02

KEY COMMODITIES

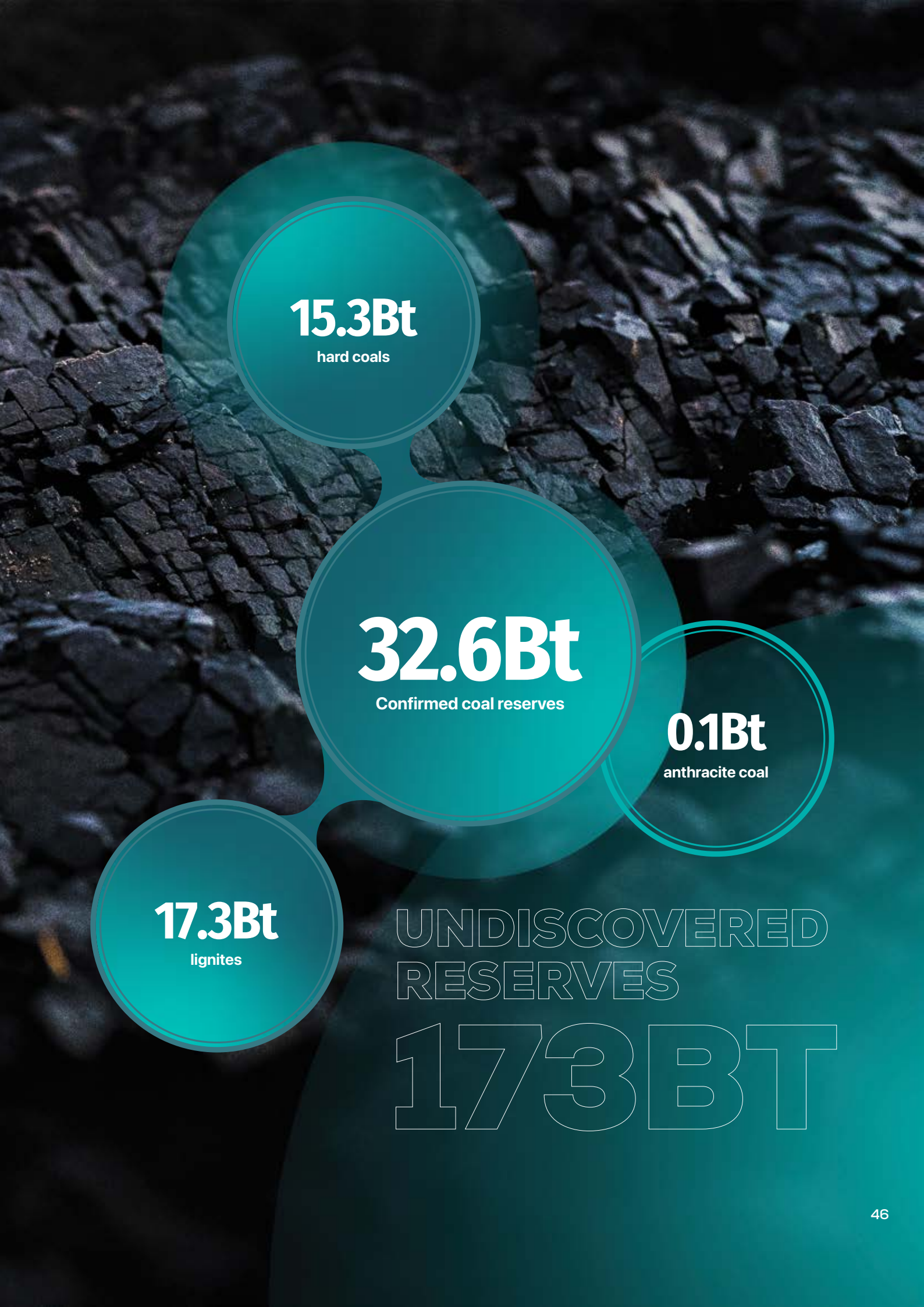
2.1 COAL

Highlights

Mongolia is ranked 23rd internationally in terms of its reserves of coal. The largest consumer of this vast coal resource is China. Mongolia single-handedly supplies 30-40% of China's coking coal demand as one of the biggest competitors in the China's market.

Reserves

Throughout the country, there are 12 basins that consist of three types of coals, holding a confirmed coal reserve of 32.6b tonnes. The Mongolian Coal Association also reports that there are about 173b tonnes of undiscovered reserves that can be unearthed by additional geological surveys.


15.3Bt
hard coals
32.6Bt
Confirmed coal reserves
0.1Bt
anthracite coal
17.3Bt
lignites
UNDISCOVERED RESERVES
173BT

As of 2022, there are a total of 304 valid coal mining licenses in the country.

Figure 1.57

COAL RESOURCE DISTRIBUTION MAP

Source: The Mineral Resource and Petroleum Authority of Mongolia

Table 1.7

COAL RESERVES BY PROVINCE AS OF 2016

№	Provinces	Number of licenses	Proved reserves (thousand tonnes)
1	Arkhangai	1	1,198.04
2	Bayankhongor	11	210,769.37
3	Bulgan	4	86,104.39
4	Govi-Altai	27	435,537.34
5	Govisumber	10	1,828,382.75
6	Darkhan-Uul	1	71,508.01
7	Dornogovi	38	3,040,328.87
8	Dornod	15	1,727,597.97
9	Dundgovi	23	2,042,829.98
10	Uvurkhangai	1	29,687.6
11	Umnugovi	46	7,164,225.82
12	Sukhbaatar	18	1,553,426.82
13	Selenge	3	439,148.35
14	Tuv	42	7,881,601.57
15	Uvs	13	1,158,041.21
16	Ulaanbaatar	18	839,632.09
17	Khovd	11	177,896.14
18	Khuvsgul	6	214,235.3
19	Khentii	8	3,708,080.96

The table shows all confirmed coal reserves. As of 2019, total reserves currently stands at 32.6b tonnes. Information was collected from the 173 coal producers within the framework of the 296 coal mining licenses already issued, reviewed by the Mineral Resources Professional Council, submitted to the Mineral Resource and Petroleum Authority of Mongolia.

Source: The Mineral Resource and Petroleum Authority of Mongolia

Production & exports

The coal industry as a percentage of overall exports exceeded copper in 2010, and its contribution to the state budget also surpassed copper, becoming the biggest driver in the country's economy. Mongolia single-handedly supplies 30-40% of China's total coal consumption and is one of the biggest players in the coking coal industry.

Figure 1.58

MINERAL EXPORTS BY TYPE

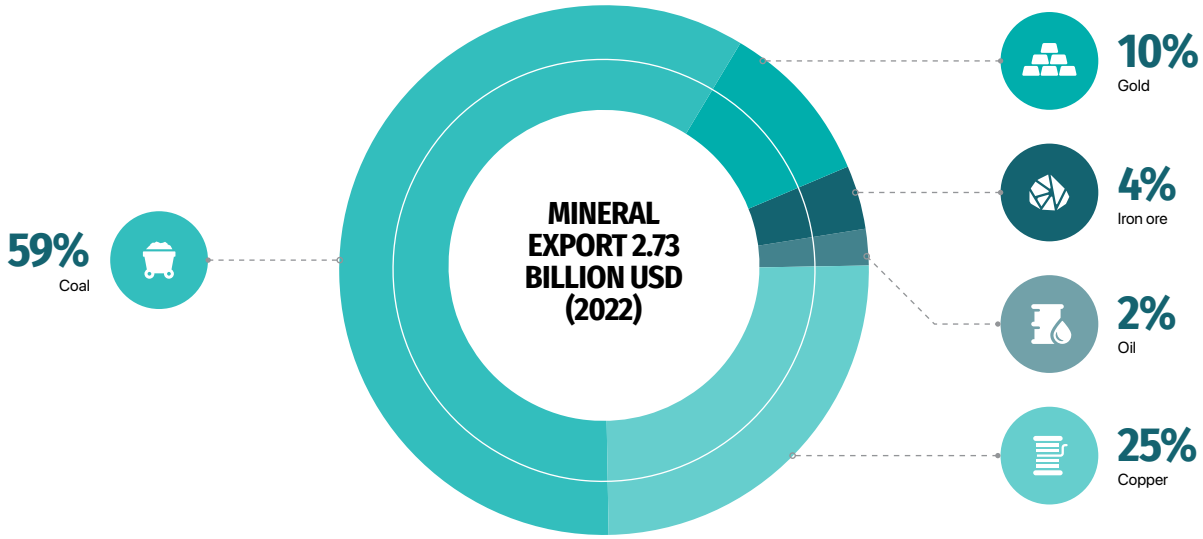
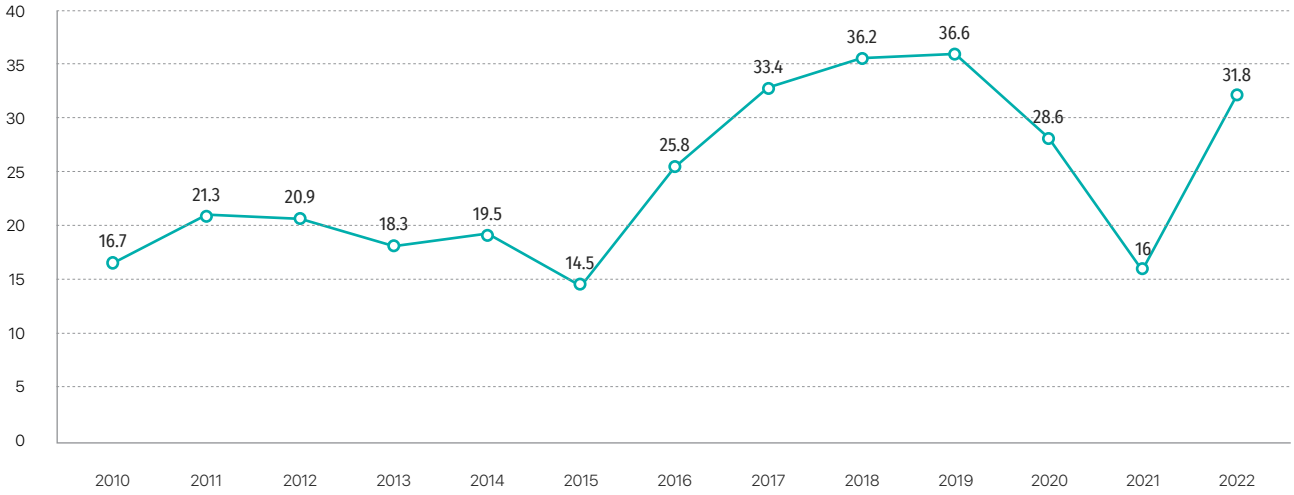


