Darkhan Metallurgical Plant (DMP) operates below its capacity, and Mongolia still relies heavily on imports to meet over 70% of its steel needs. While the country possesses significant iron ore reserves, domestic steel production is limited to scrap-based mills and basic casting.

In copper metallurgy, Mongolia hosts major mining operations at Erdenet and Oyu Tolgoi, which produce large volumes of concentrate, but domestic smelting and refining capacity is nonexistent. All concentrate is exported, primarily to China. The government is now promoting copper smelter projects, including a planned smelter at Erdenet and a potential facility at Oyu Tolgoi. The most advanced example of domestic copper processing is the Steppe Metal Powder plant, which began operations in 2022 and produces high-purity copper alloy powders from scrap using foreign technology.

Mongolia's coal-based chemical industry is even less developed. Although the country has abundant coal reserves and some washing plants in operation, there are no coal-to-liquid or coal-to-chemical plants in existence.

Labor supply in these sectors presents both opportunities and constraints. In the steel industry, the current workforce is small, comprising approximately 2,000 to 2,500 Mongolian workers, but is expected to double with the construction of new complexes (Adiya *et al.*, 2021). While reliance on foreign labor has been limited so far, upcoming projects will require a surge in skilled tradespeople and engineers, particularly in metallurgy, welding, and equipment operation. Vocational and university graduates will be essential to filling these roles, but immediate shortages may require international recruitment and training.

In copper mining, labor demand is already substantial. Erdenet and Oyu Tolgoi employ tens of thousands of Mongolians, particularly during construction phases. As OT transitions to full production, long-term employment is expected to remain high, and future copper smelting facilities will require an entirely new cohort of specialists in metallurgy and chemical processing. However, Mongolia currently lacks sufficient expertise in these areas, and substantial investment in human resource development will be necessary.

The coal-chemical sector poses the greatest labor challenge. With no prior large-scale processing facilities, there is virtually no existing labor pool skilled in the chemical processing of coal. Future coal-to-chemicals plants may require hundreds to thousands of highly trained staff, including process engineers, operators, and technicians (U.S. Geological Survey, 2022). Developing this workforce from scratch will require a national effort in education, training, and targeted incentives. The government's current strategy recognizes this gap and emphasizes parallel investment in technology acquisition and workforce development.

4. Policy Proposal for the Development of Mongolia's Heavy Industry

4.1. Expansion and Development Strategy of Mongolia's Heavy Industry

The development of Mongolia's heavy industry should begin with the construction of anchor plants—a small number of strategically selected high-impact industrial facilities. Rather than attempting to build a nationwide industrial base from the outset, the focus should be on launching a few flagship projects such as a copper smelter, steel mill, or coal chemical plant. This approach follows the principle: "Start small, go deep, then expand." By concentrating efforts and resources on core plants, Mongolia can establish a strong industrial foundation, build institutional and technical capacity, and gradually scale up industrialization in a sustainable and manageable manner.

The second strategic focus is to emphasize value chain integration, not just production. Rather than attempting to manufacture every product independently, Mongolia should aim to control the flow of resources, energy, logistics, and trade across both upstream and downstream segments. The goal is to operate a selective and focused supply chain, spanning from resource extraction to smelting/refining, processing, intermediate materials, and potentially final products.

The third policy is to promote industrialization through foreign capital and off-take models. Given the limitations of domestic financing, Mongolia should actively attract investment by leveraging its natural resources through resource-backed financing and long-term supply agreements. For example, capital can be secured via long-term off-take contracts with buyers in countries such as Korea, China, and Japan. The core principle is: "Don't own everything—co-develop with markets in mind." By integrating financing and market access into project development from the outset, Mongolia can mitigate risk, mobilize capital, and enhance the economic viability of industrial projects.

