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MARKETING AND TRADING:
POSSIBILITIES OF ESTABLISHING A MINERAL COMMODITY EXCHANGE IN MONGOLIA

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Contents

Abstract

According to the previous “Marketing and Trading in the Mining Sector” study (ERI, 2018), one of the problems associated with the export of mineral commodities is the fact that there are neither commodity trading platforms nor any organized mineral commodity exchanges in Mongolia. Mineral commodity exchanges fulfill important marketing, financial and risk management duties. Trading commodities on the exchange have many advantages such as producers’ share of the end market price increases, transparency in sales contracts improves, state budget revenue increases etc., According to a study conducted by the Mongolian Exporters’ Association (2013), it is possible to establish a mineral commodity exchange in the country. However, for a mineral commodity exchange to be viable, Mongolia must heavily invest in warehouses, logistics centers and transportation infrastructure. Moreover, it should be considered that Mongolia’s current level of financial services development and its macroeconomic environment is lacking when compared to regional countries. In addition to ensuring the availability of factors such as trading programs, networks and the technical infrastructure needed to operate an exchange, numerous regulations, guidelines and legislations have to be either amended or ratified to oversee the operations of a mineral commodity exchange. However, Mongolia’s legal environment and government policy on the development of a mineral commodity exchange is unclear and unstable. A new exchange would require a qualified workforce in addition to well-informed buyers and suppliers. As these necessities all require ample investments, detailed feasibility studies, and the decision of whether this investment is financed by the government. Finally, it should be considered and compared with other viable options such as expanding the current operations of the previously established Mongolian (Agricultural) Commodity Exchange to include mineral commodity trading and making use of already established foreign mineral commodity exchanges.

Key words: commodity trading, mineral commodities exchange, Mongolia

JEL classification: G23, G32, O13, Q02, Q39

1. Introduction

In the previous Marketing and Trading (ERI, 2018) study, the burdens and problems associated with mineral commodities at every stage of the trading process were identified and studied in detail. According to the experts interviewed, finding and getting into contact with buyers was not an issue, especially during periods of high commodity prices. However, depending on the specific characteristics of the commodities and their market development, coal exporters faced more challenges in crossing the border and setting prices with buyers in comparison to other mineral commodities. In particular, there are neither commodity trading platforms nor any organized mineral commodity exchanges. As a result, mining companies operating at the same basin and extracting the same commodities set different contract prices for direct sales. This means that producers are less informed about their relative share of the end market price and cannot collectively bargain with buyers for higher prices. As such, intermediaries may capture a disproportionate share of the profits from mining activities. From a tax perspective, it is difficult to use actual selling prices when imposing taxes because there is still a lack of transparency of sales contracts in the mining sector.

In such cases, establishing a commodity exchange, trading commodities on the exchange and using exchange prices could be an effective solution for these issues. Trading mineral commodities through a commodity exchange has a long history, for instance the Chicago Board of Trade was first established in 1864 and the London Metal Exchange began operations in 1877. The concept of mineral commodity exchanges first developed in industrialized countries, eventually settling into the structure it has today while in industrializing countries, the use of mineral commodity exchanges grew rapidly after 1990. This was mainly due to the market liberalization of industrializing countries during this time and the development of new technologies. Some successful examples of such mineral commodity exchanges include three Chinese and the three Indian exchanges established in the 1990s and the early 2000s that are now some among the world's largest commodity exchanges. In China's case, while many commodity exchanges that traded a wide variety of products and allowed for electronic trading were established in the early 1990s modelled after the exchanges in Western developed countries, many eventually failed or merged together. As a result, in 2000, only 3 large exchanges that traded only 12 different products remained (Peck, 2001). Meanwhile, commodity exchanges in Latin America are growing rapidly while exchanges in Eastern Europe, the former Soviet Union and Central Asia have started to developed since the region's transition to a market economy. In contrast, African commodity exchanges have fared the least successfully (UNCTAD, 2009).

Mineral commodity exchanges fulfill important marketing, financial and risk management duties. When mineral commodity exchanges were first developing, they were mainly focused on increasing the overall efficiency of the mining sector by organizing auctions and connecting the demand and supply sides of the sector. Currently however, as mineral commodity exchanges continue to develop, they are geared towards increasing the overall transparency of the market by disseminating important information from the supply side through indicators such as quality and grade certificates to potential buyers. Additionally, mineral commodity exchanges

must ensure that the buying and selling side fulfill their contractual obligations after establishing an agreement. At the higher stages of development, mineral commodity exchanges can act as platforms to shift mineral commodity price risks through the use of derivative securities.

As of 2011, while over 200 commodity exchanges operate in Eastern Europe and in Central Asia, their level of development and their contribution to the economy remains low (Belozertsev, Rutten, & Hollinger, 2011). Following the collapse of the planned socialist economic systems in this region, hundreds of commodity exchanges were established in Eastern Europe and Central Asia. However, these exchanges were mainly focused on organizing auctions and many quickly went bankrupt. The government also subsidized some commodity exchanges such that they could continue stable operations. However, many of the commodity exchanges that remained do not go beyond utilizing electronic price boards and take part in spot trading. Examples include commodity exchanges from Armenia, Georgia, Kazakhstan, Kyrgyzstan, Moldovia, Russia, Poland, Romania, Tajikistan and Ukraine. However, these countries have made attempts to further develop their commodity exchanges. For instance, with assistance from the Asia Development and the Canadian International Development Agency, Tajikistan has made plans to develop its export related commodity exchange. These developments include offering brokerage services, organizing auctions, especially for cotton, a major export of Tajikistan, and developing the cotton futures market. Moreover, in order to bring in small-scale farmers and foreign buyers, the government has planned to improve the legal environment to include provisions to regulate the financing of warehouse receipts.

However, some commodity exchanges have been more developed than others. For instance, in Macedonia, their agricultural commodity exchange has become the largest auction and the main market for agricultural commodities in the country. In Turkmenistan, in addition to organizing domestic auctions, the state owned commodity exchange also organizes auctions with foreign companies as buyers. In other Eastern European countries, new products and services such as forward trading and the trading of carbon dioxide emission permits have also become available.

In Mongolia, the Mongolian Exporters' Association was commissioned by the Ministry of Economic Development to research whether it was possible to establish a mineral commodity exchange. The detailed 293-page report looked into not only the international examples of commodity exchanges and the trading instruments they used but also factors such as Mongolia's current mineral reserves and future mining prospects, the commodities to be traded, transportation and storage options when offering policy recommendations on the prospect of establishing a mineral commodity exchange in Mongolia (Mongolian Export Association, 2013). In terms of establishing the commodity exchange, the association suggested that the Law on the Mineral Commodity Exchange and its related operational and trading regulations be ratified together. Other recommendations include conducting a feasibility study, studying international best practices on commodity exchanges, disseminating information on the benefits of having a mineral commodity exchange, and conducting training and capacity building activities for mining companies and brokers to participate in trading activities at the exchange.

Following this, in 2014, the Parliament of Mongolia included a provision on the establishing a mineral commodity exchange using private investment and creating and ratifying all the necessary regulations and laws needed in the State Minerals Policy 2014-2025. In 2015, while a draft bill of the Law on the Mineral Commodity Exchange was introduced to the Government of Mongolia, for undisclosed reasons the bill was not submitted to Parliament for ratification.

In the meantime, the Mongolian Agricultural Commodity Exchange was established in 2013 for trading cashmere, wool, live cattle and wheat. Its operations are regulated by the Law on Agricultural Products and Raw Materials Exchange. It is a 100 percent state-owned company and its regulating bodies are the Financial Regulatory Committee and the Ministry of Food, Agriculture and Light Industry of Mongolia. The experiences of the operations of the exchange hopefully provide important lessons to learn from when establishing a mining commodity exchange.

In this study, the research team updates the assessment of the conditions necessary for establishing a mineral commodity exchange as previous done by the Mongolian Exporters' Association (2013). The study is based on literature reviews and meetings with stakeholders including Ministry of Mining and Heavy Industry, Financial Regulatory Committee and Mongolian (Agricultural) Commodity Exchange.

2. Current State Of Mineral Products Sales In Mongolia

The mining sector's contribution to the Mongolian economy has been steadily increasing. In 2018, the economic contribution of mining sector reached a historical high, constituting 23.5% of GDP, 32.9% of total budget revenue and 86.6% of total export (NSO, 2019). In recent years, within the mining sector, coal mining has been expanding rapidly. The main exporting commodities include coal, copper concentrate, gold, iron ore, zinc and fluorspar. Mongolia also ranks high in terms of reserves and according to the Mineral Resources Reserve Fund, as of 2017, there is 27.9 billion tons of coal, 16.8 million tons of fluorspar, and in terms of pure metal, 350 million tons of iron, 53.6 million tons of copper and 1.2 million tons of zinc in reserves (EITI Mongolia, 2018).

As indicated in the base study conducted by the Economic Research Institute (ERI, 2018), each commodity has its own market where pricing and selling mechanisms are different. For instance, gold is mostly sold by the Bank of Mongolia to the international market. For copper there are two key sellers, Erdenet and Oyu Tolgoi. Both companies sell their products to China. Similarly, iron ore is directly sold to Chinese buyers and the main producers are private companies. While a fraction of the price of coking coal is determined by a contract created between producers and Chinese buyers another fraction of the coal mined is auctioned off. Additionally, some coking coal producers sell directly from their open pit to Chinese buyers (ERI, 2018).

In this brief update study, we take a closer look at the possibility of establishing a mineral commodity exchange. However, it is important to mention that as the sales contracts of Mongolian mining companies are not published and information on the provisions of the contracts are not widely available, limited data remains a challenge when researching this topic.

2.1. Coal Trading

In 2018, Mongolia exported 36.3 million tons of coal, valued at USD 2.8 billion or 40% of total exports. These results reflect a boost in coking coal demand and prices driven by an increase in China's crude steel production compelled by the country's solid economic growth. Coking coal is a key input of steel and according to the Shanxi Fenwei Energy Information Services, Mongolia ranks as the second largest coking coal supplier to China, only behind Australia, constituting 42.7% or 27.7 million tons of China's total coking coal imports in 2018 (MMC, 2018).