Figure 1.59

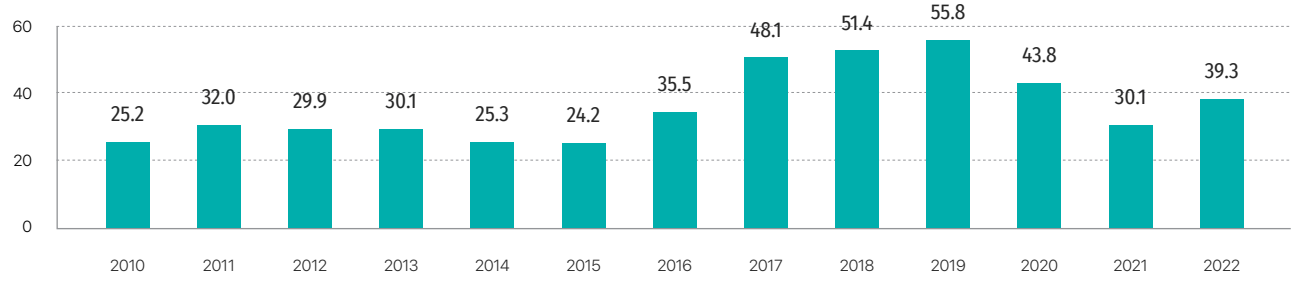
COAL EXPORTS (MT)



Source: Ministry of Finance, Ministry of Mining and Heavy Industry

Figure 1.60

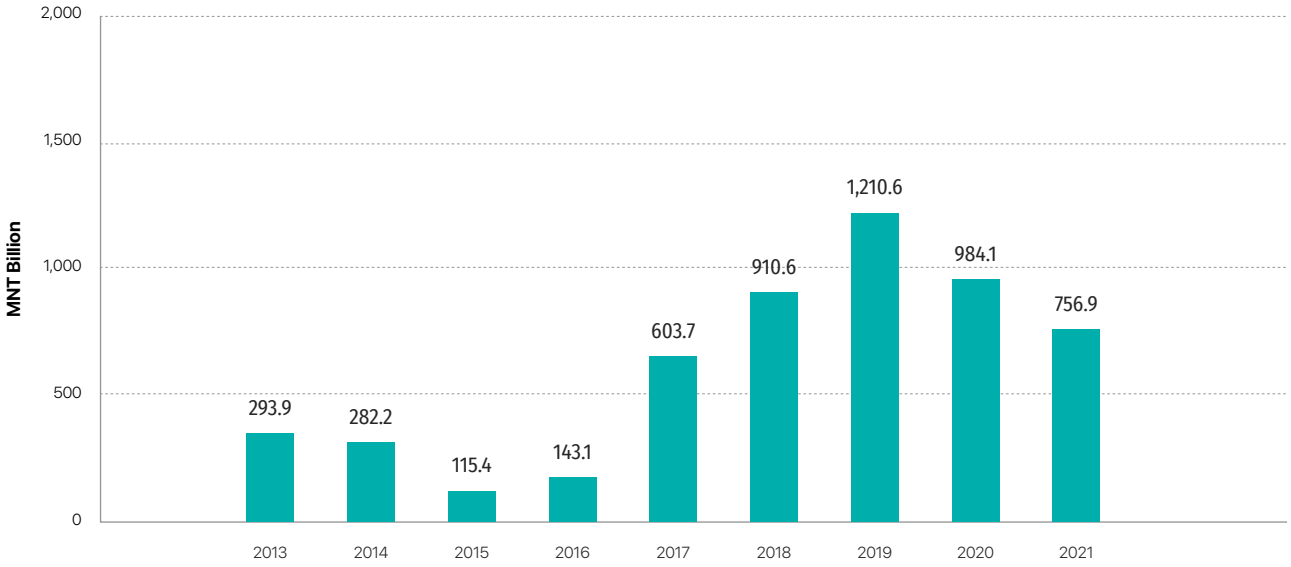
COAL PRODUCTION (MT)



Source: Ministry of Finance, Ministry of Mining and Heavy Industry

Figure 1.61

FISCAL REVENUES FROM COAL (BILLION MNT)



Source: Ministry of Finance, Ministry of Mining and Heavy Industry

Table 1.8

CHINA'S ANNUAL COKING COAL IMPORT VOLUMES (MT) (NOTES)

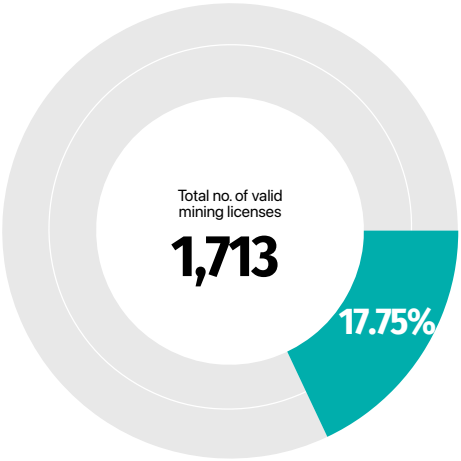
Countries	2020	2019	Change	Market Share
Mongolia	**23.8**	33.8	-29.6%	**32.8%**
Australia	**35.4**	30.9	+14.6%	**48.8%**
Canada	**4.7**	3.0	+56.7%	**6.5%**
Russia	**6.7**	5.4	+24.1%	**9.2%**
USA	**1.0**	1.1	-9.1%	**1.4%**
Others	**1.1**	0.3	+266.7%	**1.5%**
Total	**72.6**	**74.7**	**-2.8%**	**100.0%**

Notes:
(i) Imports from Mongolia include raw unprocessed, dry and wet processed coking coal.
(ii) Due to rounding, discrepancy may exist between summary of volumes of individual countries with total volume, year-on-year percentage changes and market share.

Source: Fenwei Energy

Figure 1.62

COAL MINING LICENSES (NUMBER AND TOTAL AREA)



The total area covered by mining licenses is 1,836,487.3 hectares, and **44.26%** of that area is designated for coal mining.

Of the 38 coal mines currently operating in the country, over half are hard coal mines:

- 7 state and locally owned enterprises in eight mines
- 28 domestic and joint ventures in 33 mines
- 7 companies with 100% foreign investment have been operating eight coal projects.

Infrastructure

Mongolia exports coal via five border checkpoints, namely Gashuunsukhait, Shiveekhuren, Khangi, Bichigt, and Yarant. The majority of exports flow through via Gashuunsukhait-Ganqimaodu port (51.4%) while 40% flows through the Shiveekhuren-Sekhe crossing.