The fourth strategic priority is the establishment of a legal framework for the development of heavy industry. To guide and sustain industrialization, Mongolia needs a comprehensive legislative structure that aligns with its national development goals and small-country strategy. This includes enacting an overarching Industrial Development Act tailored to Mongolia's unique scale and resource-based economy, as well as introducing sector-specific legislation, such as the Steel Industry Development Act, the Copper Industry Promotion Act, and the Chemical Industry Development Act. A strong legal foundation will provide clarity, attract investment, and enable long-term policy consistency for Mongolia's industrial transformation.

The fifth strategic direction is to establish a Trans-border Industry Belt with Inner

Mongolia. This approach leverages the comparative strengths of both sides to create a mutually beneficial industrial ecosystem. Key components include utilizing Chinese infrastructure, logistics networks, and investment capital to accelerate industrialization. This strategy allows Mongolia to industrialize more rapidly by integrating with a nearby, established manufacturing ecosystem.

The sixth strategy is to designate the low-carbon coal chemical industry as a strategic sector and to select methanol as its core product. Although coal has traditionally been regarded as a high-emission fossil resource, this approach does not involve burning coal but rather chemically converting it. This strategy positions Mongolia not as a target of investment avoidance in the era of carbon neutrality, but as a country that can strategically develop a coal-based, low-emission chemical industry. It enables Mongolia to utilize its coal resources while simultaneously attracting climate-aligned investment, thus turning a conventional liability into a sustainable industrial opportunity.

The seventh strategic priority is to pursue strategic critical minerals (CM) cooperation to expand Mongolia's heavy industry supply capabilities. By aligning with key industrial partners, Mongolia can secure long-term demand, financing, and technological collaboration. Key action areas include establishing long-term offtake agreements to ensure stable export markets and attract upstream investment, as well as undertaking joint exploration and refining projects with foreign partners to develop and process critical mineral resources.

The final strategic pillar is the implementation of an integrated water treatment system, designed to modernize Mongolia's industrial water supply infrastructure. Currently, many industrial facilities rely on individually operated water systems, which are inefficient and unsustainable in the long term. Key objectives include managing water resources as national strategic assets, ensuring equitable and sustainable use across industries, and transitioning from isolated, enterprise-level water supply systems to a centralized, integrated water treatment and distribution model. This system-level reform will support industrial growth while ensuring the long-term sustainability of Mongolia's scarce water resources.

4.2. Measures to Support Expansion of Heavy Industry Product Demand

4.2.1. Measures to Expand Domestic Demand in Mongolia

To expand Mongolia's domestic demand base, a mid- to long-term investment plan for fixed assets needs to be established and implemented.

Firstly, infrastructure-centric front-end industries must be intensively nurtured. At the national level, a mid-to-long-term master plan for social overhead capital (SOC), including railways, roads, power plants, and water and sewage systems, should be established to secure a stable domestic demand base for heavy industry products such as steel, plastics, and copper.

Secondly, manufacturing-focused Industrial Technology Parks (ITPs) should be fostered. Nurturing domestic machinery industries, such as construction equipment, mining machinery, and agricultural machinery, will directly increase demand for heavy industry products. Establishing industrial clusters centered on electrical equipment, water treatment, and piping component materials industries is essential. This promotes the growth of related industries through incentives for technology-based small and medium-sized manufacturing startups and activates the venture ecosystem.

Thirdly, it is necessary to mandate the preferential procurement of domestically produced heavy industry products in public procurement and to legislate a system for prioritizing the use of domestic materials and machinery in major public projects, thereby strengthening the domestic heavy industry production base.

4.2.2. Measures to Expand Overseas Exports

Mongolia requires a tailored strategic and policy approach to expand its overseas exports of heavy industry products, based on market segmentation strategies and enhanced cost and quality competitiveness. This is because the current market maintains a certain equilibrium in supply chain relationships, requiring new entrants to induce market disruptions and explore niche markets to create entry opportunities.