TABLE 1. COAL EXPORT

	2015	2016	2017	2018
Export Value, USD million	555.9	973.1	2,267.6	2,802.5
Export Volume, million ton	14.5	25.8	33.4	36.7
Of which				
Washed coking coal	1.5	2.2	4.5	5.4
Raw coking coal	5.6	10.1	11.5	14.4
Weak coking coal	5.6	8.0	8.6	11.7
Thermal coal	1.9	5.9	10.6	5.1

Source: NSO, MRPAM

Mongolia exports coal from the Tavan Tolgoi, Nariinsukhait and Khushuut coal basins, with Tavan Tolgoi being the largest. According to the Norwest Corporation, the total JORC coal reserves of the Tavan Tolgoi coal basin is estimated to be around 8 billion tons. In 2018, 53.6% of total coal exports, including coking and thermal coal, was from the Tavan Tolgoi coal basin, which contains higher grade coal in comparison to other basins in Mongolia. Currently, the Mongolian Mining Corporation (MMC) LLC, Erdenes Tavan Tolgoi (ETT) JSC, and Tavan Tolgoi JSC are extracting, processing and exporting coal from the basin. Sales information of the three mines are shown in the following table.

TABLE 2. SALES STATISTICS OF COAL MINES AT TAVAN TOLGOI MINE SITE, 2018

	Description	Volume (mln.ton)	Value	Average price, per ton
Mongolian Mining Corporation (Washed coking and thermal coal)	Exported to Chinese end-user	4.7	USD 591 mln	USD 170.1
	Exported through Gantsmod port			USD 135.6
Erdenes Tavan Tolgoi JSC	Payment for mining services	1.7	USD 803.5 mln*	-
	Exported through auction	7.9		USD 68.1-72.2
	Exported directly to Chalco	3.47		USD 59.3-61.0
Tavan Tolgoi JSC	Export	1.70	USD 91.4 mln*	USD 53.8*
	Domestic Market	0.14	USD 0.1 mln*	USD 6.1*

* - Average exchange rate in 2018 was USD 1 = MNT 2 472.67

Source: Annual Reports of Tavan Tolgoi JSC, Erdenes Tavan Tolgoi JSC, and MMC

According to ETT, when taking into account transportation, customs and other tax costs, this price is in line with world trading prices (compared to the prices traded at Chinese sea ports) (ERI, 2018). MMC exported to Chinese final consumers first hand at an average price of USD 170.1 per ton and at the Gantsmod port where it sells washed coal at an average price of USD 135.6 per ton. While, in 2018, Tavan Tolgoi JSC exported coal at 133 thousand MNT (~USD 54) per ton.

The second major coal basin of Mongolia is the Nariin Sukhait basin. Coal extracted from the Nariin Sukhait basin is usually of a lower grade than the coal from the Tavan Tolgoi coal basin. For instance, only a third of the Nariin Sukhait mine consists

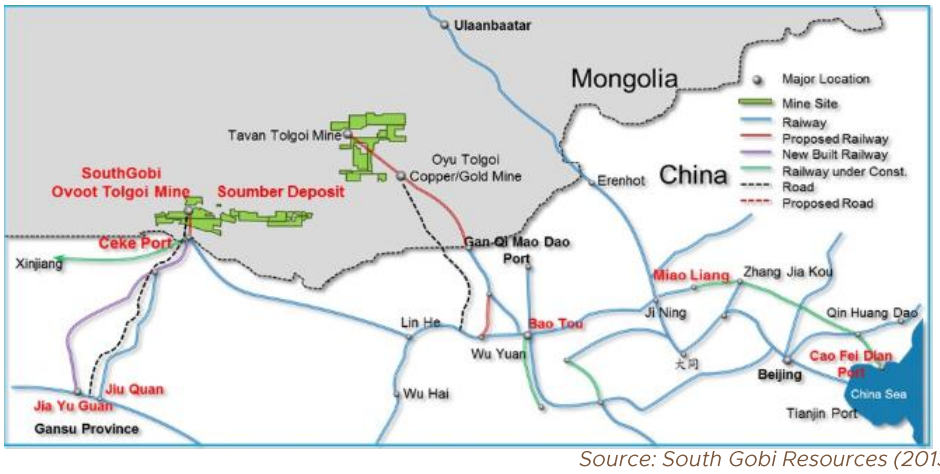
of coking coal, lowering the overall grade. However, it has the advantage of being geographically closer to the Chinese market. In particular, the Nariin Sukhait mine site is located about 40 to 50 km from the border while the Tavan Tolgoi mine site is located 270 km away from the border. Currently, there are 6 companies operating at the Nariin Sukhait mine site: Mongolyn Alt (MAK), Southgobi Sands (SGS), Usukh Zoos, Chinhua MAK Nariinsukhait, Terra Energy and Jawkhlant Ord (Mongolian Mining Journal, 2019). Biggest mines consist of MAK, SGS and Usukh Zoos. According to the Shiveekhuren port statistics, 14.1 million tons of coal was exported through the border-crossing in 2018. Of this, MAK singlehandedly exported 7.2 million tons of coal.

The Khushuut mine is located in the Western region of the country and is estimated to have a reserve of about 171 million tons of coal. MonEnCo LLC is the license owner and the operator at the Khushuut mine. According to the Customs Office at Bulgan, Khovd province, the mine exported 694.2 thousand tons of coal to China in 2018.

Overall, the trading patterns of coal exporting companies operating at Tavan Tolgoi differ significantly. For instance, MMC processes coal and sells the washed coal to the end-users directly while ETT sells the bulk of its coal at the mine through auctions. Additionally, the prices of coal exports differ greatly depending on whether or not the product is washed, its delivery point, and on the contracts made between the mining companies and end-users. As for other mines, the coal quality is not up to par with coal extracted from Tavan Tolgoi. However, companies try to offset their weakness by investing in processing coal. Currently, information about trading contracts, prices, buyers and any other performance indicators are not available to the public. This increases the difficulty of identifying trading related issues.

One of the most critical issues of marketing and trading of coal in Mongolia is the transportation and logistics of the sector. The border point bottleneck is a critical limitation of a potential increase in coal exports. Border-crossing process at the Shivee Khuren port was slowed down due to the Chinese requirement that coal unloading be done in enclosed areas under China's bid to be more environmentally friendly. In contrast, the slowdown of border-crossing clearance at Gashuun sukhait is caused by stringent Chinese checks and smuggling has played a crucial role in increasing the time needed to check cargo at the border. In addition to stringent Chinese checks, the inadequate capacity of Mongolian customs also play a part in limiting coal exports. However, the Government of Mongolia (GoM) has planned to enhance customs' capacities in 2019 and 2020. In particular, the GoM aims to double the export capacity of customs at Gashuun Sukhait and quadruple the total area of paved road between Tavan Tolgoi and Gashuun Sukhait in 2020.

FIGURE 1. MAJOR COAL EXPORTING MINES, AND EXISTING AND PROPOSED RAILWAYS



Source: South Gobi Resources (2013)

Mongolian coal exports are completely reliant on paved roads and coal exporting companies can either use their own trucks to transport coal for export or outsource contracted transportation companies. The poor quality of paved roads in Mongolia also contribute to the limitations on coal exports. The GoM has been discussing plans to construct a railroad to boost coal exports since 2012. However, due to policy uncertainties and financial issues, the construction of the railroad from Tavan Tolgoi to Gashuun Sukhait to be delayed. Fortunately, construction started up again in September 2019 and is calculated to last 28 months with expected operations in 2021. The railway can export 30 million tons of coking and thermal coal per annum, double the current amount of coal being exported from the Tavan Tolgoi basin. According to the ADB (2018), rail transportation would be the optimal mode of transportation for Mongolia's mineral commodities as railways have a 65% lower fuel cost and a 58% less carbon dioxide emissions compared to road transportation.

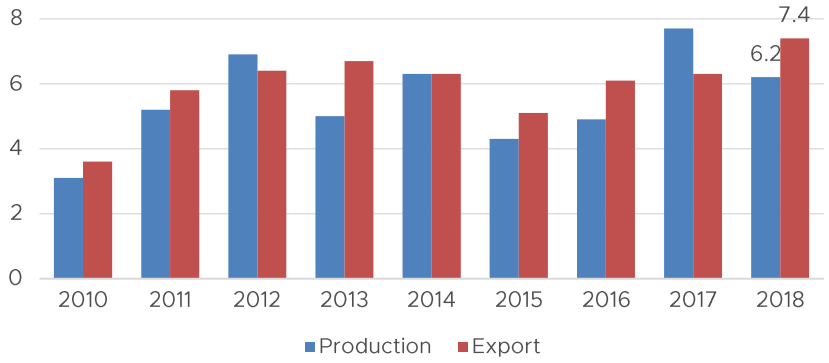
2.2. Iron Ore Trading

In 2018, Mongolia produced 6.2 million tons of iron ore and exported 7.4 million tons of iron ore valued at USD 342.2 million. According to the MRPAM, 13 mines currently extract and export iron ore. Bold Tumur Eruu Gol (exported 3 million tons of iron ore), Altain Khuder (exported 1.6 million ton of iron ore) and Darkhan Metallurgical Industry (exported 1 million ton of iron ore) are the biggest exporters. Historically, iron ore export levels reached a record high in 2013, constituting 15% of total export. However, due to falling world market prices, export volumes have steadily decreased since then. In 2018, iron ore export constituted 5% of total export.

Additionally, the average border price of iron ore for export equaled USD 46 per ton, significantly lower than the world price of USD 70 per ton. As indicated in the base study conducted by the Economic Research Institute, the lack of transparency of sales contracts, customers and actual selling prices result in numerous challenges (ERI, 2018).