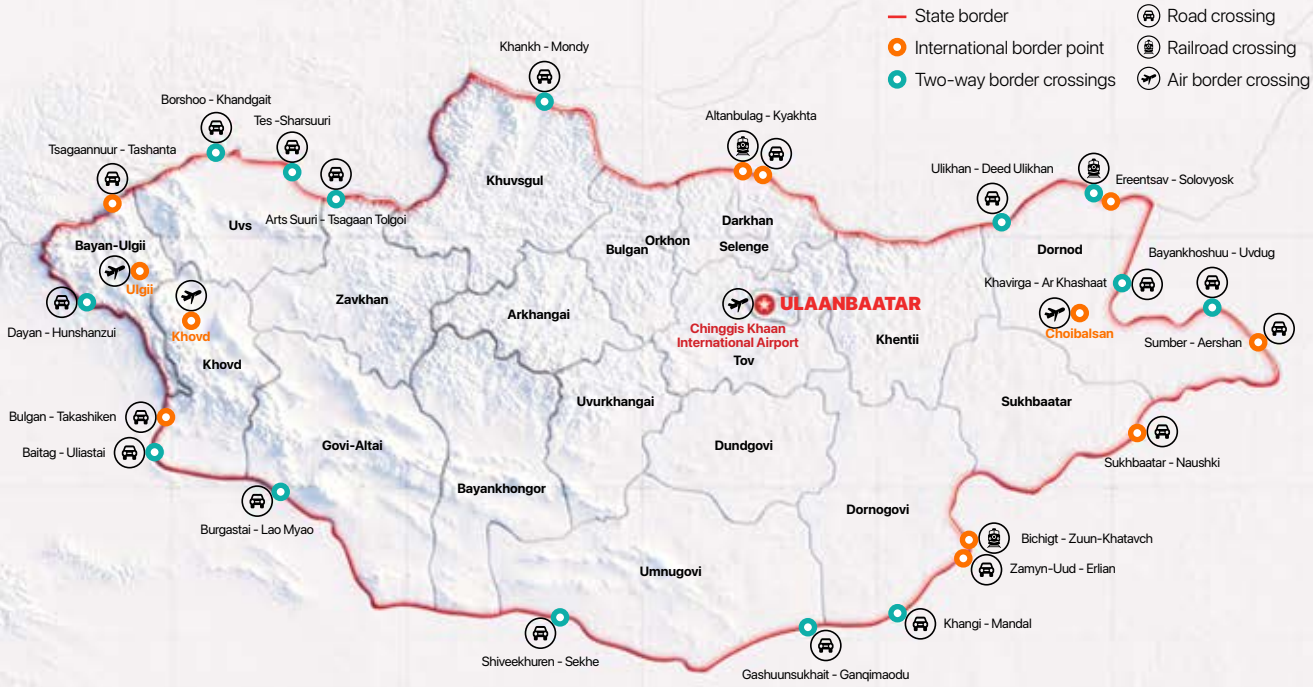
Figure 1.63

% OF COAL EXPORTS KEY BORDER CROSSINGS

Source: Mongolian Coal Association

Figure 1.64

BORDER CROSSINGS



Coal is exported both by road and rail, with the majority of exports still being transported across the border to China via road. Only a small portion – or just under 1%, is transported is exported via the Zamyn-Uud-Ereen border crossing.

A number of public and private partnerships exist on road and railroad construction projects, ultimately helping to boost coal exports:

Figure 1.65

NEW RAILWAY PROJECTS

The Government of Mongolia has a plan to enhance the country's railway system. Three major railway projects were completed in 2022, and more are in the pipeline.

1. Tavan Tolgoi - Zuunbayan railway project

The construction of Tavantoloi – Zuunbayan route finished and trial transportation began. It is expected to have annual capacity of 15 million tonnes of freight with the potential to double.

- Continuous length: 416.1 km
- Location: From Tavan Tolgoi coal deposit in Tsogttsetsii soum, Umnugovi aimag to Zuunbayan in Dornogovi aimag, covering Tsogttsetsii and Manlai soums of Umnugovi aimag, Mandakh and Zuunbayan baghs of Sainshand soum in Dornogovi aimag.
- Annual capacity: 15 million tonnes of cargo

2. Tavan Tolgoi - Gashuunsukhait railway project

Tavantolgoi – Gashuunsukhait railway has been completed and has an annual capacity of 30-50 million tonnes of freight transportation. It will reduce the current export cost from Tavantolgoi deposit by 3.8 times. The railway is of great social and economic importance as it connects Tavan Tolgoi, which produces 50 percent of the country's coking coal production, and Gashuunsukhait, the largest coal exporting port.

- Continuous length: 233.6 km
- Location: Continues from the Tavan Tolgoi coal deposit in the South Gobi to the Gashuunsukhait border crossing.

3. Zuunbayan - Khangi railway project

Zuunbayan – Khangi railway has been completed and has an annual capacity of 20 million tonnes of freight transportation. The railway project will also increase the export value of over 10 deposits in the Gobi region.

- Continuous length: 226 km
- Location: The railway starts at the Zuunbayan station of the Ulaanbaatar Railway in Zuunbayan bagh, Sainshand soum, Dornogovi aimag, and run to Khangi port, connecting it to the Chinese port of Mandal

The Khangi port is strategically located in the middle of Gashuunsukhait, the main coal and copper export port, and Zamyn-Uud, the main import port.

Upcoming railway projects

The 13 km long railway along the Shiveekhuren-Seqe route
The 10 km long railway along the Bichigt – Zuunkhatavch route
The 100 km long railway project along the Bichigt – Khuut route
The 300 km long railway project along the Shiveekhuren – Shinejinst route

Coal Processing Industry

Mongolia's policy is to process their own coal, thereby adding more value to the industry prior to exporting abroad. Although coal accounts for over 30% of total exports, coal processing only accounts for about 20% of all coal exports. Current state policy is focused on increasing the number of coal processing plants.

About 30 coal processing plants currently operate in Mongolia, out of which about 20 deploy the wet method, with the remaining amount being processed using dry method technologies.

Mongolia's first-ever coal processing plant was established in 2011 by Energy Resource LLC within the framework of the Ukhaa Khudag project. Built with three phases, each phase of the plant is capable of washing and processing 5m tonnes of coal each year. Within a decade after becoming operational, the plant had processed a total amount of 69.5m tonnes of raw coal, produced 34.6m tonnes coking coal, and refined 13m tonnes of thermal coal.

Located in the Nariin Sukhait of Umnugovi province, MAK's processing plant has an annual processing capacity of 1m tonnes of coal. The plant, which is currently running at 65% of output capacity, uses 100 liters of water and recycles 92% of the used water. Capacity can be further expanded to 5m tonnes.

In April 2021, the Mineral Resources Professional Council reviewed and accepted the feasibility study of the Tavan Tolgoi coal processing plant. The plant is expected to have three building blocks with a processing capacity of ten million tonnes per annum each and a total capacity of 30 million tonnes per year. Project costs are estimated to be $911.5m and investment payback is expected within seven years. The plant will be specifically used for processing the coking of low-grade coals at Tavan Tolgoi, and for producing coking coal concentrate, semi-soft coking coal concentrate, and middlings for export to international markets.

Coal companies

The Mongolian state-owned Erdenes Tavan Tolgoi, the Mongolian Stock Exchange-listed Tavan Tolgoi JSC, and the Hong Kong Stock Exchange-listed Mongolian Mining Corporation (also known as Energy Resource LLC) all operate coal mines at the Tavan Tolgoi residual deposits. These three projects account for over half of Mongolia's coal exports.

According to an assessment of the JORC standards, the Tavan Tolgoi coal deposit has 7.4 billion metric tonnes of coal reserves. Of this, 5.1 billion tonnes are coking coal and 2.2 billion are thermal coal as Erdenet Tavan Tolgoi announced.

The state-owned company, Erdenes Tavan Tolgoi, commenced its raw coal production in 2010 and became the first domestic company to exceed $1b in sales revenue in 2019.

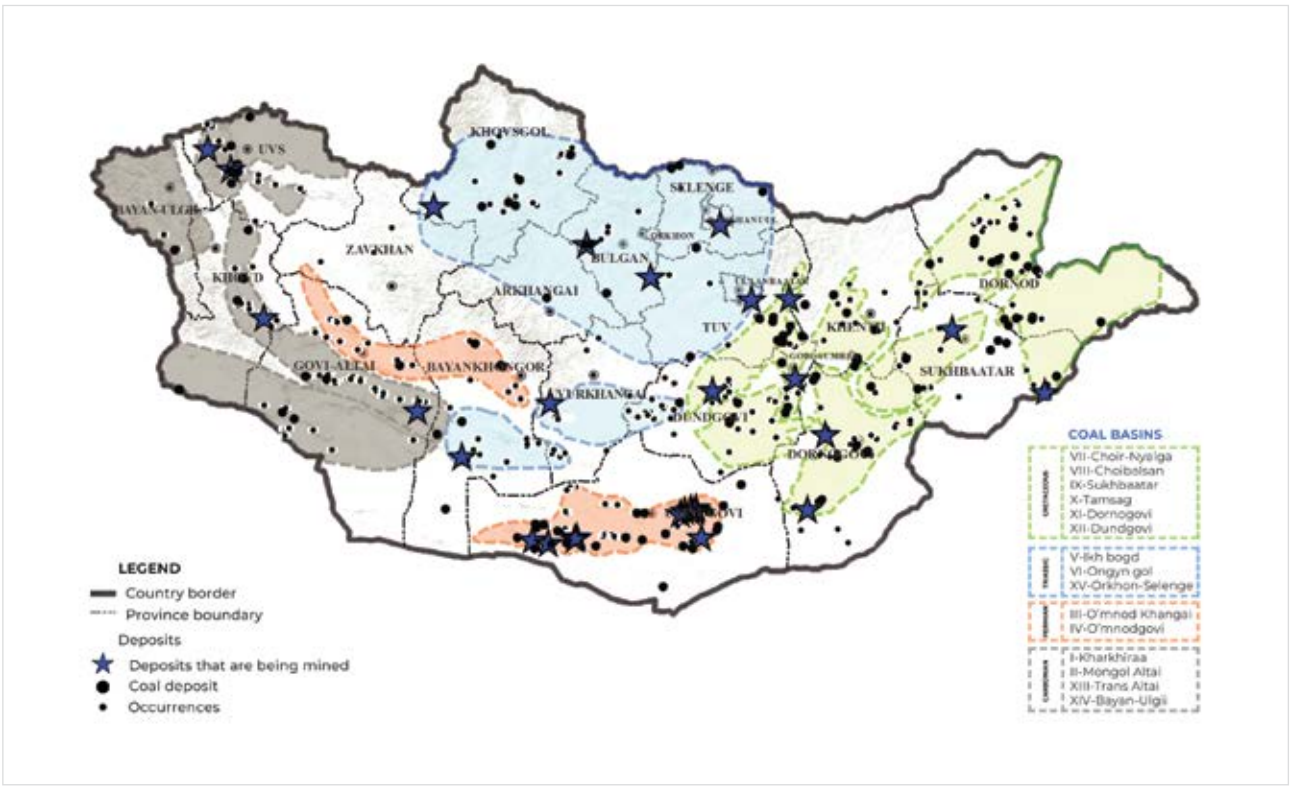
Mongolian Mining Corporation (also known as Energy Resource LLC) is the largest producer of washed hard coking coal in Mongolia. The company owns the Ukhaa Khudag deposit, a part of Tavan Tolgoi residual deposits, as well as the Baruun Naran coking coal deposit, both located in the South Gobi region, Mongolia.