Firstly, export strategies and support are required based on product-customer segmentation. This involves designing and supplying customized high-value-added products, such as high-purity refined copper and high-grade methanol, for specific quality-demanding customers (e.g., Korea, Japan), while simultaneously supplying large quantities of cost-advantaged coke and semi-finished steel products to neighboring countries (China, Russia), thereby implementing differentiated export strategies that consider market characteristics.

Secondly, building an industrial base to strengthen export capabilities is necessary. This includes enhancing non-price competitiveness by acquiring international quality and standard certifications, responding to low-carbon product development, and ensuring delivery reliability. Furthermore, developing and supporting programs that strengthen the capabilities of export companies through strategic alliances (OEM, joint development) and contract-based export models is crucial.

Third, facilitating the financing of export companies is critical. This can be achieved by introducing trade finance schemes to support production funding for export

products, as well as export insurance and trade guarantee schemes to cover political, commercial, and credit risks.

Fourth, national-level market development measures are needed, including the introduction of a general trading company system. In particular, it is proposed to introduce Korea's large enterprise general trading company system in Mongolia, granting them functions such as market research and information gathering, buyer identification and supply chain linkage, sales agency, and investment attraction.

4.2.3. Logistics System Improvement Measures

If Mongolia's heavy chemical industrial complexes become fully operational, it is estimated that the current export logistics system and transportation capacity will be insufficient to deliver customer orders on time. Therefore, policy proposals are made to improve Mongolia's logistics system.

First, a large-scale Inland Port should be established around Zamiin-Uud and operated as an efficient inland logistics hub. This inland port should integrate container yards, transshipment facilities, storage warehouses, and customs clearance complexes to resolve customs delays and logistics bottlenecks occurring at the Mongolia-China border.

Second, the establishment of an exclusive berth for Mongolian heavy industry products within Tianjin Port should be actively pursued. A dedicated berth can reduce cargo handling waiting times and minimize port congestion, thereby cutting overall logistics costs and securing a stable shipping base for heavy cargo.

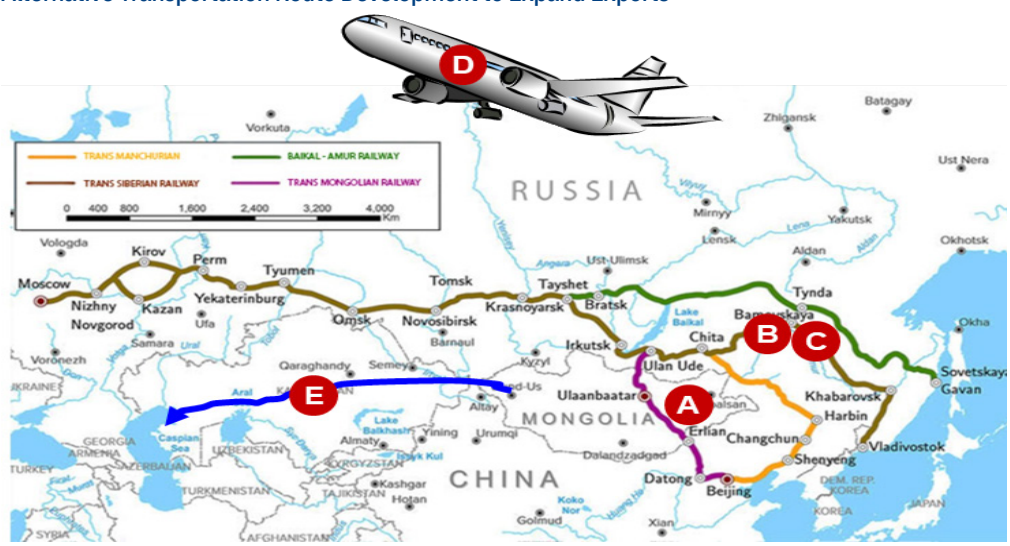
Third, despite the WTO Trade Facilitation Agreement, there is a need to conclude a separate bilateral agreement with China regarding the freedom of transit trade and the right to free use of Tianjin Port.