In the near future, iron ore production is expected to increase modestly as two new mining companies are expected to start operations in 2019. According to their feasibility studies, the mining companies are planning to invest MNT 18.4 billion and MNT 9.3 billion respectively to the development of the new mines (Bloomberg TV Mongolia, 2019).

FIGURE 2. MONGOLIAN IRON ORE PRODUCTION AND EXPORT, MILLION TON



Source: Mongolian Customs Office

The end-user of iron ore mining is the steel making industry. In Mongolia, there are 5 registered steel plants including the Darkhan Metallurgical Plant. All of them are small in terms of capacity and struggle to compete with Chinese and Russian quality and prices. The domestic market for steel is also limited and developing the domestic steel producing industry is not considered as a viable strategy for Mongolia (Wuperman, Zorig, Erdenebulgan, & EPCRC, 2015). Therefore, the main market for iron ore miners is Northern China, not the domestic market. According to a study on the iron ore market (ERI, 2017), iron and steel producers in Norther China, such as Baosteel Group Bayi Iron and Steel Co. Ltd., Baotou Iron and Steel Group, and Shougang Mining Investments Co., are the main consumers of Mongolian iron ore. Baotou Iron and Steel Group is the largest state-owned steel enterprise in Baotou, Inner Mongolia, China.

The bulk of iron ore in Mongolia is extracted from Selenge province and is transported through the Altanbulag- Zamiin-Uud railway. More than 80% of iron ore and its concentrate is cleared through the Zamiin-Uud border crossing point. In contrast, Tayan Nuur iron ore at Govi-Altai provice is transported by dirt road through the Burgastai border-crossing port. Most iron ore mines in Mongolia are small and located far from the main railroad. Due to the difference between the railway gauges used in Mongolia and China, when transporting between the two, the entire cargo needs to be transloaded from the Mongolian trains to the Chinese trains. According to the Corridor Performance Measurement and Monitoring Report (CAREC, 2016), the biggest reason for export delay at the Zamiin-Uud border crossing was the time needed to transload cargo at the gauge change points. In 2015, the process took an average of 33.6 hours.

As indicated in the base study (ERI, 2018), the transportation cost of iron ore is much higher due to the steep tariff imposed by Ulaanbaatar Railways. The average transportation cost was estimated to be around USD 17 per ton, almost equal to 40% of the border price (USD 46 per ton in 2018). A possible solution to reduce costs and increase the capacity of iron ore transportation is to build an alternative railroad between Zuunbayan and Khangi. If the railroad is built, iron ore can be transported through the Khangi border crossing point, which has the advantage of being located much closer to the Baotou Metallurgic Company, the biggest consumer of Mongolian iron ore. However, construction of the railroad has not begun.

2.3. Other Minerals Trading

In comparison to coal and iron ore, the marketing and trading of other key mineral commodities such as copper concentrate, crude oil, zinc concentrate and fluorspar ore and concentrate face fewer challenges overall (ERI, 2018). The export volumes and sales values of these mineral commodities are detailed in the table below.

TABLE 3. OTHER COMMODITY EXPORTS BY VOLUME AND SALES VALUE

	Commodities	2015	2016	2017	2018
Volume, mln ton	Copper concentrate	1.5	1.6	1.4	1.4
	Crude oil, mln barrel	8.1	8.0	7.5	6.2
	Fluorspar ore and concentrate	0.3	0.2	0.3	0.6
	Zinc concentrate	0.08	0.13	0.12	0.12
Sales value, mln USD	Copper concentrate	2 280.1	1 607.8	1 613.1	2 012.2
	Crude oil	65.5	59.0	84.2	189.9
	Fluorspar ore and concentrate	101.7	145.4	180.8	197.8
	Zinc concentrate	387.2	337.2	374.1	392.0

Source: NSO

Copper concentrate is extracted from the Oyu Tolgoi and Erdenet mines and in 2018, 99.4% of the copper concentrate mined was exported to China while the remainder was exported to South Korea and Japan. Mining companies don't sell extracted copper concentrated directly to final users, nor do they trade on any foreign mineral commodity exchange. Instead, they opt to create contracts with traders.

One of Mongolia's major producers of copper concentrate is Erdenet Mining Corporation SOE (EMC). While the EMC is a state owned company[1], detailed official information on the company's sales activities are not publically available. Between

[1]51% of this company (and of Mongolrostsvetmet, a fluorspar mining company) was owned by the Mongolian government while 49% was owned by the Russian Rostech. In 2016, the Mongolian Copper Corporation LLC purchased the minority shares from Rostech. However, by Parliament Resolution #23 in 2017, the Government of Mongolia decreed state ownership over 49% of both EMC and Mongolrostsvetmet. This remains a highly contested political issue that is currently being disputed in court.

2015 and 2017, EMC employed the use of 13 international trading companies to sell its copper concentrate (Mongolian National Audit Office, 2018). According to an interview with D. Galsandorj, president of the Mongolian Exporters' Association, "When selling copper concentrate, EMC creates 3-year contracts with traders and adjusts prices annually. Copper concentrate is then exported across the Mongolian-Chinese border through the Zamiin-Uud. According to the contracts, 5 to 7 days before shipping the copper concentrate, 95% of the sales revenue of the product is paid in advance and placed in a Mongolian bank account. After the payment is made, shipping begins. Then, the quality of the product is analyzed by foreign concentrate and purifying plant laboratories, and the results are compared to the results from the EMC's laboratories. After this, the remaining 5% payment is made within 45 to 60 days" (D.Galsandorj, 2014).

However, some unfavorable provisions are made in the contracts created with trading companies. For instance, in another interview with D. Tserenbadam, head of EMC's legal department, mentioned that when calculating the sales price of copper concentration, the lowest 3-month price on the world market is used. Another unfavorable provision concerns metal deductions, which in 2018 was set at 1.1%. He also mentioned that EMC sets a blanket treatment change and refining charge price TC/RC that reduces overall revenue. In 2018, this cost was USD 103.5 per ton (D.Tserenbadam, 2019). This set TC/RC, which gets deducted from the price of copper concentrate when calculating revenue, was found to be 10.5-35% higher than the costs published by refineries in the Chinese market. Thus, how the cost it set is a major source of lost revenue for EMC and considering EMC's status as an SOE, maybe due to political influences (Mongolian National Audit Office, 2018).

Oyu Tolgoi is another major company of which the government of Mongolia owns 34% and Turquoise Hill Resources (of which more than 50% is owned by Rio Tinto) owns the remaining 66%. As with other mining companies operating in Mongolia, Oyu Tolgoi does not publish any official data concerning its sales contracts and agreements. As mentioned in the company's sales policy, "its sales revenue is recognized at the point in time when the product is delivered as specified by the customer, which is typically upon loading of the product to the customer's truck, train or vessel… In order to determine the transaction price, revenue from contracts with customers is measured by reference to the forward price for the commodities for the expected quotation period and the Company's best estimate of contained metal at the date revenue is recognized. Concentrate is provisionally priced whereby the selling price is subject to final adjustment at the end of a period normally ranging from 30 to 180 days after delivery to the customer as defined in the sales contract" (Turquoise Hill Resources, 2019). However, from analyzing interviews made by sector experts, Oyu Tolgoi seems to sell its copper concentrate based on long term contracts that last from 5 to 8 years to 2 state-owned Chinese companies, 2 privately owned Inner Mongolian companies, and 1 company from Holland. Based on Oyu Tolgoi's sales contract made in 2013, while the TC/RC of copper concentrate was average, its smelting deductions were found to be double EMC's, negatively affecting the company's overall profits (D.Galsandorj, 2014).

In the crude oil sector, PetroChina Daqing Tamsag LLC, under the government owned China National Petroleum Corporation, and Dongsheng Petroleum Mongolia LLC, also established through investment from China, extract crude oil in Mongolia

and export to directly to China. PetroChina Daqing Tamsag LLC extracts crude oil from two oil fields located in Dornod province and transports the crude oil extracted from the Toson Uul oilfield to either the Bichigt port on the Mongolia-China border via a 139 km auto road or to the Bayankhoshuu port via a 210 km auto road. Crude oil extracted from the Tamsag oilfield on the other hand is exported through the Bayankhoshuu port via a 110 km auto road (EITI Mongolia, 2018). The crude oil extracted from the Tamsag oilfield is traded directly to China and is priced based on the prices of similar products traded on the Singaporean commodity exchange. Dongsheng Petroleum Mongolia LLC, on the other hand, extracts crude oil from the Zuunvayan and Tsagaan-Els oilfields located in Dornogovi province. The extracted crude oil is then exported to China and is priced USD 3.62 below the DTD Brent benchmark price used on the London commodity exchange (MRPAM, 2015).

A major project being implemented by the government of Mongolia in the crude oil sector is the construction of an oil refinery in Dornogovi province utilizing funding from the Indian government. The refinery has an expected capacity of 1.5 million tons of crude oil and in order to oversee its construction the government of Mongolia established a state-owned enterprise responsible for the refinery in 2017. Currently, the oil refinery is stated to be completed in 2023 (Mongol Refinery, 2019). As this state-owned refinery is expected to be a major consumer of domestically extracted crude oil, it is important to consider when calculating the possibility of establishing a commodity exchange in Mongolia that trades crude oil.

In 2018, 75% of the total zinc concentrate produced in Mongolia was extracted by Tsairt Mineral LLC, a joint-venture between Mongolia and China, while the remaining 25% was extracted by the Chinese owned Shin Shin company. All zinc concentrate produced in Mongolia is exported to China. Tsairt Mineral LLC transports its zinc concentrate from its mine in Sukhbaatar province to the border port through 350 km paved road and then 218 km railway. The company sells its product to the China Nonferrous Metal Industry according to a long term agreement. While the price of zinc concentrate negotiated in the agreement is based on the price of zinc concentrated used on the London Metals Exchange, the deducted treatment and refining charges are not specified (ERI, 2018). Shin Shin company extracts zinc concentrate from a polymetal mine deposit in Dornod province and information regarding its sales activity is also publicly unavailable.