In addition, multiple projects which include Southgobi Resources, Usukh Zoos, and Mongolyn Alt Corporation all operate at the Nariin Sukhait residual deposits, located over 400 km away from Tavan Tolgoi deposits, and all produce coal for export.

Nariin Sukhait deposits hold about 380 million tonnes of high-rank, low-ash, low-sulfur metallurgical, and steam coal resources.

Figure 1.66

LOCATION MAP OF COAL DEPOSITS AND OCCURRENCES IN MONGOLIA, SCALE 1: 12 000 000



Source: National Geology Survey of Mongolia

In the western part of Mongolia, Mongolia Energy Corporation (MEC) operates Khushuut Coking Coal Projects which is located approximately 1,350 km west of Ulaanbaatar in the Khovd Province of Mongolia. It is about 311 km from the Xinjiang Takeshiken border, connected by the Khushuut Road. The company, listed on the Hong Kong Stock Exchange, sells coking coal and thermal coal to Northern China.

Another highly prospective major coal deposit is Aspire Mining Limited's project.

Aspire Mining Limited is an Australian Stock Exchange-listed 100% metallurgical coal and rail company with a 100% interest in the world-class Ovoot Coking Coal Project and a 90% interest in the Nuurstei Coking Coal Project. Aspire's flagship Ovoot project, located in Khuvsgul Province of Mongolia, hosts 255 Mt JORC Coal Reserves.

The company has not yet started its coal project, postponing its implementation.

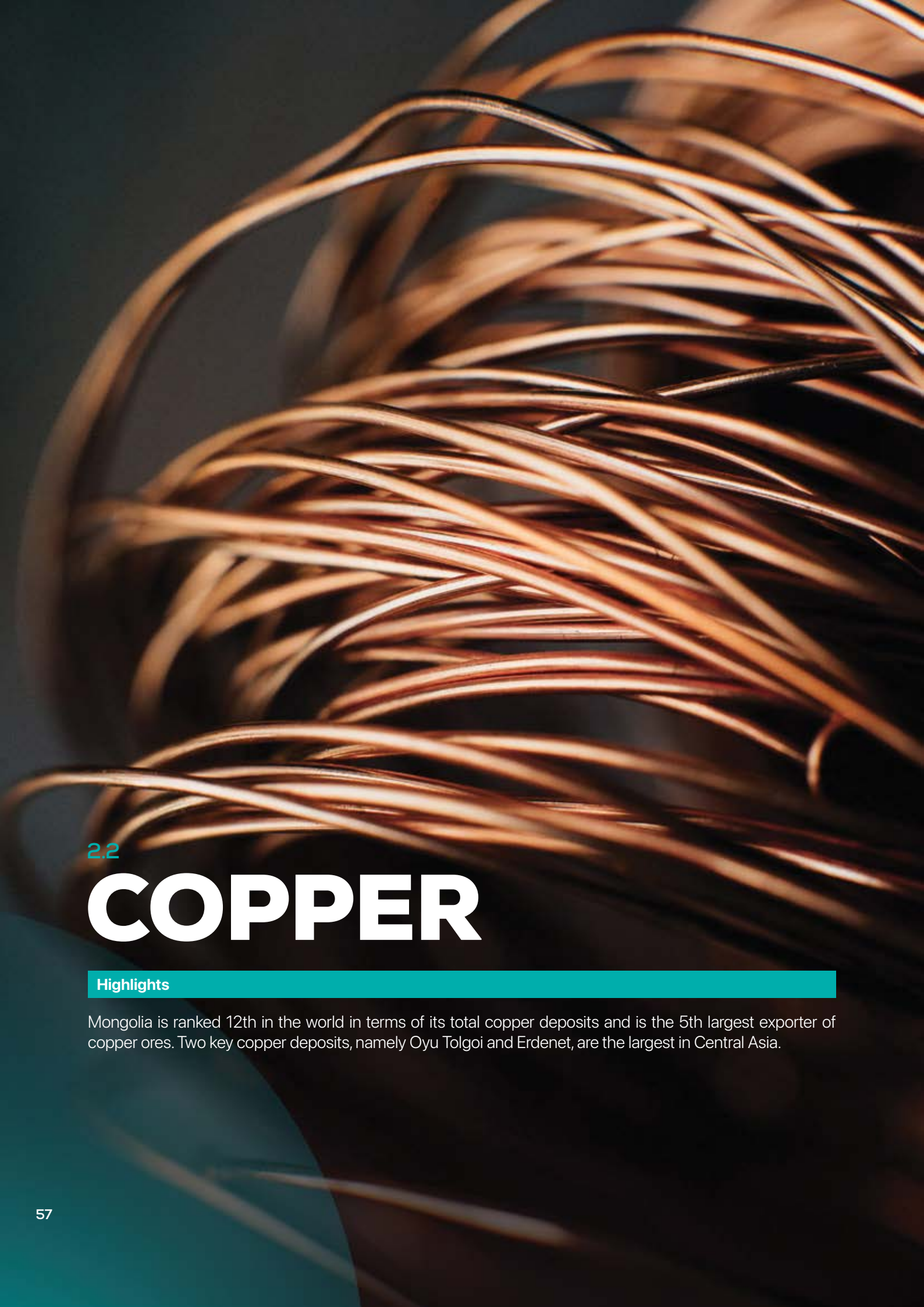
In 2022, The Mongolian Government completed new railway projects to boost exports of coal and other minerals. This includes a 267 km-long railroad in the Tavantolgoi-Gashuunsukhait route, 416 km-long railroad in the Tavantolgoi Zuunbayan route, and a 227 km-long railroad between Zuunbayan and Khangi port, as it was mentioned on the previous pages.

These railroads will have broad gauges. However, the key consumer market in China has a narrow-gauge railway network. Therefore, the two sides still need to agree on plans for track gauge conversion points and develop freight transfer terminals.

The Prime Minister of Mongolia L.Oyun-Erdene, during his visit to China in February 2022, negotiated connection points with the Chinese side. This setup favorable conditions for the continuation of the railroad projects.

The Prime Minister described the mutual agreement on the railway gauge conversion points as "a major undertaking, equivalent to the launch of the underground mine of Oyu Tolgoi project, that can expand Mongolia's export 2-3 times."

Mongolia's annual export of coal could reach 50 million tonnes with the implementation of these freight transfer terminals, announced the Minister of Mining and Heavy Industry of Mongolia.



2.2

COPPER

Highlights

Mongolia is ranked 12th in the world in terms of its total copper deposits and is the 5th largest exporter of copper ores. Two key copper deposits, namely Oyu Tolgoi and Erdenet, are the largest in Central Asia.

Copper plays a significant role in Mongolia's economy and its contribution to the mining industry in the overall economy is considered the third highest in the world, ranking the country above other mining-driven economies like Uzbekistan and Kazakhstan (joint 16th), Georgia (22nd), and Russia (23rd). The Rio Tinto-backed Oyu Tolgoi project is forecasted to become the world's 4th biggest copper producer by 2030.

Reserves & exploration

Mongolia has the 12th biggest resource of copper in the world with 53.4 million metric tonnes. The country is also 17th in terms of copper production and 5th worldwide in terms of copper ore exports. As of Q1 2021, there are 18 copper deposits across Mongolia with valid mining licenses. Of these, the biggest deposits are the Erdenet, Oyu Tolgoi, and Tsagaan Suvarga deposits.

In 2018, the National Development Agency estimated the value of Mongolia's copper reserves at about USD 529 billion based on the copper reserves and market prices at the time.

Exploration projects are progressing at a rapid phase, especially in the gold and copper porphyry belt of Southern Mongolia, where the Oyu Tolgoi and Tsagaan Suvarga projects are in operation. By way of example, the ASX-listed Xanadu Mines and TSX-listed Kincora Copper have been exploring the region for years.