Fourth, the establishment of a multimodal transportation system extending from Zamiin-Uud to Tianjin Port (Plan A) should also be pursued in parallel. This involves designing an integrated transportation network linking rail, port, and sea transport, and utilizing a digital logistics platform to provide functions such as cargo tracking, real-time customs status checks, and cost simulations, thereby increasing the visibility and efficiency of the entire logistics process.

Fifth, to reduce excessive dependence on Tianjin Port and to respond to China's "weaponization of resources" and related border controls, alternative export transportation routes via Russia's Vladivostok Port (Plan B, C) should be additionally considered. From a long-term perspective, to strengthen connectivity with the West and further diversify geopolitical risks, the development of a Kazakhstan-Caspian Sea-Turkey transport route (Plan E) should be explored. Mongolia must prepare countermeasures against anticipated pressure from China when pursuing cooperation

with Western countries on rare earth supply chains. Mongolia should actively participate in multilateral cooperation frameworks, such as the Northern Economic Cooperation, to underscore its logistical importance and garner international support for securing resources to enhance its infrastructure.

Figure 1.
Alternative Transportation Route Development to Expand Exports



Source: Author.

4.2.4. Financing and Investment Attraction Strategies

4.2.4.1. Governance Innovation to Promote Foreign Direct Investment (FDI)

Proposals for governance innovation to promote foreign direct investment in Mongolia should focus on dramatically improving the predictability, efficiency, reliability, and transparency of the investment environment.

First, to enhance policy predictability, it is crucial to legally mandate a minimum 90-day advance notice period and a 60-day grace period for any amendments to major laws and regulations concerning investment and taxation. This measure would eliminate the risks associated with sudden policy changes often driven by political transitions, thereby guaranteeing investors a stable framework for long-term business planning.

Second, to ensure administrative efficiency, the government should introduce FDI-Service Level Agreements (FDI-SLA) that specify legal deadlines for administrative procedures like licensing. This should be coupled with a “Silent Approval” system,

where applications are automatically approved if not processed within the stipulated timeframe. Such reforms would fundamentally prevent administrative delays and opacity, building a truly investor-friendly business environment.

Third, to secure reliability in dispute resolution, official guidelines for the domestic enforcement of international arbitration awards must be established and published. These guidelines should clearly outline the procedures, required forms, and timelines to ensure swift and certain enforcement. This would bolster international confidence in Mongolia's judicial system and serve as a key mechanism for protecting investor assets.

Finally, to strengthen transactional transparency, it is necessary to mandate the registration and regular updating of beneficial ownership information in a central registry. Requiring the disclosure of this information for major transactions, such as public procurement, would significantly reduce the risks of corruption and money laundering, thereby fostering a transparent market that attracts reputable, compliance-oriented global corporations.

4.2.4.2. Asset-Based and Supply Chain-Linked Investment Attraction Model

Considering Mongolia's capital market and financial conditions, an asset-based investment attraction (ABF) strategy linked to global supply chains, leveraging the country's abundant mineral resources (including rare earth elements, copper, and coal), is deemed highly effective. Recent strategic competition between the U.S. and China has led countries worldwide to designate key strategic minerals essential for future industries and formulate supply chain stabilization strategies to secure critical mineral resources and raw materials. The Mongolian government needs to actively explore strategies for attracting asset-based investment that utilize mineral resources as leverage and effectively link them with the supply chain stabilization policies and funds of major developed countries, such as Korea and Japan.

Firstly, the asset-based investment attraction and global supply chain linkage model includes specific structures for asset-based investment attraction linked to Mongolia's strategic minerals and global supply chain companies, such as in-kind equity, offtake-linked equity, and the EPC+F model (EPC plus Finance).

Secondly, the supply chain partnership building model with large corporations and nations is a crucial aspect of this model. Mongolia should actively propose and pursue long-term supply contracts with major steel, machinery, and automotive parts companies in Korea, China, and Japan. Beyond simple supply contracts, this strategy also involves strategically linking Korea's advanced parts and materials industry with Mongolia's finished product manufacturing and export sectors.