According to the Customs General Administration, 66% of the fluorspar ore and concentrate produced in Mongolia is exported to China while the remainder 34% is exported to Russia, Belarus, Poland, Uzbekistan and Ukraine (Custom's Office, 2018). While many mining companies extract fluorspar, the largest producer in Mongolia is Mongolrostsvetment SOE, accounting for 20-30% of the total fluorspar produced. Mongolrostsvetment SOE directly supplies its extracted fluorspar to metallurgical plants in Russia. As fluorspar is not a product traded on commodity exchanges, Mongolrostsvetment SOE's price is set based on Chinese FOB prices as China is the world's leading producer of fluorspar. However, when calculating this price, the cost of transporting the commodity from the Chinese Tianjin port to the Bor-Undur mine in addition to the cost of transporting fluorspar from Bor-Undur mine to the Russian border is subtracted, greatly reducing the final selling price of the commodity. Moreover, other mining companies and individuals that extract fluorspar sell their

products at a price 20-30% lower than the price used by Mongolrostsvetment SOE (Mongolian Export Association, 2013).

3. Assessment Of The Preconditions Of Establishing A Mineral Commodity Exchange In Mongolia

The goal of a mineral commodity exchange is highly dependent on the trading contracts utilized. The simplest trading contract used by commodity exchanges are warehouse receipts. These warehouse receipts, which contain information on the type of commodity being traded, their quantity and quality, make it easier to exchange ownership rights. Another commonly used type of trading is called spot trading in which current commodity prices are directly used. Spot trading greatly reduces the cost of trading commodities on the market. By consolidating the trading of certain commodities, information on the market is more transparent and the exchange of ownership rights are much quicker as a result. For instance, the issue of finding a supplier and a consumer, physically checking the quality of a commodity and participating in the market become much easier with consolidated commodity exchanges. With reduced transaction costs and improved information streams, the profit margins of market participants increase, short term price fluctuations are reduced and regional producer price differences are lowered.

Meanwhile, trading futures the most effective way to combat fluctuating prices caused by changing supply and demand. By trading futures, commodity exchanges can increase the overall liquidity of a market. Additionally, futures make it possible to set a suitable price based on supply and demand as well as manage pricing risks. Unfortunately, establishing a futures market in developing countries remains difficult. In particular, country factors such as weak infrastructure, a lack of support from financial institutions, a developing legal environment and asymmetric information pose as challenges when trying to establish a profitable commodities exchange in the private sector. Additionally, in order for a commodities exchange to make up the vast amount of initial investment needed through transaction fees, a large volume of trades is necessary. In fact, a low volume of commodities traded on an exchange signifies low liquidity. While government intervention may overcome these issues in the short run, for the long term success of a commodities exchange, large scale structural reforms are necessary.

Establishing a commodity exchange requires large investments of capital. In particular, a commodity exchange needs a well functioning information network, storage and warehouse facilities as well as a trading room to operate properly. While a benchmark number of the amount of funding needed to establish a commodity exchange is not available, Kenya allocated USD 2 million over the course of a 4 year period in its Mining Sector 2013-2017 Plan for the preparatory work needed to establish a mineral commodity exchange (GOK, 2013). In Mongolia, Erdenes Mongol has begun a project focused on establishing a mineral commodity exchange. To develop its feasibility study and other preparation activities, the company is planning to spend USD 10 million (P.Gankhuu, 2019).

In addition to the initial investment needed, after the creation of a mineral commodity exchange, funds are needed to cover current expenditures such as monitoring traders, ensuring the implementation of trading contracts and ensuring adherence to regulations. Commodity exchanges also provide clearing services. As clearing services ensure that both sides of a trade buy and sell at the agreed upon price, the risk of either side failing to abide by its contractual obligations is borne by the commodity exchange. Therefore the cost of this bearing this risk must be included in the commodity exchange's transaction fee.

In light of all this, a detailed analysis of numerous factors, including how to increase the benefits and reduce the costs of operation, is necessary when assessing the possibility of establishing a mineral commodity exchange. While the establishment of mineral commodity exchanges has been historically spearheaded by the private sector, support from the government is also key. In particular, commodity exchanges are most effective in countries in which the government has ensured well developed infrastructure, a free flow of information, strong rule of law, and adherence to contracts. Learning from the experiences of establishing commodity exchanges in several African countries, the following conditions are considered necessary for the successful development of a commodity exchange:

- Domestic market size
- Physical and communication infrastructure
- Information technology
- Favorable legal and regulatory environment
- Low likelihood of policy interventions (Rashid, Winter-Nelson, & Garcia, 2010).

The following sections explore the extent to which the aforementioned conditions necessary to establish a mineral commodity exchange in Mongolia are met.

3.1. Economic environment

For a mineral commodity exchange to be most effective, the development of the communication and transportation sector is key. Good communication is necessary to correctly assess the market and gather information on the spot market while a well-developed transportation sector is needed to develop a reliable transportation network and ensure timely deliveries of mineral commodities. The development of physical infrastructure is not just needed for a mineral commodity exchange but necessary for the development of the mining sector over all. Without information on the quality, quantity, and price information of all commodities sold in a market, the setting of spot prices becomes disordered, making managing the risk of the futures market impossible. Overall, in countries with a well-developed information and communications sector, mineral commodity sectors are much more likely to be successful. As such, investment into various infrastructure sectors is vital for the establishment of a successful mineral commodity exchange.

In Mongolia, the largest infrastructure challenge remains the lack of efficient transportation options. Low quality paved roads, limited railroads and the resulting high transportation costs and issues with crossing the border make it difficult to deliver mineral commodities to their intended destinations (ERI, 2018). Comparative

studies with international cases show this well. For instance, the Logistic Performance Index (LPI) calculated by the World Bank is an "interactive tool created to help identify the challenges and opportunities they face in performance on trade logistics and what they can do to improve their performance" (World Bank, 2018b). It measures international and domestic performance along the logistics supply chain within a country supplementing quantitative and qualitative assessments based on the operators' and consumer's feedback and available data. Overall, the "International LPI is a summary indicator of logistics sector performance, combining six core performance indicators into a single aggregate measure" (World Bank, 2018b). These include:

- Efficiency of the clearance process (i.e. speed, simplicity and predictability of formalities) by border control agencies, including customs;
- Quality of trade and transport related infrastructure (e.g. ports, railroads, roads, information technology);
- Ease of arranging competitively priced shipments;
- Competence and quality of logistics services (e.g. transport operators, customs brokers);
- Ability to track and trace consignments;
- Timeliness of shipments in reaching destination within the scheduled or expected delivery time.

In 2018, Mongolia ranked 129th out of 169 countries with a score of 2.4[2]. As the table below shows, Mongolia is lagging behind its neighboring countries in terms of its logistics performance.

TABLE 4. LOGISTIC PERFORMANCE INDEX, 2018

	LPI Score	Customs	Infrastructure	International Shipments	Logistics Competence	Tracking & Tracing	Timeliness
Mongolia	2.40	2.25	2.12	2.45	2.23	2.21	3.07
Kazakhstan	2.77	2.57	2.59	2.73	2.60	2.81	3.31
China	3.6	3.28	3.73	3.57	3.58	3.63	3.86
Russia	2.69	2.25	2.64	2.59	2.74	2.67	3.23

Source: World Bank, 2018

Mongolia's level of competitiveness in the business sector can be seen from the World Economic Forum's Global Competitiveness Report highlighted in the table below.

Table 5. Global Competitiveness Index, Rank out of 140 countries

	Infra-structure	ICT Adoption	Skills	Business Dynamism	Macro-Economic Stability	Financial System
Mongolia	103	78	109	89	121	89
Kazakhstan	69	44	100	37	62	57
China	29	26	30	43	39	63
Russia	51	25	86	51	55	50

Source: World Economic Forum (2019)

[2] Maximum score is 5 while the lowest score is 1.

As the tables above show, in comparison to the selected countries, Mongolia is severely lacking in the key indicators deemed necessary for the establishment of a successful mineral commodity exchange. For instance, in terms of competitiveness Mongolia ranks 103 out of 140 countries in terms of infrastructure and 78 in terms of ICT adoption, a finding that is repeated when assessing its LPI. Moreover, both the worker skill level and business dynamism indicators are weaker than comparative countries.

In addition to these indicators, a monetary and foreign trade policy that ensures stable inflation, exchange and interest rates are also key for the successful establishment of a mineral commodity exchange. However, as the tables above show, macroeconomic instability is the root cause of why so many of Mongolia's economic competitive indicators are low. In order to analyze this further, the averages of key macroeconomic indicators are shown in the table below.

TABLE 6. AVERAGES OF MACROECONOMIC INDICATORS BETWEEN 2010 AND 2018, %

	GDP growth	St.dev. of GDP growth	Inflation rate	Exch.rate depreciation
Mongolia	7.9	5.1	8.2	6.5
Kazakhstan	4.5	2.3	7.6	11.1
China	7.8	1.4	2.6	-0.3
Russia	1.9	2.2	7.1	9.4

Source: World Development Indicators, World Bank

Since 2010, Mongolia has displayed faster average GDP growth than China, Kazakhstan and Russia. However, despite this achievement, due to fluctuations in mineral commodity prices and instable FDI inflows, Mongolia's GDP growth displays much higher levels of variation (standard deviation). Additionally, while Mongolia's exchange rate depreciation is below Kazakhstan and Russia's, its inflation rate is relatively higher.

Furthermore, a successful mineral commodity exchange required a good financial market base with a large number of participants. In particular, these participants need to have a sufficient understanding of the risks involved with trading on a mineral commodity exchange and the market overall as well as be financially capable. Moreover, there needs to be clearing houses that can guarantee all the trades that go through a mineral commodity exchange.