Table 1.9

VALID COPPER MINING LICENSES (AS OF 2022)

	Mining Licenses		Share of Licenses in the Total Area	
	#	%	#	%
Copper	19	1.1%	86,141	4.9%
Gold (placer mine), copper	12	0.7%	85,491	4.66%
Copper, molybden	8	0.47%	14,328	0.8%
Copper, gold	5	0.29%	8807	0.5%

Source: MRPAM

Production & Export

In Mongolia, two main concentrators produce export copper concentrate - the Erdenet and Oyu Tolgoi projects. The country began exporting copper concentrates in 1970 with the establishment of the Erdenet mine which is the key deposit for copper concentrates. Copper exports accounted for 22.2% of total exports in 2013 when the Erdenet Plant was the only copper exporter. After Oyu Tolgoi became operational in the following year, 44.5% of total exports were copper, which increased to 49% in 2015.

Mongolian refined copper is supplied by both Erdmin LLC and Achit Ikht LLC.

Achit Ikht LLC exports processed copper cathode to China. Erdmin LLC produces copper cathode and copper products, such as copper wires, for domestic consumption.

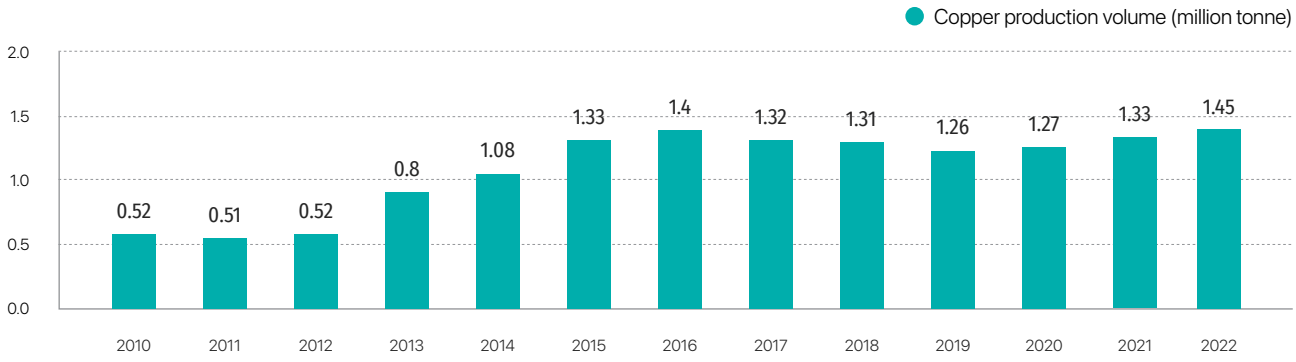
Looking forward, Mongolia is interested in refining copper concentrates and producing copper cathode. Therefore, the following two projects are included in the "Vision-2050" program:

- Inaugurating a copper refinery with an annual capacity of 124,100 tonnes near Erdenet Plant.
- A copper refinery project that will use copper concentrates of Oyu Tolgoi to produce copper cathode.

With new projects such as the Tsagaan Suvarga and Kharmagtai projects, Mongolia is expected to become one of the world's largest copper suppliers in the decades to come.

Figure 1.67

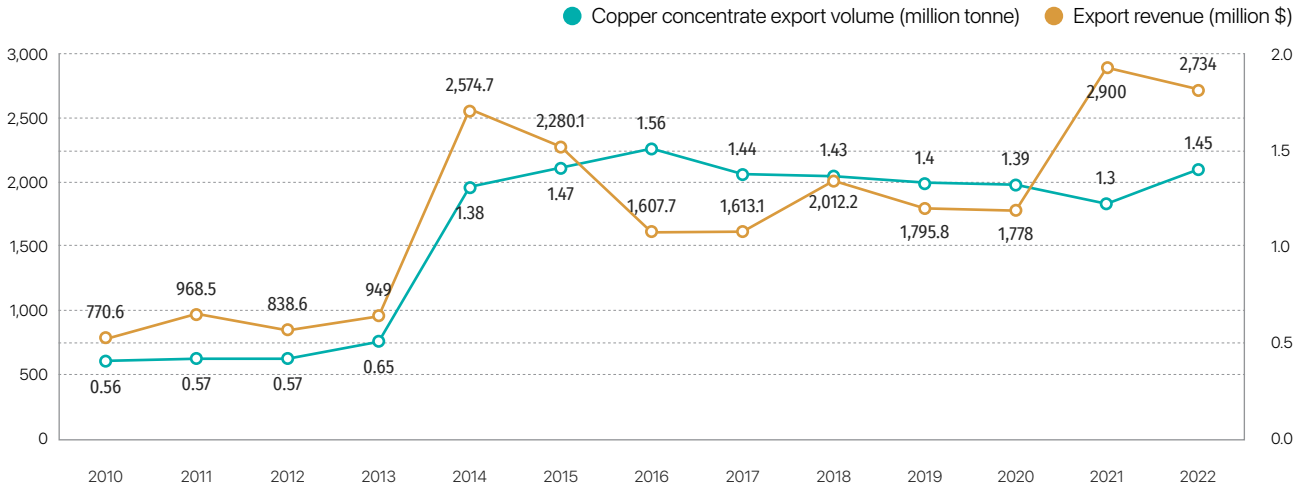
COPPER PRODUCTION VOLUME (MILLION TONNE)



Source: NSO of Mongolia

Figure 1.68

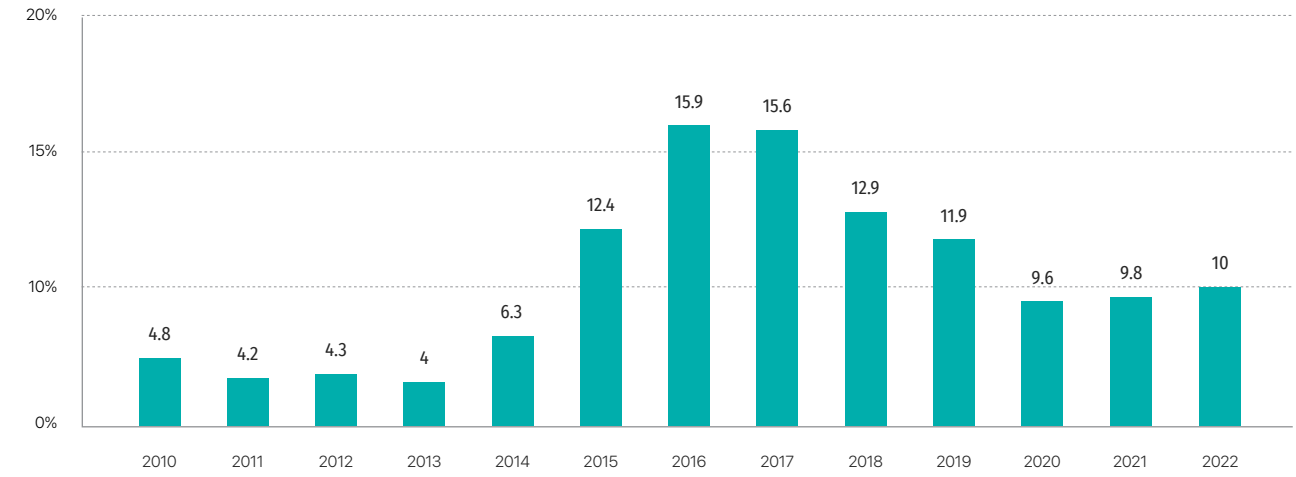
COPPER CONCENTRATE EXPORTS VOLUME (MILLION TONNE) AND REVENUE (MILLION $)



Source: NSO of Mongolia

Figure 1.69

COPPER CATHODES, 99% (TONNE)



Source: NSO of Mongolia

Mongolia exports 100% of its copper concentrates to the Chinese market via road and rail. The Erdenet plant uses the Erdenet-Zamyn-Uud route while the Oyu Tolgoi plant delivers via the Oyu Tolgoi- Gashuunsukhait road route for exports.

Chinese demand for Mongolian copper concentrate is expected to continue to be strong in the mid and long term.

Figure 1.70

COPPER EXPORTS ROUTE

31.3%
of total export

100%
of the products are exported to China.