4.2.4.3. International Development Financial Institution Linkage Investment Attraction Model

International Development Financial Institutions (MDBs) generally provide financial assistance, technical support, and policy advice to promote economic and social development in developing countries. Mongolia needs to appropriately utilize MDB funds for infrastructure development (including roads, power, and water resource development) and energy development in the process of developing four major Industrial Technology Parks (ITPs) for the heavy chemical industry sector. Furthermore, it will be necessary to actively utilize equity investment or loan support from the International Finance Corporation (IFC), which supports private sector development, along with guarantee support through the Multilateral Investment Guarantee Agency (MIGA). MDB support can be utilized for the proactive development of industrial technology park infrastructure, the promotion of production facility investment and technology transfer, and the securing of risk mitigation and guarantee functions.

4.2.4.4. Fiscal and Financial Support Measures

The Mongolian government faces significant limitations in securing sufficient funds for large-scale infrastructure and industrial complex development through its own finances due to structural fiscal constraints and unstable foreign currency procurement. To address this, a strategy is required to expand the domestic capital mobilization base and systematically scale up policy finance instruments.

Firstly, establishing an industrial bank as core infrastructure for policy finance is necessary. Referring to successful cases in developed countries, such as Korea's KDB, Japan's DBJ, and India's SIDBI, an institution that supplies long-term industrial funds based on government fiscal contributions and domestic bond issuance should be established. The expansion of long-term, low-interest policy loans through industrial banks, combined with government guarantees for private or foreign borrowing, can make a significant contribution to building a mid-to-long-term investment base.

Secondly, the industrial investment function of pension funds and sovereign wealth funds should be strengthened. While Mongolia's public funds are currently limited, it is necessary to strategically allocate a portion of public assets, such as the national pension, to the manufacturing and social overhead capital (SOC) sectors in the future.

Thirdly, measures are needed to encourage private financial institutions to participate in industrial projects. The government can promote the inflow of funds from private banks, insurance companies, and securities firms through guarantees, subsidies, and partial risk guarantee (PRG) schemes. Fiscal policy and tax incentives are also crucial for promoting industrial investment. The priority development of core infrastructure,

such as roads, railways, and power within heavy industrial complexes, is essential. The designation of Export Processing Zones (EPZs) can attract global investment, along with tax benefits. Furthermore, tax incentives such as corporate tax reductions, investment tax credits, and customs exemptions, along with the introduction of direct subsidy schemes including cash subsidies or interest rate subsidies, are necessary.

4.2.4.5. Large-Scale Investment Promotion Model

Mongolia is pursuing industrial structure advancement and high-value-added centered on five major heavy industry projects, including steel, copper, coal, chemicals, and rare earth refining. However, the capital demand of billions of dollars per project far exceeds the domestic fiscal and private capital capacity. Therefore, the Mongolian government needs to systematically establish a strategic investment promotion program targeting international financial institutions (MDBs), strategic investment countries, and global private investors, and build a large-scale investment mobilization model utilizing diversified financing techniques.

- **Mega-Project-Based Investment Attraction Roadmap:** The Mongolian government should compile a list of representative projects from the four core heavy industries (steel, copper smelting, coal chemicals, and rare earth refining) that are certified by the government as mega-projects. This includes systematizing investment proposals that detail project overviews, feasibility studies, profitability analyses, investment attraction structures, and geopolitical risk management plans. This list should be presented as strategic package proposals to major friendly nations' national banks and private investors, such as those in Korea, Japan, the UAE, and Singapore, as government-certified investment opportunities.
- **Global Investment IR Events and Strategic Partnership Building:** Beyond simple investment briefings, it is necessary to regularize IR roadshows and strategic partner matching programs focused on investment realization. Events should be held in major investment hubs such as Seoul, Tokyo, Singapore, Dubai, Frankfurt, and London. Additionally, institutionalized partnerships such as the Korea-Mongolia Financial Cooperation Committee or a 'Heavy Industry Joint Investment Council' should be established in parallel to strengthen trust.
- **Introduction of Blended Finance Model:** Mongolia, considering its credit rating (B-grade) and limited foreign currency liquidity, should adopt a risk-sharing blended finance structure where the main funding components are government fiscal contributions and land contributions, policy finance from friendly nations like Korea and Japan (KEXIM, JBIC), international development banks (MDBs, ADB, WB, etc.), and private investor funds.