TABLE 7. FINANCE SECTOR INDICATORS IN 2018, %

	Lending interest rate	Interest rate spread*	Real interest rate lending	Domestic credit to private sector of GDP	Domestic credit to private sector by bank of GDP
Mongolia	17.7	5.3	7.8	56.2	54.2
Kazakhstan	12.3	4.9	4.7	27.3	23.8
China	4.4	2.9	2.1	161.1	161.1
Russia	8.9	3.5	1.3	76.0	51.3

** - lending rate minus deposit rate*

Source: World Development Indicators; National Bank of Kazakhstan

The fact that the interest rate spread is large and loan interest rates are high indicates that Mongolia's financial market is inefficient and has low liquidity. As a

result, the domestic loan to GDP ratio is low. In other words, the cost of financing the operations of a mineral commodity exchange in Mongolia are expected to be high.

In economies where credit bureaus include data from retailers, utility companies and trade creditors, the average coverage of the credit reporting system tends to be higher than in those where such information is not available (World Bank, 2016). A well-developed credit reporting system that includes credit history data from banks and other institutions is important when establishing a commodity exchange. The Bank of Mongolia has been operating a public credit registry covering all borrowers since 2000. In Mongolia, the Law of Credit Information was passed in 2011. A private credit bureau has been established by commercial banks, though it is not yet operational. Regulations that guide the operations of private credit bureaus, including the rights of data subjects and dispute resolution mechanisms need to be further developed (World Bank, 2012).

The access to credit indicator has improved in the last two years with the introduction of the "Law on Movable and Intangible Property Pledges" (2015) in addition to the establishment of a new collateral registry in Mongolia. As mentioned in the Doing Business 2019 report, the law implemented a functional secured transactions system and a collateral registry that is operational, unified geographically, searchable by a debtor's unique identifier, up to date, and notice based (World Bank, 2018).

TABLE 8. GETTING CREDIT

	2016	2017	2018	2019
Rank (countries)	59 (189)	62 (190)	20 (190)	22 (190)
Score (0-100)	60.0	60.0	80.0	80.0
Strength of legal rights index (0-12)	5	5	9	9
Depth of credit information index (0-8)	7	7	7	7
Credit bureau coverage (% of adults)	0	0	0	0
Credit registry coverage (% of adults)	40.5	42.2	45.0	50.3

Source: World Bank

According to Doing Business 2019 report, in access to credit indicator, Mongolia perform better than Kazakhstan (rank is #60) and China (#73) and same with Russia (#22)

3.2. Policy and legal environment

Article 3.7.5 of the "State Policy on the Mining Sector" ratified by the Parliament of Mongolia in 2014, calls for the "establishment of a mineral commodities exchange that promotes the open and efficient trading of mineral commodities in domestic and foreign markets under market principles, with fair price setting that supports the development of domestic capital markets under a unified export policy." As a result, on June 28 2014, with the ratification of Government Resolution #211, the government of Mongolia decided to prepare draft international bidding documents for the creation of a mineral commodity exchange financed by the private sector, in partnership with domestic and foreign entities with turnkey conditions as well as a draft regulation of the activities of a mineral commodity exchange.

More significantly, the operations of a mineral commodity exchange could not be regulated by the then-active Securities Market Law and the Agricultural Commodity Exchange Law. As such, in Session #20 of the Government of Mongolia held on April 4, 2016, a draft Mineral Commodity Exchange Law was prepared by the Ministry of Mining was presented for discussion (Cabinet, 2016). However, following the government session, the draft law was not presented to the Parliament of Mongolia. Nevertheless, in 2017, by Resolution #11, the Parliament of Mongolia ratified the "Guidelines for refining Mongolian Legislation until 2020" in which the creation of a draft Mineral Commodity Exchange Law was entrusted to the Financial Regulatory Commission and the Ministry of Finance. Unfortunately, there have been no updates on how this project is going and what stage it is in.

However, in recent years, Erdenes Mongol has decided to continue the project of establishing a mineral commodity exchange in Mongolia and have included provisions to make investments towards establishing an exchange in the company's medium term strategy goals (Erdenes Mongol, 2019). Erdenes Mongol is a state owned enterprise that was created in order to represent the government in conducting activities concerning strategically important mineral deposits. According to Erdenes Mongol, establishing a mineral commodity exchange will facilitate some healthy competition among Mongolian producers, increase trading transparency between suppliers and consumers and ultimately benefit the state budget. Despite these benefits to the state, as the feasibility studies needed to establishe a mineral commodity trade, as well as the amount of investment necessary, are beyond the government's expertise and budget, the task of establishing a mineral commodity exchange has been shifted to Erdenes Mongol (G.Ganbold, 2018).

However, it is important to note that this decision to involve Erdenes Mongol goes against the 2014 government decision to establish a 100% privately funded mineral commodity exchange. As such, with the involvement of Erdenes Mongol, the question of the level of government involvement becomes salient. For instance, if the price of mineral commodities on the world market were to drop, it is likely that government will intervene motivated by political pressures. This is especially likely in Mongolia as the government owns and operates several key mineral commodity producers and is especially invested in the mining sector as the largest contributor to the state budget. Government involvement, especially in price setting measures, will negatively affect the activities of the mineral commodity exchange and hinder its successful development. Although price movements in the futures and forward markets are less volatile in comparison to the spot markets, it is not guaranteed that the prices will be stable. It would be better for the mining sector overall if the government relinquishes tight control while focusing on improving the institutions and infrastructure that promote development. A system in which the government makes rule-based decisions rather than discretionary decisions that affect the market is an important precondition to the establishment of an effective commodity exchange. In addition, prices shouldn't be fixed within a certain interval.

This is supported by international examples. For instance, the success of the Bursa exchange in Malaysia and the SAFEX exchange in South Africa can partially be explained by the respective government's promise not to take part in any price setting activities. Conversely, the Argentinian government's decision to instill an export quota in 2002 negatively affected the trading of agriculture commodities on

its Rosario exchange. Additionally, following government price setting activities, Zambia's ZAMACE exchange faced challenges while Zimbabwe's ZIMACE exchange closed altogether by its government due to food price fluctuations (USAID, 2017). Moreover, in the Eastern European and Central Asian region, the successful commodity exchanges in Hungary, Romania, and Russia were all established with private sector initiative (Belozertsev, Rutten, & Hollinger, 2011).

In addition to the role of government, regulations, enforcing contractual obligations, and market governance all effect the business environment and the subsequent success of commodity exchanges. For instance, in Africa, one major challenge when operating mineral commodity exchanges is poor law enforcement (Belozertsev, Rutten, & Hollinger, 2011). When trading warehouse receipts on a commodity exchange, one of the simplest types of sales contracts traded, ensuring a legal environment that registers and authenticates contracts to prevent the use of false or duplicated documents is key. Enforcing contracts is one of the 11 areas of business regulations included in the Doing Business Survey conducted by the World Bank. This indicator measures the time and cost to resolve a commercial dispute and the quality of judicial processes. From 2016 to 2018, Mongolia's rank in enforcing contracts has deteriorated from 80 to 88, though the rank improved significantly to 68 in 2019 (Table 9) mainly due to reducing the fees that are advanced by the plaintiff to enforce a judgment (World Bank, 2018).

TABLE 9. ENFORCING CONTRACTS

	2016	2017	2018	2019
Rank (countries)	80 (189)	85 (190)	88 (190)	68 (190)
Score (0-100)	59.4	58.5	58.5	60.9
Time (days)	374	374	374	374
Cost (% of claim value)	30.6	30.6	30.6	26.5
Quality of judicial processes index (0-18)	6	5.5	5.5	8

Source: World Bank

As of 2018, in terms of enforcing contracts, Mongolia performs below comparative economies such as Kazakhstan (#4), China (#6) and Russia (#18). For the first component indicator, time for resolving commercial disputes, Mongolia performed better than the East Asia and Pacific average (581.1 days) and China (496 days). It has a similar performance to Kazakhstan (370 days) but did worse than Russia (337 days). As for the second component indicator, cost of resolving disputes, Mongolia did better than the East Asia and Pacific average (47.2% of claim value), but worse than China (16.2%) and Russia (16.5%), while performing comparably to Kazakhstan (22.0%). For the third component indicator, quality of judicial processes index, Mongolia performed much lower than Kazakhstan (16.0), China (15.5), Russia (9.5) and even lower than the regional average (8.5).

3.3. Commodity specific conditions

When assessing the possibility of successfully establishing a commodity exchange, it is important to evaluate the specific conditions of the commodity to be traded. For instance, when established a mineral commodity exchange, the following conditions should be considered: mineral reserves, size of market, availability of specialized storage facilities, presence of logistics centers, mineral commodity grade, possibility

of trading on a traditional commodity exchange, ease of finding consumers, and whether the commodity is sold below the world market price.

A successful mineral commodity exchange first requires a large, active market with enough market particiapnts and a large enough cash turnover for the exchange to be able to cover its operational costs via transaction fees. Additioanlly, as the number of participants trading on the exchange increase, the likelihood of withholding or wrongly reporting data decreases. However, there is no direct formula for calculating the minimum market size needed to support a mineral commodity exchange. Additionally, as mentioned in section 2, most Mongolian producers create direct sales contracts with intermediaries, making detailed sales information scarce.

Another key requirement of a successful mineral commodity exchange is related to the availability of commodities. For a contract trade to be viable, both the buyer and seller must be confident on the availability of a specific product at the specified volume and quality at a particular date and time (Rashid, Winter-Nelson, & Garcia, 2010). In such cases, commodity storage is incredibly important and the capacity, quality and standards of storage must continually be assessed and invested into. Moreover, the location of storage facilities, its distance from the main commodity market and related infrastructure requirements also need to be taken into consideration. The following table shows the warehouse and storage needs required to establish a mineral commodity exchange as calculated by the Mongolian Exporters' Association in their report (2013).