34%
of total minerals export

62.9%
of fiscal revenue from the mining sector (as of 2021)

Oyu Tolgoi	
Location:	**Khan-Bogd, Umnugobi Province, Mongolia**
Ownership:	Erdenes Oyu Tolgoi LLC - 34% (Government of Mongolia) Rio Tinto - 66%
Operations:	Active
Commencement:	Open-pit mine - 2013 Underground mine - 2023
Mineral reserves:	Copper and gold
Production Capacity:	100 kt p/a
Total number of employees:	14,400 (as of 2021)
Infrastructure:	Concentrator, open-pit mine, underground mine

Figure 1.71

COPPER CONCENTRATE PRODUCTION

(thousand.t, by dry weight)

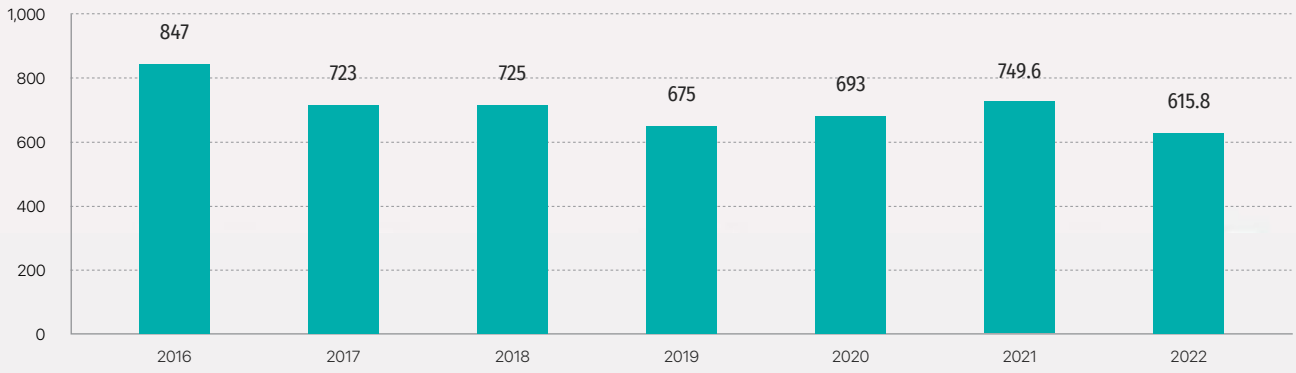
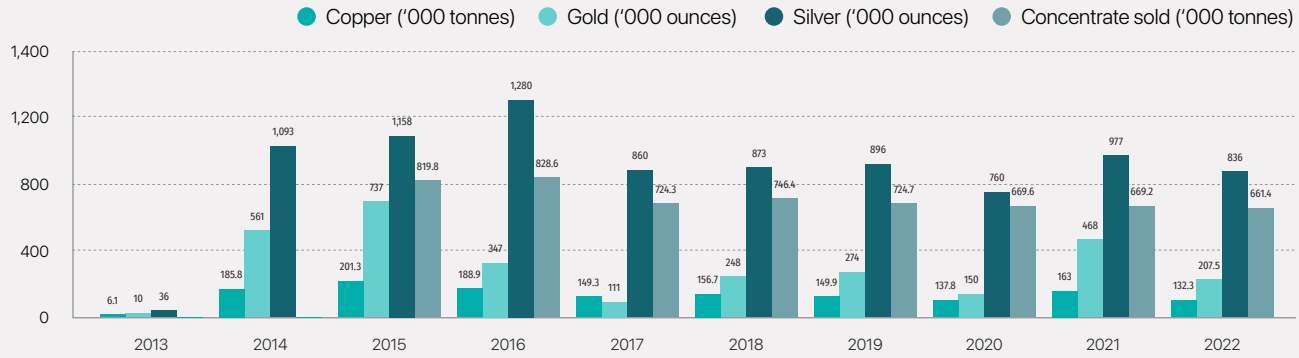


Figure 1.72

COPPER CONCENTRATE SALES



Highlights:

Oyu Tolgoi is known to be one of the largest deposits of copper and gold in the world. The Mongolian government owns a 34% stake in Oyu Tolgoi (OT), while the rest is controlled by Rio Tinto, the second-largest mining company in the world, which operates the mine. In 2022, Rio Tinto invested $3.1 billion and completed the acquisition of 49% of Turquoise Hill Resources, which previously owned 66% of Oyu Tolgoi. Rio Tinto CEO Jakob Stausholm stated that "Oyu Tolgoi is a remarkable asset with talented people that will bring significant long-term value for both Rio Tinto and Mongolia."

The Oyu Tolgoi project is located approximately 550 kilometres south of Ulaanbaatar, and 80 kilometres north of Mongolia-China border. The property is cut by the Oyu Tolgoi trend, a 12 kilometres north-south oriented corridor which is host to the known deposits, Hugo North, Hugo South, Oyut and Heruga. Open-pit mining operations commenced at Oyut in 2013. The Hugo North depost is currently being developed as an underground operation.

The copper concentrator plant, with related facilities and necessary infrastructure, was originally designed to process approximately 100,000 tonnes of ore per day from the Oyut open pit. However, since 2014, the concentrator has consistently achieved a throughout of over 105,000 tonnes per day due to improvements in operating practices.

"Rio Tinto strongly believes in the long-term success of Oyu Tolgoi and Mongolia"
Jakob Stausholm, CEO of Rio Tinto

Production of the underground mine is planned to start in the first half of 2023.

From 2028 to 2036, the project is expected to have an average production of 500,000 tonnes of copper a year from both open pit and underground operations, compared with 163,000 tonnes in 2021 from open pit operations.

With the commencent of the OT project, large inflows of foreign investment has been come to Mongolia since 2011. Between 2010 and 2020, the OT project invested $11.6 billion in Mongolia. Rio Tinto and the Government of Mongolia renegotiated the deal several times over the progress of the project due to implementation process and excess cost.

"Rio Tinto strongly believes in the long-term success of Oyu Tolgoi and Mongolia, and delivering for all stakeholders over the long-term. The transaction will simplify the ownership structure, and further strengthen Rio Tinto's copper portfolio," Rio Tinto's Chief Executive Director Jakob Stausholm said in a statement.

Prioritized safety and achieved an All-Injury Frequency Rate (AIFR)

OF 0.14 PER 200,000

PEOPLE/HOURS WORKED.

Achieved an average water-recycling rate

OF 89.1%, COMPARED TO A TARGET OF 80%.

Source: Oyu Tolgoi LLC

Erdenet Mining Corporation SOE

The Erdenet Mining Corporation (EMC) once used to provide a third of the Mongolia's fiscal revenue before Oyu Tolgoi mine project commenced. Nowadays EMC plant annually produces 37m tonnes of copper ore, about 580,000 tonnes of concentrates, up to 5000 tonnes of molybdenum, and processing 32m tonnes of copper ores.

ERDENET MINING CORPORATION, SOE

The production contract was extended by an additional 30 years owning to the fact that geological exploration conducted between 2017 and 2019 discovered an additional $21.2m worth of minerals.

EMC SOE supplies 3% of all copper traded in global markets, and 5% of molybdenum concentrates, and is ranked 6th in Asia with its copper production capacity.

ERDENET MINING CORPORATION – KEY INDICATORS

Total output, 2020
36.9 mt ore

Processed amount
32.5 mt ore

Share of Mongolia's GDP
5.1%

Number of employees
6,586 or 0.6%
of total employment rate

Share in total exports
10%

Share in the mining industry
22.2%

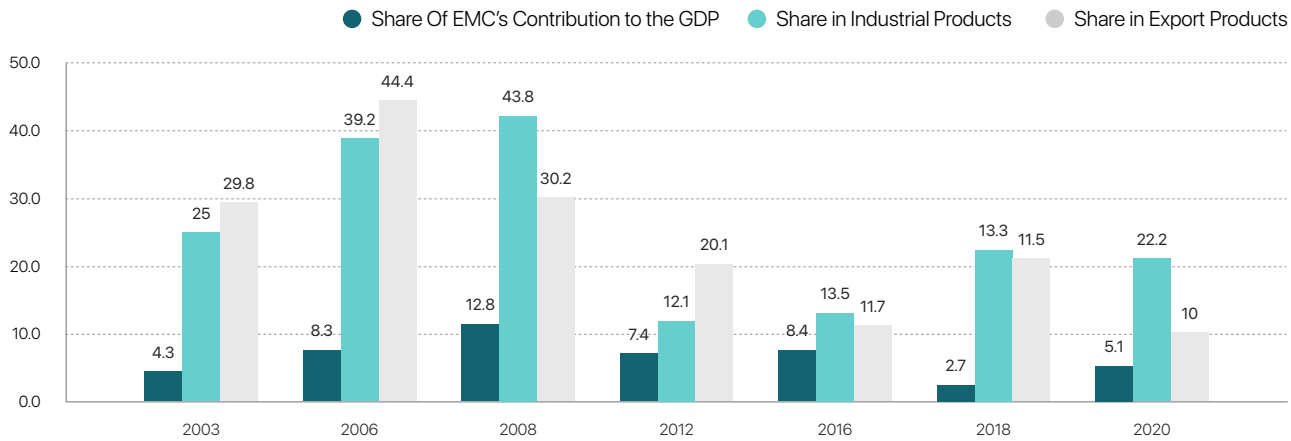
Development Plan:

- Investments worth $68.7m will be made to increase copper and molybdenum mining between 2019 and 2031
- $68.4m will be spent on introducing downflow technology in the open-pit mining cycle
- $230m will be used for the expansion and upgrading of the processing plant
- Project on processing oxidized and low-grade ore using leaching technology
- $21.7m will be invested in the project on expanding and renovating the maintenance plant between 2017 and 2021

Figure 1.73

CONTRIBUTION TO THE ECONOMY (IN %)

Extraction of high-grade copper and gold is expected to continue until 2021



Aranjin Resources

Aranjin Resources Limited is an emerging copper exploration company with a focus on Mongolia. The company has three highly prospective projects across Mongolia, including Sharga, Bayan Undur and Victory Discovery at Baavhai Uul Project with 80% interest through JV agreement with ION Energy.

ARANJIN RESOURCES
ARANJIN RESOURCES LTD (TSXV: ARJN)

Highlights:

01. Proven in-country team

The Management and Board of Aranjin have an unrivalled track record in developing and scaling mining projects - Hunnu Coal sold to Banpu Coal for $500m and Steppe Gold, now Mongolia's top gold producer.