4.3. Policy Recommendations for Domestic Financing and Workforce Supply

4.3.1. Domestic Financing Policy Recommendations for Mongolia's Heavy Industry Sector

To accelerate the development of Mongolia's heavy industry, a strategic and multifaceted reform of domestic financing systems is required. Central to this effort is the revitalization of policy-based financing, especially through the full rehabilitation of the Development Bank of Mongolia (DBM). The government's capital injection and governance reforms must be implemented to re-establish the DBM as a proactive lender for strategic industrial projects. Beyond DBM, the creation of specialized industrial development funds—possibly co-financed with private or foreign capital and operated with professional independence—could provide long-term financing and equity to large-scale ventures, drawing lessons from international models like Korea's KDB.

To address the short-term bias in Mongolia's financial system, mechanisms to mobilize long-term domestic capital are essential. This includes encouraging banks to issue long-term bonds, developing a local currency yield curve through government instruments, and establishing access to international credit lines from multilateral institutions such as the ADB or AIIB. Regulatory adjustments may also be required to incentivize long-term lending, including reduced reserve requirements or modified risk weightings for qualifying industrial loans. Establishing clear project finance standards where future project cash flows serve as collateral would open new pathways for both banks and non-bank financial institutions to support the industry with limited recourse models.

Given Mongolia's persistently high interest rate environment, targeted government support is needed to reduce the cost of borrowing for strategic industrial investments. Interest rate subsidies—similar to those used for SMEs or housing in recent years—could be reintroduced to offset high nominal rates. Complementary measures include tax incentives, such as enhanced deductibility of interest expenses or investment tax credits, as well as mechanisms to hedge foreign exchange risks for companies seeking external loans. Expanding the Credit Guarantee Fund to include large industrial loans and allowing a broader range of assets—such as movable equipment, future production rights, or offtake contracts—to be recognized as collateral would also ease credit access and reduce perceived risk for lenders.

In parallel, Mongolia must foster a deeper capital market to diversify financing beyond banks. This involves accelerating the development of institutional investors,

such as pension funds, life insurance companies, and private asset managers. By partially liberalizing the social security fund to allow investment in domestic corporate bonds and equities, and by encouraging voluntary pension schemes through tax incentives, Mongolia could inject long-term liquidity into the capital market. This would enable heavy industry firms to issue bonds and raise capital with confidence that buyers exist.

Improving the infrastructure and regulatory framework of the Mongolian Stock Exchange is another priority. Steps include modernizing listing requirements, offering specialized bond tiers for institutional investors, and promoting instruments like project bonds and industrial REITs. Educating companies on the benefits of market financing and enforcing strong corporate governance standards would increase market participation. State-owned enterprises can play a catalytic role by issuing IPOs or bonds, thereby enhancing market liquidity and serving as benchmarks for other issuers.

Ultimately, a stable and credible policy environment is crucial for encouraging investment and unlocking financing. Mongolia should adopt legal mechanisms, such as "grandfathering" provisions or an Investment Stability Act, to ensure predictability for long-term investors. Building cross-party consensus on national industrial priorities—through parliamentary resolutions or national councils—would reduce policy volatility across election cycles. Institutional capacity must also be enhanced through dedicated project implementation units and inter-agency coordination committees to streamline approvals and manage complex industrial projects efficiently. Clear environmental and community engagement practices will also be essential to avoid delays caused by social opposition.