TABLE 10. CAPACITIES AND LOCATIONS OF WAREHOUSES PROPOSED BY MONGOLIAN EXPORTERS' ASSOCIATION

	Long-Term Production	Volume to be traded	Storage location and capacity	Location and capacity of logistics centers
Coal	50 million tons	50 million tons	Tavan Tolgoi – 5 million tons Gashuun Sukhait border port	Border port – 10 million tons
Iron ore concentrate	10 million tons	9 million tons	Darkhan – 2 million tons Eruu Gol – 1 million tons	Version 1: Eruu Gol – 1 million tons Version 2: Darkhan – 2 million tons
Fluorspar concentrate	450 thousand tons	430 thousand tons	Bor-Undur – 50 thousand tons Govisumber – 100 thousand tons	Govisumber – 150 thousand tons
Copper concentrate	2 million tons	1 million tons	Erdenet – 40 thousand tons Sainshand – 90 thousand tons Oyu Tolgoi – 50 thousand tons	Sainshand – 100 thousand tons

Source: Mongolian Export Association (2013)

It's important to note that these calculations, made in 2012, were made under the assumption that mineral commodity production in the long term would increase significantly in addition to the establishment of the Sainshand Industrial Park. As such, when assessing the possibility of establishing a mineral commodity exchange, the report highlighted the importance of calculating the amount of storage needed,

their locations, related infrastructure and organization. It is also necessary to regulate the activities of the warehouses and create rules and regulations that prevent the falsification of warehouse receipts and documents.

When these conditions have not been met or given their due importance, the success of commodity exchanges can suffer. In a 2011 study, Belozertsev et al. found that the weak regulation of warehouse and storage activities, an insufficient grading system and the consolidation of warehouse ownership to a few individuals have led to failures on the part of the private sector when trying to establish a mineral commodity exchange in Kazakhstan and Russia (Belozertsev, Rutten, & Hollinger, 2011).

In addition to operating warehouses and logistics centers, there is also a need for accredited laboratories that work alongside warehouse and storage facilities. As there are differences in the level of moisture, energy and concentration within a single type of mineral commodity, laboratories need to set appropriate levels and standards for each commodity. By doing so, different quality mineral commodities can be traded on a commodity exchange at differing price levels. In order to facilitate this, mineral commodity exchanges must establish and calculate the operating costs of operating laboratories that can set standards for each commodity and constantly analyze the quality of commodities being traded.

Overall, the incentive for mining companies to trade their commodities on a mineral commodity exchange increase as finding buyers is getting easier, marketing costs are low, and the price the mineral commodities are sold at are comparable to world prices. This sentiment was also shared by representatives from mining companies that were interviewed by ERI for the initial study of Marketing and Trading in 2018. In light of this, from a marketing perspective, Mongolian coal and iron ore producers have a relatively low incentive to participate and trade on a mineral commodity exchange.

In general, when assessing the possibility of establishing a mineral commodity exchange in Mongolia, it is important to note that both coal and iron ore demands are highly dependent on the Chinese steel industry. Therefore, the activities of the mineral commodity exchange must take into account not only the overall steel industry but China's import policies as well. Currently, China's tighter environmental policies, aimed at reducing air pollution, are expected to have an adverse effect on demand for Mongolian mineral commodities. On the other hand however, in response to the ongoing trade war between China and the US, the Government of China has been implementing a fiscal stimulus policy in steel industry that is expected to boost Mongolian mineral commodity exports (World Bank, 2019). The overall effect of these policies and how they may change in the future will be of great significance to Mongolia's mining sector.

4. Alternatives To Domestic Private Commodity Exchanges

Alternatives to establishing a domestic mineral commodity exchange should also be explored as the cost of ensuring the necessary trading programs, warehouses, laboratories, transportation infrastructure, human resources and the legal and regulatory environment needed may far exceed the benefits of having a mineral commodity exchange.

This section looks at the possibility of expanding the activities of the Mongolian (Agricultural) Commodity Exchange to include mineral commodity trading as well as the alternative of coordinating with other countries to use their established mineral commodity exchanges.

4.1. Expanding the Mongolian agricultural commodity exchange's current operations

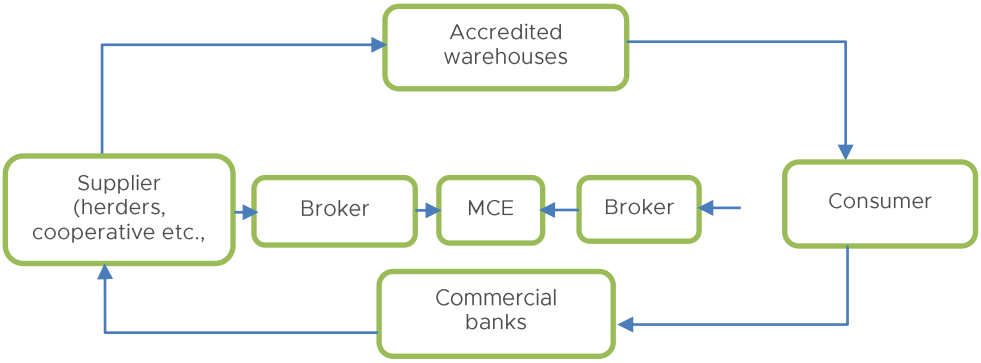
Before delving into the possibility of expanding the scope of the Mongolian (Agricultural) Commodity Exchange, it is first necessary to get a clear understanding of its current operations.

In July 2010, Mongolia adopted the Law on the Agricultural Commodity Exchange and in response, founded the Mongolian Commodity Exchange (MCE) in 2013. The MCE is a 100% state owned exchange dedicated to trading agricultural commodities. Currently, the Financial Regulatory Commission (FRC) is in charge of regulating and monitoring the MCE's operations.

According to the Law on the Agricultural Commodity Exchange, commodities traded on the MCE must be included in the exchange's list of traded commodities and fulfil the requirements specified in the law. The list of 11 commodities traded on the MCE include: cashmere, sheep wool, camel wool, cattle molt, scoured cattle wool[3], scoured goat wool, oilseed, livestock for edible meat and wheat grain. The figure below illustrates the operations of the MCE.

[3] Scoured wool refers to wool obtained by industrial methods from livestock which have been slaughtered or died from infectious diseases or by accident.

FIGURE 5. OPERATIONAL SCHEME OF MONGOLIAN AGRICULTURAL COMMODITY EXCHANGE



Source: Mongolian Commodity Exchange

Moreover, "Stakeholders of the exchange trade" include suppliers and brokers who are registered to the exchange and have obtained permission to sell its commodities though the exchange, while "Stakeholders of exchange market trade" refer to individuals or companies who engage in the production, qualification, storage, transportation, intermediation and organization of exchange trade as well as provide payment, certification of origin and export services.

According to the MCE regulations, brokers are permanent members of the exchange whereas supplying cooperatives are temporary members. As of February 2019, 14 companies possessed permanent (broker) permissions of which 6 have permission to participate MCE trading. Meanwhile, 58 cooperatives (suppliers) hold temporary permissions. A permanent member has the right to bring in orders of their own and on behalf of others while temporary members can only make their own orders. Temporary members are responsible for preparing commodities according to the standards adopted by the MCE. Suppliers are required to inform and register their trading information to the local agricultural database and obtain accreditation certifications from veterinary hospitals and laboratories for agriculture commodities to be sold on the exchange.

The Law on the Agricultural Commodity Exchange include 4 types of contracts that can be traded on the MCE. These include spot, forward, futures and option contracts. Despite this, almost all of the trades done on the MCE are done via spot contracts. For example, in 2018, the MCE traded 157 spot contracts and 1 forward contract. In 2017, the MCE got permission to trade securities from the FRC in order to be able to trade futures contracts.

As of the end of 2018, the total value of the MCE trade reached MNT 3.13 trillion, with cashmere accounting for around 90% of the value alone. Historical volumes of the commodity traded on the MCE are shown in the table below.

TABLE 11. TRADE VOLUME AT THE MCE, TONS

	2013	2014	2015	2016	2017	2018
Cashmere	6382	6124	6877	7216	6956	5862
Sheep wool	1005	7641	10171	16150	10888	13794
Camel wool	1048	1018	434	774	356	274
Oilseed	14912	12535	-	-	-	-
Scoured wool	-	902	2130	1639	2881	4642
Total trade value, billion MNT.	404	554	432	463	572	711

Source: www.mce.mn

In order to calculate the scope of the MCE, the research team estimated what share of commodities produced in the agricultural sector are traded on the exchange. The results are shown in the table below:

TABLE 12. SHARE OF AGRICULTURAL COMMODITIES TRADED ON THE MCE

	2013	2014	2015	2016	2017	2018
Cashmere	91%	79%	78%	76%	68%	54%
Sheep wool	5%	34%	39%	59%	36%	42%
Camel wool	73%	67%	26%	45%	19%	13%

Source: NSO and Research team calculation

As the table shows, the volume of cashmere traded on the MCE as a share of the total cashmere produced in Mongolia is incredibly high. This finding, however, rather than being a testament to the effectiveness of the MCE is related to a few provisions included in the Law on the Agricultural Commodity Exchange. According to the law, all raw and combed cashmere exports must be traded through the MCE. Moreover, as mentioned in the law, any government subsidies given to sheep wool producers must be based on data collected from the MCE.

While these legal stipulations promote the operations of the MCE, it can affect the long-term success of the exchange as producers seem to have little economic incentives to take part in the MCE beyond what is required by law. This in turn can inadvertently support the development of a hidden agricultural economy. Related to this, the precise reasons behind the year on year drop in the share of cashmere, sheep and camel wool traded on the MCE need to be explored further.

In 2018, the total revenue of the MCE reached MNT 2.3 billion, of which 92.9% was from service fees while the remaining 7.1% was from other activities. Moreover, the MCE paid MNT 333.3 million in taxes and fees to the State Budget. Additionally, in 2018, the ratio of expenditure to sales was 0.64 and the MCE expects the ratio to equal 0.8 in 2019.