02. Highly propsective exploration portfolio

The Company now has three highly prospective projects across Mongolia. Drillin commenced and is in progress on Sharga, Bayan Undur and Victory Copper Nickel Discovery at ION Energy's Baavhai Uul, through a JV agreement with Aranjin Resources.
Highly-encouraging results at Sharga asset.
Strong indications at the Victory Discovery show significant copper and nickel anomalies.

03. Compelling location for Copper Supply

China's preferred source for copper will be Belt and Road countries like Mongolia. Strong supply chains for copper concentrate already established through Oyu Tolgoi. Aranjin's projects, Sharga and Bayan Undur, as well as the Victory Discovery are close to the Chinese border.

04. Strong support for mining in Mongolia

The pro-mining government, supported by a political party with a majority in parliament, is offering robust support for foreign investment, the mining industry, and the infrastructure required.

Table 1.10

ARANJIN RESOURCES – KEY INDICATORS

	Sharga Copper Project	Bayan Undur	Lithium & Copper: A Battery Metals Strategic Alliance
Location	The Sharga Project is located in the Sharga Soum of Gobi Altai Province and 80 km from the Altai city and only 20km away from key roads linking Altai to China. The accessibility to the Project area is well developed including paved road to Altai City.	Located in Bayan Undur Soum of Bayankhongor Province, 980 km south-west of Ulaanbaatar.	Strong indications at ION Energy's flagship Baavhai Uul, show significant Copper and Nickel anomalies; Located in Sukhbaatar Province, only 24km north of China.
Area	9,000 hectares	Four mining licenses with a 30-year term. Covers a total area of 2,773 hectares.	
Exploration	East Sharga Discovery SHD001 – 37.8m at 0.95% copper, 1.37g/t gold and 6.8g/t silver from 132.6 meters West Sharga Discovery SHD002 – 11m at 0.15% copper and 0.12g/t gold from 28 meters."	• $10m in prior exploration work • Geochemical sampling (3,968 samples) 1,973.52 m3 of trenching with 137 channel samples • 57,446.8m (546 drill holes) and RC drilling with 14,215 core samples • Laboratory analyses of 22,705 samples Topographic survey at scale of 1:1000 • Ground magnetic survey covering the wholeproject Area IP survey of 125.2m in total	• Initial auger geochemical drilling with 814 holes completed at the Baavhai Uul Copper Project has highlighted a significant copper nickel geochemical discovery, under very shallow alluvial cover. • Results up to 1,252ppm copper and 494ppm nickel in weathered gabbroic clays, and extensional auger geochemical drilling will soon commence. • Potentially a new copper nickel province with over 25 copper nickel anomalies highlighted in auger geochemistry and ground magnetics across the Project.

2.3

GOLD

1. Highlights

The gold industry provides a considerable contribution to Mongolia's foreign exchange reserves and significantly weighs on export revenues; thus, it is considered an industry of high economic importance for Mongolia. The central bank of Mongolia, with an aim to support gold miners, implemented the "Gold" financing program three times since 1992, dispensing crucial support for the sector.

Since 1992, the gold production and mining in Mongolia has increased 26 times and the gold purchase by the central bank grew 10 times in the last decade. Gold industry accounted for 10% of mining production and 24% of Mongolia's total export revenue in 2020. However, as of 2021, the sector accounted for 11% of export revenue, and 13% of foreign exchange reserves.

2. Reserve

Mongolia's residual gold reserve, including placer deposits, hard rock deposits, and other gold-bearing metal deposits, amounted to 1,587 tonnes as of 2018.

Registered gold reserves

Types of deposit	1991		1997		2014		2020	
	Number of deposits	Reserve, t	Number of deposits	Reserve, t	Number of deposits	Reserve, t	Number of deposits	Reserve, t
Placer deposit	156	90.3	498	206.25	608	27.6		
Hard rock deposit	15	50.2	31	127.8	74	224.2		
Other gold-bearing metal deposits	-	-	-	-	17	1101.3		
Total	**171**	**140.5**	**529**	**334.05**	**699**	**1353.1**		

There are numerous placer deposits registered in Mongolia. But the share of placer deposits in the total discovered reserves of gold is relatively small. On top of that, exploration activities drastically reduced since the enactment of a "The Law with the Long Name" that prohibited gold mining activities near rivers and ponds. As a result, mining activities in placer deposits have continually shrunk. In terms of location, numerous placer deposits of gold were registered in the central region provinces, including Tuv, Selenge, Bayankhongor, and Darkhan-Uul.

In order to increase the overall production of gold, the Government of Mongolia is strongly supporting the deployment of advanced technologies in major deposits for average capacity instead of utilizing low-yield small mines.

The number of registered hard rock deposits in Mongolia is the highest in Selenge, Tuv, and Umnugovi provinces. From the major mines, Boroo and Gatsuurt deposits are already depleted.

Major hard rock gold deposits

	Deposit name	Province	Soum	AM
1	Altan Tsagaan Ovoo	Dornod	Tsagaan-Ovoo	Au
2	Bayan Airag	Zavkhan	Durvuljin	Au
3	Bayan-Undur	Tuv	Bayan	Au
4	Bayan-Uul	Tuv	Delgerkhaan, Buren	Au
5	Boroo	Selenge	Bayangol	Au
6	Gatsuurt	Selenge	Mandal	Au
7	Naran Tolgoi	Tuv	Jargalant	Au
8	Olon Ovoot	Umnugovi	Mandal-Ovoo	Au
9	Undur Naran	Dornogovi	Saikhandulaan	Au
10	Urkhut	Bayankhongor	Bayangovi	Au
11	Kharmagtai	Umnugovi	Tsogttsetsii	Au
12	Tsagaan Chuluut	Dornod	Bayandun	Au
13	Ereen	Selenge	Mandal	Au
14	Bayan Khundii	Bayankhongor	Shinejinst	Au

Figure 1.74

GOLD DEPOSITS IN MONGOLIA

Other gold-bearing metal deposits include copper, lead, and zinc deposits. The majority of the country's discovered resources of gold are incorporated in these deposits. By far, the biggest one in terms of size is Oyu Tolgoi. The copper-gold deposit of Oyu Tolgoi alone has a total of 1,028 tonnes of gold resources. In addition, 810 tonnes of additional gold reserves, which can be used in certain circumstances, have been registered at the Oyu Tolgoi deposit.

In 2020, most of the newly registered hard rock gold deposits were in Zavkhan, Umnugovi, and Bayankhongor provinces, whereas most of the placer gold deposits were located in Tuv, Selenge, Khentii, and Bayankhongor aimags. Among these, several major gold deposits were registered in 2020, including:

Khoid Burged deposit in Umnugovi province	Khan-Altai deposit in Govi-Altai province	Zos Uul deposit in Zavkhan province
53.1 tonnes	**40.06** tonnes	**11.8** tonnes

Placer gold mining licenses account for the majority of valid licenses, while hard rock deposits account for about 90% of total gold reserves. In recent years, the number of hard rock gold minig projects, including the Altan Tsagaan Ovoo, Bayankhundii and Tsagaan Tsakhiur, operated by foreign invested companies have been increasing thanks to FDI inflow.

3. License & Exploration

Gold mining license:

Throughout Mongolia, there are 462 valid mining licenses for placer mines and 92 for hard rock deposits of gold. In addition, licenses for gold-bearing metal deposits remain valid. In terms of quantity, placer gold accounts for the largest share of all mining licenses, accounting for 26%.

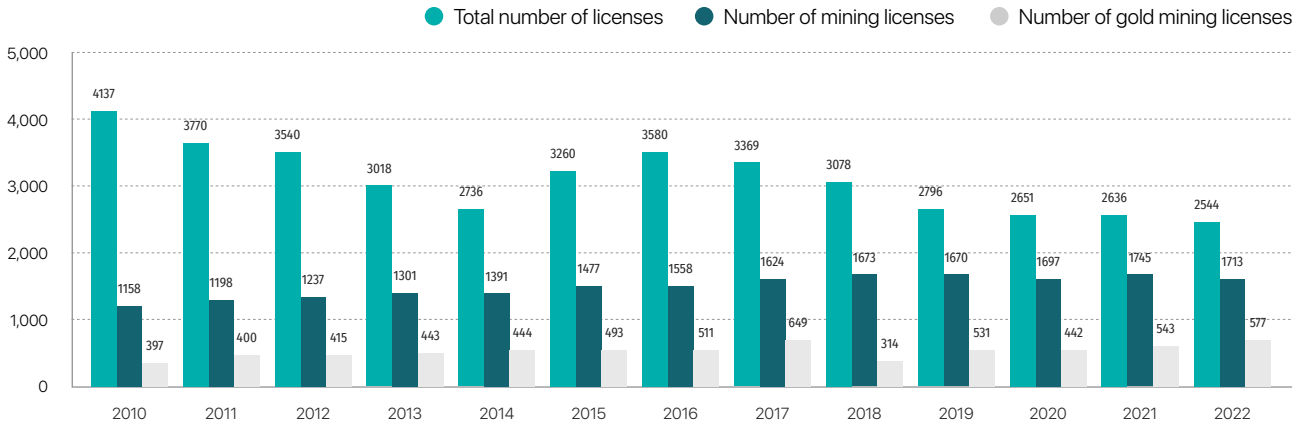
The number of valid mining licenses and effective area as of 2022

	Mining licenses		Area size	
	Number	Percentage	Number	Percentage
Total	**1713**	**100%**	**1,836,487.3**	**100%**
Gold (placer)	462	26.97%	184,223.3	10.03%
Gold (hard rock)	92	5.37%	124,153.1	6.76%
Gold (placer) and Copper	12	0.7%	85,491	4.66%
Copper and Gold	5	0.3%	8,807.4	0.5%
Gold (placer) and polymetals	3	0.2%	17,320.6	1.0%
Gold (placer) and Silver	3	0.2%	9,587.7	0.5%

Source: MRPAM,

Figure 1.75

NUMBER OF GOLD MINING LICENSES



Source: MRPAM

Gold exploration

The number of mineral exploration licenses has been declining, especially since 2018. This is due to the prohibition of request or application-based process of exploration licenses. Today, exploration licenses are only granted by way of tender organised by the Government agency. All licenses to be issued in competitive bidding causes a huge delay in the process and provides lack of transparency, leading to a reduction in the number of new licenses. The 159 exploration licenses have been issued within two and a half years since 2019, which is relatively low, therefore, the government is paying attention to adjusting.