In summary, Mongolia must pursue integrated reforms across financial infrastructure, capital markets, and policy governance to mobilize affordable, long-term capital for heavy industry. A combination of revitalized public finance institutions, private sector participation, investor protection, and institutional strengthening will be critical to transforming Mongolia's resource wealth into industrial capacity and long-term economic resilience.

4.3.2. Strategies to Supply the Workforce in Heavy Industries

During the heavy and chemical industry-driven 1970s–1980s, Korea faced severe labor shortages but overcame them through comprehensive, joint responses by the government and business—vocational training, expansion of higher education, overseas technical training, and the construction of regional living infrastructure. In particular, the simultaneous expansion of technical high schools, vocational training centers, corporate training centers, and engineering colleges enabled a significant increase in the labor

supply, laying the foundation for the successful establishment of heavy industry and Korea's high-growth era. Korea's experience offers an important lesson for countries pursuing heavy industry promotion today: industrial policy and human resources policy must be tightly integrated.

To address Mongolia's challenges, the government should first mandate technology transfer in contracts with foreign enterprises. Establishing a Technology Transfer Committee within the Ministry of Mining and Heavy Industry would facilitate the selection of appropriate foreign technologies and promote cooperation between foreign experts and local teams, including sending Mongolian engineers abroad for training and internships.

Second, vocational and higher education programs focused on heavy industry must expand significantly, establishing technical vocational education and training (TVET) institutions specialized in metallurgy, chemical processing, and mechanical engineering. Setting up industry-specific training centers and incentivizing corporate involvement in worker education are essential.

Third, industrial parks and project zones should offer a mobility package that reduces friction for workers and families. This includes commuter subsidies or dedicated shuttles, starter housing or dormitories near the plant, canteens, on-site clinics, and childcare facilities. Relocation stipends can help defray one-off costs for trainees taking jobs far from home, and a modest hardship allowance—time-limited and capped—can compensate for the remoteness of certified roles that are difficult to fill. Local services compacts between park operators and municipalities can co-finance upgrades to water, broadband, and schools, which in turn strengthen the local supplier base.

5. Socioeconomic Impact of Mongolia's Heavy Industry Development

5.1. Analysis Method

To quantify the impacts of GDP, we use input-output analysis, which captures the direct, indirect, and induced effects of heavy industry expansion. Mongolia's National Statistics Office publishes I-O tables (e.g., a detailed 55×55 sector table for recent years), and researchers have utilized tables from 2010 to 2018 for multiplier analysis.

These publicly available I-O tables allow modeling how an increase in heavy industry output reverberates through the economy. The approach can be summarized as follows:

- Direct Effects: The immediate increase in output and value-added from heavy industry itself. For instance, opening a new copper smelter or oil refinery directly adds to GDP through its production (the profits, wages, and taxes generated in that sector).
- Indirect Effects: The supply chain response as heavy industry demands input from other domestic sectors. A refinery will purchase services, electricity, construction materials, transportation, etc., thereby stimulating output and value-added in those supplier industries. These backward linkages can be substantial in the manufacturing and energy sectors, which Mongolia's input-output (I-O) analysis shows have strong connections to the rest of the economy.
- Induced Effects: The extra household spending generated by new incomes (wages, salaries) paid to workers in heavy industry and its supply chain. Workers spending their higher incomes on food, housing, retail, and services induces further output across the economy. This consumption effect is captured in "Type II" multipliers in an I-O model.

Leontief Input-Output Model

$$X = (I - A)-1Y$$

- X: Total Output
- I: Unit Matrix
- A: Industry Input Coefficient Matrix (Input Coefficient Matrix)
- Y: Final Demand (Consumption + Investment + Government Expenditure + Export)

Using the I-O framework, we can estimate the total impact on GDP. Conceptually, each ₮1 (or USD 1) of final demand for heavy-industry output leads to more than ₮1 in overall production after accounting for indirect and induced effects. For example, input-output multipliers indicate that "on average, a USD 1 increase in demand in a sector generates about USD 1.55 in total output", with the extra USD 0.55 coming from indirect production in supplier industries.