TABLE 13. FINANCIAL PERFORMANCES, MILLION MNT

	2017	2018*	2019**
Total Revenue	1,922.2	2,321.8	2,098.9
Fees	1,867.2	2,158.0	2,033.8
Other	55.1	163.8	65.1
Total Expenditure	1,435.6	1,488.8	1,682.7
Taxes paid to State Budget	131.0	333.3	259.4
Net Profit after Taxes	436.6	749.7	374.5
Expenditure per MNT sales (MNT)	0.75	0.64	0.80

**Expected value, **Plan* *Source: MCE, 2018*

The MCE has expressed an interesting in trading mineral commodities, especially coal, on the exchange. According to the MCE's upper management, the exchange has already prepared the trading platform needed to facilitate spot and forward trading and has the technical equipment, network, and trained human resources to be able to effectively trade mineral commodities (MCE, 2019b). The MCE has planned the following activities to start coal trading:

- To use a combined clearing model consisting of both bilateral and central models.
- To calculate the VaR6 model with other types of margins (such as fixed, initial and variation margins) and factor in unrealized profit/loss depending on contract types to be used
- Trade coal only after coal quality has been analyzed by accredited international laboratories by either the selling or buying side.
- Create flexible trading conditions that take into account Mongolia's coal production, transportation and customs clearing conditions.
- Work with Erdenes Mongol to develop a unified logistics system and get information on coal trading, payments and warehouses

In terms of logistics, as of February 2019, the MCE has a total of 15 accredited warehouses, of which 6 are located in remote areas and were accredited as logistical centers. However, this is not enough storage for producers from all 21 provinces of Mongolia. Moreover, in terms of transportation, only one company, "Mongol Teever", is accredited. Additionally, only 2 banks, the State Bank and Golomt Bank have obtained the rights to process the trade payments of the MCE (MCE, 2019). Should the operations of the MCE be expanded to include mineral commodity trading, based on export data, the total trade turnover is expected to increase at least 10-fold. Thus logistics, including the capacity of warehouses and transportation, remain the largest issue when considering expanding the MCE's activities. This problem is especially important as experiences from the former Soviet Union and China show that the absence of warehouse receipt was a major problem for developing commodity exchanges (Peck, 2001).

While expanding the operations of an already established commodity exchange means that there is no need to ratify new legislation, there is still need for significant changes and amendments. Moreover, new protocols and rules to regulate mineral commodity exchange operations also need to be created and implemented. These changes need to be considered in addition to the issue of accrediting and regulating newly established mineral commodity warehouses, laboratories and transportation

companies. Likewise, the current trading network needs to be expanded on and banks to process the payments made through the MCE also needs to be chosen. These developments require vast amounts of effort and investment. Moreover, as discussed in section 3.2, the government's policy on establishing a mineral commodity exchange changes frequently and the state-owned Erdenes Mongol has expressed a desire to establish a new mineral commodity exchange rather than expand the operations of the MCE. These are the risks to be considered though the option of expanding the operations of the MCE to include mineral commodity trading may be more attractive due to its efficiency.

4.2. Use of offshore commodity exchanges

Should establishing a domestic mineral commodity exchange prove to be too difficult, another option is to use offshore exchanges to garner some of the same benefits. A well-established foreign mineral commodity exchange can provide hedging opportunities, has high liquidity and is better integrated with world markets (Rashid, Winter-Nelson, & Garcia, 2010).

However, the biggest drawback with this option is that trading on offshore exchanges increases exposure to exchange rate risks in addition to mineral commodity price fluctuation risks (Rashid, Winter-Nelson, & Garcia, 2010). Though, as a country that exports the majority of its mineral exports however, Mongolia is already exposed to exchange rate risks regardless. The largest challenge for Mongolia therefore, is longer transportation distances needed to comply with foreign trading contracts as well as weak infrastructure integration with key importing countries.

Other common risks associated with trading on offshore exchanges should also be considered. For instance, if the quality of a mineral commodity is graded by different specifications on an offshore exchange, commodities may be subject to undue price discounts due to quality differences. Moreover, trading contracts on offshore exchanges may include provisions that are not suitable for domestic producers. For example, minimum contract sizes may be beyond the production capabilities of domestic producers (Rashid, Winter-Nelson, & Garcia, 2010). As a result, to successfully trade on offshore exchanges, domestic producers may need to take extra measures such as washing, mixing and concentrating their commodities to better fit international standards. For instance, in 2018, Mongolia exported 31.6 million tons of coking coal, of which only 5.5 million tons were washed coal (MRPAM, 2019). In this vein, as mentioned in section 2.1 2 companies who operate in the Nariinsukhait coal basin are currently building a processing plant with the capacity to wash 1.5 million tons of coal per annum. It is evident therefore, that to better adhere to international standards and be able to trade on offshore exchanges, Mongolia's coal processing capacities must be increased significantly.

When assessing the option of trading on offshore exchanges, in terms of economic efficiency, the best option for Mongolia is to work together with Chinese commodity exchanges. The reason for this lies in the fact that only is China the main destination of Mongolia's commodity exports but is also the biggest player on the world commodity market. The following table shows China's share of world production by volume and imports by value for the commodities chosen.

TABLE 14. CHINESE SHARE OF PRODUCTION AND IMPORT OF MAJOR COMMODITIES

Commodies	Production, mln.ton	Import value, USD bln.
Iron ore	825.0 (37%)	57.1 (68%)
Copper ore and concentrates	1.7 (9%)	20.6 (48%)
Zinc	4.3 (33%)	3.2 (25%)
Crude oil	214.6 (5%)	116.2 (17%)
Coal	3 747.0 (48%)	11.5 (13%)

Note: Percentage numbers in brackets indicate share of world production or imports
Source: Tamvakis (2018); US Geological Survey (2019); ITC (2019)

Moreover, Chinese commodity exchanges are some of the largest in the region. The world ranks of regional mineral commodity exchanges by contract volume for Mongolia's key exports (coal, iron ore, copper, zinc) according to the Futures Industry Association are shown in the table below (FIA, 2019).

TABLE 15. TRADED CONTRACT VOLUME AND WORLD RANKS OF NEAREST COMMODITY EXCHANGES

Contract	Sector	World rank in sector	Volume, mln
Coke Futures, Dalian Commodity Exchange	Energy	8	69.1
Thermal Coal (ZC) Futures, Zhengzhou Commodity Exchange	Energy	11	48.9
Hard Coking Coal Futures, Dalian Commodity Exchange	Energy	12	46.5
Steel Rebar Futures, Shanghai Futures Exchange	Metal	1	531.0
Iron Ore Futures, Dalian Commodity Exchange	Metal	2	236.5
Zinc Futures, Shanghai Futures Exchange	Metal	4	92.3
Copper Futures, Shanghai Futures Exchange	Metal	8	51.2

Source: FIA, 2019

As Mongolia has the added benefit of being geographically close to the exchanges mentioned above, the possibility of working with these exchanges need to be carefully considered. A short description of the exchanges in question are listed below:

- The Shanghai Futures Exchange trades futures of 14 types of mineral commodities including copper, zinc, steel and crude oil. It currently has 196 members and has more than1,600 remote trading seats all over China. Currently there are 86 delivery warehouses and 160 storage sites in total.
- The Zhengzhou Commodity Exchange trades 5 types of mineral commodities including thermal coal and ferroalloy. In 2016, its trading volume reached 0.9 billion contracts and trading turnover reached 31 trillion RMB (~4.5 trillion USD). The exchange has 164 members spread over 26 provinces (municipalities) and autonomous regions and includes 149 futures firm members (ZCE, 2017).
- The Dalian Commodity Exchange is the largest futures market for crude oil, thermal and coking coal and iron ore. In 2018, it was ranked as the 12th largest exchange in the world by trading volume. A total of 17 futures and 2 options have been listed for trading on the exchange. The exchange has started introducing overseas traders into the iron ore futures market and formally launched a commodity swaps business. The Exchange has 164

member firms, 314 designated delivery warehouses and 15 designated depositary banks. In 2018, DCE's annual trading volume reached 982 million lots and its turnover totalled 52.2 trillion RMB (~7.6 trillion USD) (DCE, 2019).

The Zhengzhou Commodity Exchange trades thermal coal while the Dalian Commodity Exchange trades both thermal and coking coal as well as iron ore. For Mongolian coal and iron ore to be traded however, they need to be further processed to fit the exchanges' standards. As for copper and zinc concentrate, Chinese exchanges require that they be smelted and purified before being eligible to trade. As such, in order to trade Mongolian copper and zinc concentrate, we must either establish a domestic smelting plant or look at the option of using foreign smelting plants.

Another issue of trading on foreign exchanges is the fact that brokers may be hesitant to work with new clients they deem risky, lowering the chances of clients from developing countries with weak infrastructure. One way to circumvent this would be to establish branch exchanges trading in the same commodities also traded on the central exchange (Rashid, Winter-Nelson, & Garcia, 2010).

When expanding the operations of a well-established exchange to a host country, the exchange can set up either a representative's office or directly establish a new branch. This has the advantage of achieving economy of scale from pooling risk and the competitive, fair pricing of contracts (Mohan, 2007). In addition to these benefits, the host country will enjoy all the same benefits of the original mineral commodity exchange. The branch exchange will also be able to introduce new trading programs, train specialists and enforce standardized regulations at a relatively low cost.

The long-term success of a branch exchange is directly related to its transaction volume, with higher contract volumes better predicting overall success. For example, in 2001, the World Bank's International Task Force on Commodity Price Risk Management introduced the services of the New York Board of Trade and London International Financial Futures Exchange to the coffee producing countries of El Salvador, Tanzania, Mexico and Uganda. The price-risk management instruments introduced to these countries were implemented successfully, a finding that Mohan (2007) attributes to the good reputation of the exchanges as well as the availability of viable intermediaries to connect producers. Not only do both of the exchanges above have a high enough sales volume to cover its operational costs, the coffee markets of the host countries were also large. By utilizing the reputations of the exchanges, the host countries were able to attract the attention of enough financial institutions, brokers and traders to hit a critical mass and solidify its market positions. Overall, while establishing branch exchanges require ample investments, cooperation within the host country, its workforce and other resources have the potential to reduce these costs.

Some developing countries have expressed an interest in spreading the liberalization of mineral commodity trading. As mentioned in the World Investment Report (UNCTAD, 2019), in Vietnam, foreign investors are now permitted to make investments towards establishing commodity exchanges, so long as it does not exceed half of their charter capital, trade goods on the commodity exchange as

clients and become members of the exchange (brokers or traders) without any ownership restraints.

5. Conclusions And Recommendations

Currently, most of Mongolia's mineral commodity trading is done through direct sales contracts using intermediary traders. This practice, however, has numerous disadvantages that call for the establishment of a mineral commodity exchange. Some of the disadvantages include the same products being sold at different prices, the undervaluation of Mongolian mineral commodities, a low interest in processing commodities, a lack of transparency of commodity sales contracts, difficulties in taxing commodity production and lower tax revenue as a result. Not only can many of these drawbacks be mitigated with the establishment of a mineral commodity exchange, Mongolia's economy will be positively affected as well.

As with all other businesses, for a commodity exchange to be successful, the exchange must facilitate a large number of trades. This is especially true for mineral commodity exchanges which must also attract the attention of foreign buyers, intermediaries and financial institutions. In Mongolia's case, while the production volumes and quality of Mongolian coal, iron ore and copper concentrate attract significant attention from potential buyers, the country's weak transportation infrastructure poses a challenge. For a mineral commodity exchange to be viable, Mongolia must heavily invest in warehouses, logistics centers and transportation infrastructure. Moreover, Mongolia's current level of financial services development and its macroeconomic environment is lacking when compared to neighboring countries.

In addition, Mongolia's legal environment and government policy on the development of a mineral commodity exchange is unclear and unstable. As a result, while there have been numerous attempts to establish a mineral commodity exchange, none have been successful. Moreover, while the government of Mongolia expressed an interest in establishing a mineral commodity exchange with 100% private sector investment in partnership with both foreign and domestic enterprises, currently Erdenes Mongol, a state-owned enterprise, is working on the project to establish a mineral commodity exchange. This should ideally be avoided as many international studies have found that state-owned mineral commodity exchanges have had limited success.

In the case of establishing a new mineral commodity exchange, in addition to ensuring the availability of factors such as trading programs, networks and the technical infrastructure needed to operate an exchange, numerous regulations, guidelines and legislations have to be either amended or ratified to oversee the operations of a mineral commodity exchange. Likewise, a new exchange would require a qualified workforce in addition to well-informed buyers and suppliers. Activities to increase the capacities of all participants must therefore be regularly conducted. As these necessities all require ample investments, detailed feasibility studies of establishing a new mineral commodity exchange must be conducted and compared with other viable options.

The first option entails expanding the current operations of the previously established Mongolian (Agricultural) Commodity Exchange to include mineral commodity trading. With this option, totally new trading programs and technical infrastructure aren't needed. The existence of relevant laws and regulations also cut down costs significantly. The MCE has expressed an interest in beginning with coal trading, adding other mineral commodities afterwards in order to mitigate risks. However, adding mineral commodity trading requires significant logistics investments in terms of warehouses, logistics centers, laboratories and financial infrastructure. Moreover, as the MCE is a state-owned enterprise, its operations may be susceptible to political influences and risks.

Another option is making use of already established foreign mineral commodity exchanges. In light of the country's economic and geographic circumstances, Mongolia can potentially work with China's Shanghai Futures Exchange, Zhengzhou Commodity Exchange and the Dalian Commodity Exchange. By doing so, Mongolian companies can directly trade their commodities on the aforementioned exchanges or establish either a representative's office or branch in Mongolia. In such a case, Mongolia would be able to significantly cut back on the time and costs associated with establishing a new commodity exchange while still being able to trade its commodities at more favorable prices. However, establishing connections with and cooperating with internationally renowned commodity exchanges may prove time consuming and challenging. Moreover, Mongolia would potentially be subject to the foreign mineral commodity exchange's standards.

As previously mentioned, for a mineral commodity exchange to operate successfully, a country must have the necessary economic, business and legal environments to support it. When choosing any of the three main options for establishing a mineral commodity exchange mentioned above, it is important to note that Mongolia's economic, business and legal environments are lacking in many key respects. As such, Mongolia's policies towards establishing a mineral commodity exchange must invariably be connected with policies to improve Mongolia's overall economic environment.

Bibliography

ADB. (2018). Breaking Barriers: Leveraging Mongolia's Transport and Logistics. Manila: Asian Development Bank.

Belozertsev, A., Rutten, L., & Hollinger, F. (2011). Commodity exchanges in Europe and Central Asia: A means for management of risk. FAO Investment Centre Working Paper.

Bloomberg TV Mongolia. (2019 January 15). Customs Office: In 2018, Mongolian iron ore export reached 7.4 million tonnes, 1.2 million tons up from 2017. Bloomberg TV Mongolia: http://bloombergtv.mn/%D0%B3%D0%B5%D0%B3-2018-1-2

Cabinet. (2016.4.4). Government Session. Cabinet Secretariat of Government of Mongolia: http://www.cabinet.gov.mn/session.php?y=2016&m=4&t=#

CAREC. (2016). Corridor Performance Measurement and Monitoring. Singapore: The Central Asia Regional Economic Cooperation (CAREC) Program.

Custom's Office. (2018). Main export commodity by country. Ulaanbaatar: Custom's General Authority.

D.Galsandorj. (2014 September 09). It is possible to improve marketing activities and export revenues of Oyu Tolgoi's copper concentrate. (M. J. E.Odjargal)

D.Tserenbadam. (2019 January 15). Sales revenue wil incease after improving contract terms of trading copper concentrate. (E. I. O.Gerelmaa)

DCE. (2019 September 30). The DCE at a Glance. Dalian Commodity Exchange: http://www.dce.com.cn/DCE/About_Us/The%20DCE%20at%20Glance/index.html

EITI Mongolia. (2018). Annual report of Extractive Industry's Transparency Initiative of Mongolia-2017. Ulaanbaatar: EITI Mongolia. EITI Mongolia.

Erdenes Mongolia. (2019 September 30). Erdenes Mongol Group: Strategy (2019-2023). Erdenes Mongol: http://erdenesmongol.mn/report/

ERI. (2017). Iron Ore Study. Ulaanbaatar: Economic Research Institute.

ERI. (2018). Marketing and Trading. Ulaanbaatar: Economic Research Institute.

FIA. (2019 September 30). FIA releases annual trading statistics. Futures Industry Association: https://fia.org/articles/fia-releases-annual-trading-statistics-showing-record-etd-volume-2018

G.Ganbold. (2018 08 20). Now is Time to Establish Mineral Commodity Exchange and Selling Our Minerals at Good Value. (Dailynews)

GOK. (2013). Sector Plan for Oil and Other Minerals 2013-2017. Nairobi:

Government of the Republic of Kenya.

MCE. (2019 September 30): http://www.mce.mn/d/136#

MCE. (2019b). Presentation of Coal Trading on the Mongolian Commodity Exchange (in Mongolian). Ulaanbaatar: Mongolian Commodity Exchange.

MMC. (2018). Annual Report 2018. Ulaanbaatar: Mongolian Mining Corporation .

Mohan, S. (2007). Market based Price-risk Management for Coffee Producers. Development Policy Review, 25 (3), 333-354.

Mongol Refinery. (2019 September 30). Project Info. Mongol Refinery: http://mongolrefinery.mn/Default.aspx?page=66&menu=238

Mongolian Export Association. (2013). Study of the Potentials for Establishing The Mineral Commodity Exchange In Mongolia (only in Mongolian). Ulaanbaatar: Mineral Resources and Petroleum Authority of Mongolia.

Mongolian Mining Journal. (2019). Nariinsukhait mines will survive the market challenges with technology. Mongolian Mining Journal, 34-41.

Mongolian National Audit Office. (2018). Audit report on implementation of audit recommendation for Erdenet Mining Company's activities. Ulaanbaatar: Mongolian National Audit Office.

MRPAM. (2019). Mineral Resources Statistics-2018. Ulaanbaatar: Mineral Resources and Petroleum Authority of Mongolia.

NSO. (2019). National Accounts. National Statistical Office: www.1212.mn-

P.Gankhuu. (2019 02 01). Erdenes Mongol Group . Ulaanbaatar.

Peck, A. E. (2001). The Development of Commodity Exchanges in the Former Soviet Union, Eastern Europe, and China. Australian Economic Papers, 40(4), 437–460.

Rashid, S., Winter-Nelson, A., & Garcia, P. (2010). Purpose and Potential for Commodity Excanges in African Economies. Fourth African Agricultural Markets Program Policy Symposium. Lilongwe: Africa Agricultural Markets Program.

South Gobi Resources. (2013 August 24). Coal . South Gobi resources: https://www.southgobi.com/html/business.php

Turquoise Hill Resources. (2019). Annual Report - 2018. Vancouver: Turquoise Hill Resources Ltd.

UNCTAD. (2009). Overview of the World's Commodity Exchanges. Geneva: UNCTAD.

UNCTAD. (2019). World Investment Report 2019: Special Economic Zones. Geneva: United Nations.

USAID. (2017). Assessing the Preconditions for Commodity Exchange Success: A Guidance Document. USAID.

World Bank. (2012). Mongolia Access to Finance: Technical Note. The World Bank.

World Bank. (2016). Doing Business 2017. Washington D.C.: The World Bank Group.

World Bank. (2018). Doing Business 2019. The World Bank.

World Bank. (2018b). Logistics Performance Index. Retrieved from The World Bank: https://lpi.worldbank.org/international/aggregated-ranking?sort=desc&order=LPI%20Score#datatable

World Bank. (2019). Commodity Market Outlook. Washington: World Bank.

World Economic Forum. (2019). Global Competitiveness Index. Geneva: World Economic Forum.

Wuperman, Zorig, Erdenebulgan, & EPCRC. (2015). The Iron Ore and Steel Sector in Mongolia. GIZ, Program Integrated Mineral Resource Initiative.

ZCE. (2017). Annual Report 2016. Zhengzhou: Zhengzhou Commodity Exchange.