In Mongolia's context, the heavy industrial sector tends to have above-average multipliers because it sources inputs from many local sectors and creates well-paying jobs. Thus, an expansion of heavy industry has a multiplier effect on GDP: the initial output (direct value-added) plus additional value-added from linked sectors and consumer spending. Over a 5- to 10-year period, these effects accumulate – first through large-scale construction investments, then through sustained higher industrial output once the new plants are operational. We consider this medium-term horizon because heavy industry projects often have multi-year construction phases and ramp-up periods. By years 5 to 10, the full GDP contribution (direct and spillover) of today's heavy industry investments will be realized, elevating Mongolia's growth trajectory beyond the baseline.

5.2. Impact Analysis of Increased Investment in Heavy Industry

The Government of Mongolia has launched an ambitious Action Program (2024–2028) that includes 14 Mega Projects designed to accelerate economic growth. These projects span critical sectors ranging from transportation and energy infrastructure to industrial processing, with the dual aim of diversifying the economy and boosting export capacity. Notably, five projects are classified as social overhead capital (SOC) or infrastructure-related (e.g., cross-border rail) and are excluded from this analysis, as per the instructions. The focus here is on the remaining ten Mega-Projects, which are largely industrial and energy projects.

The combined investment (on the order of USD 20 billion to USD 30 billion over several years) will have a multiplier likely 1.5 to 2.0 or more (exact multipliers depend on import leakages). A rough calculation suggests USD 1 of project spending could generate USD 1.5 to USD 1.8 in total output. For the full program, this implies an additional output of approximately USD 30 billion to USD 50 billion, spread across construction, manufacturing, utilities, and services, during implementation. Sectors such as cement, steel, transportation, trade, and business services will benefit indirectly from the project expenditures (Dagys *et al.*, 2025).

Employment effects encompass both direct jobs (e.g., workers building a power plant) and indirect jobs (e.g., jobs in industries that supply cement, transportation, and maintenance, among others). Mega projects differ in labor intensity: the construction of roads, pipelines, and buildings requires large local workforces, while facilities such as oil refineries or power plants, once operational, are more automated (fewer ongoing jobs but higher-skilled work). Overall, the ten projects are expected to generate thousands of jobs during the construction phase and support additional permanent employment once completed.

Increased investment in heavy industry tends to have multiplier and spillover effects that extend across the economy, boosting the output of other industries, creating jobs indirectly, enabling new business opportunities, and strengthening the economic fabric through improved infrastructure and the diffusion of technology.

5.3. Socioeconomic Impact of Heavy Industry Development in Mongolia

The development of heavy industry in Mongolia promises significant socioeconomic benefits, including improved productivity, international competitiveness, and higher wages through value-added exports such as refined copper, steel, and petroleum products, thus reducing reliance on raw commodities and import dependence. It supports economic diversification and aligns with long-term goals such as Vision 2050 and the New Revival Policy. Heavy industry also generates high-paying, skilled jobs, directly and indirectly boosting local economies, incomes, and infrastructure. Notably, this benefits rural and provincial areas, reduces migration pressures, and potentially alleviates poverty through fiscal redistribution into social sectors (Dagys *et al.*, 2019).

However, Mongolia must manage risks such as commodity market volatility by establishing fiscal stabilization measures and diversifying industrial outputs. Policies must also mitigate the effects of Dutch disease, preventing currency appreciation from negatively impacting other sectors. The environmental and social impacts of heavy industry—including pollution, resource stress, and community disruption—require strict regulation, modern technologies, and inclusive growth measures, such as vocational training and local SME support, to ensure broad-based benefits. Finally, infrastructure bottlenecks and execution risks necessitate strong coordination, transparent regulations, and sustained investment strategies to deliver timely and efficient industrial growth.

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