Furthermore, Covid-19 has caused a global investment fall which had a drastic impact on foreign direct investment in the mineral exploration sector in Mongolia.

In terms of geological study in Mongolia, the southwestern region of the country belongs to the Central Asian Orogenic Belt which includes the largest known economic gold accumulations after South Africa. The zone includes several known major gold deposits, including Oyu Tolgoi, Kharmagtai, Bayankhundii, Altan Nar, and Uudam Khundii. However, the number of geological surveys is fairly limited in the zone.

Within the frames of the "Gold 2" program, a geological study of gold "BUM Alt 2019" is being carried out in the west and southwest regions, covering almost a third of Mongolia's territory. Successful completion of the survey will allow for a shorter and low-cost exploration of deposits and reserves.

Provinces under the geological study are Bayan-Ulgii, Uvs, Khovd, Zavkhan, Govi-Altai, Bayankhongor, Uvurkhangai, Arkhangai, Khuvsgul, Bulgan, Dundgovi, and Umnugovi.

Source: The National Geological Office of Mongolia

The existing major gold mines are mainly discovered as a result of many years of exploration and geological study. For example, the Altan Tsagaan Ovoo project of Steppe Gold in Dornod Province, was first discovered 18 years ago. Erdene Resource Development carried out exploration in the areas of the Bayankhundii gold mine for 16 years. Tsagaan Tsakhir hard rock gold mine of Naran Mandal LLC was also discovered by an exploration conducted between 1950 and 1960.

4. Production & Export

Gold production

In Mongolia, there are several major gold mines in Tuv, Selenge, and Umnugovi provinces. Also depending on the locations of placer mines, gold production is mostly centered in Selenge, Tuv, Uvurkhangai, Bulgan, and Bayankhongor provinces.

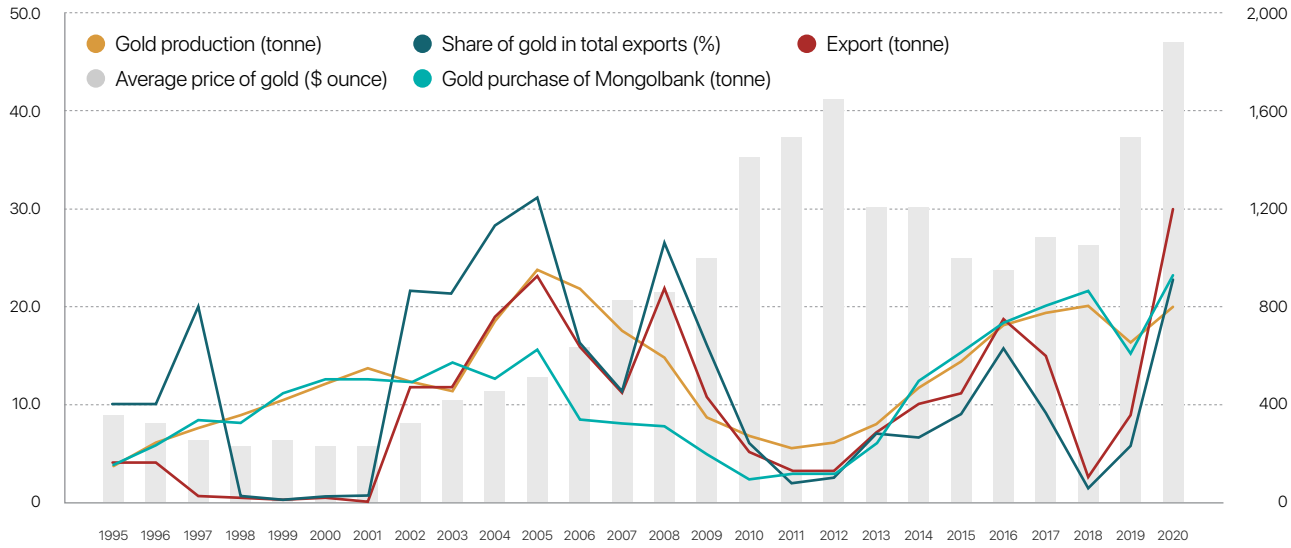
Mongolia's gold production shrank in 2007-2013 when the price of gold was high in the global market. The overall output, which was 17.5 tonnes in 2007, fell to a third of this amount in 2011 to 5.7 tonnes. This peculiar drop in production amid high prices was because of the unfavorable legal environment created by an enactment of a particular law in Mongolia, which also caused shrinkage in explorations.

Gold production then started to pick up in 2012-2013. Since the beginning of 2011, the Mongolian government has been paying special attention to create a favourable legal environment, especially in the gold sector. Also, the royalty rate, which was 10 percent, was lowered to 2.5 percent to incentivize miners to sell their gold to the central bank. These were significant supports that boosted gold output and the central bank's gold purchase.

Plus, the "Gold-2" program implemented in 2017 offered soft loans to gold miners and as a result, gold production started to pick up.

Figure 1.76

GOLD PRODUCTION, EXPORT AND CENTRAL BANK'S GOLD PURCHASE IN MONGOLIA



Source: NSO of Mongolia, Customs Office of Mongolia, Mongolbank, World gold council

Gold purchase by the Bank of Mongolia

As stated in the Law on Minerals, gold mined within the territory of Mongolia must be sold to either the Bank of Mongolia or its partnering commercial banks. The central bank purchases gold at global market rates. The new gold testing laboratories in Darkhan-Uul and Bayankhongor provinces were also established which have improved the transparency of gold trades and increased turnover. Plus, the improved tax environment and the impact of "Gold" financing programs to support gold miners has made a positive impact on the gold sector.

In the last 5 years, about 100 tonnes of gold was purchased by the Bank of Mongolia, bolstering foreign exchange reserves by $3.7 billion. The annual gold purchase of the Bank of Mongolia reached its historic high of 23 tonnes in 2020, which is 23 times higher than the total amount of 1990.

Figure 1.77

MONGOLBANK'S GOLD PURCHASE, REVENUE FROM GOLD, FX RESERVES, AND SHARE OF GOLD IN FX RESERVES

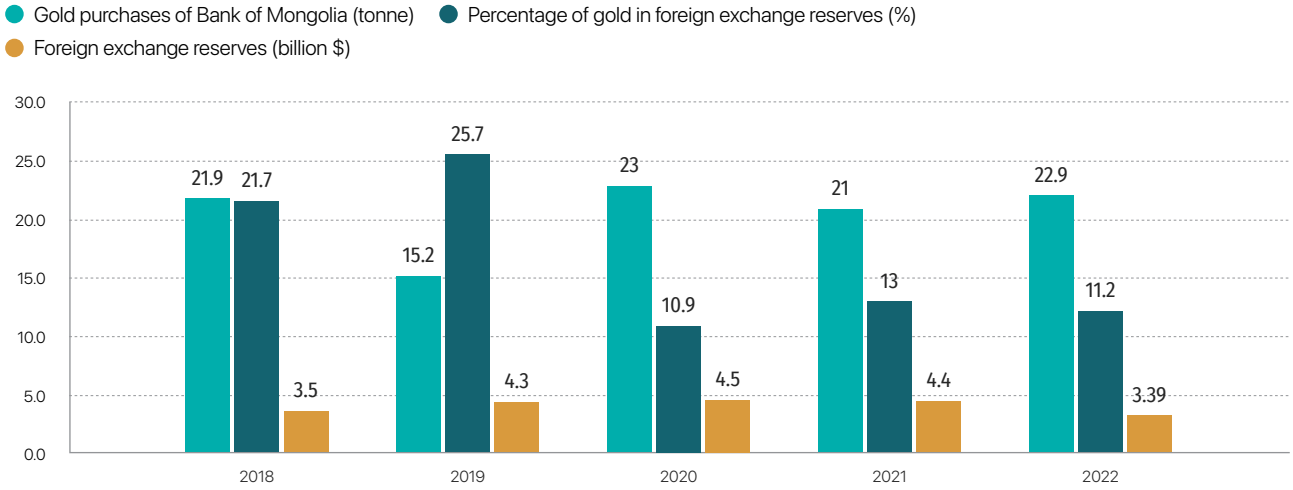
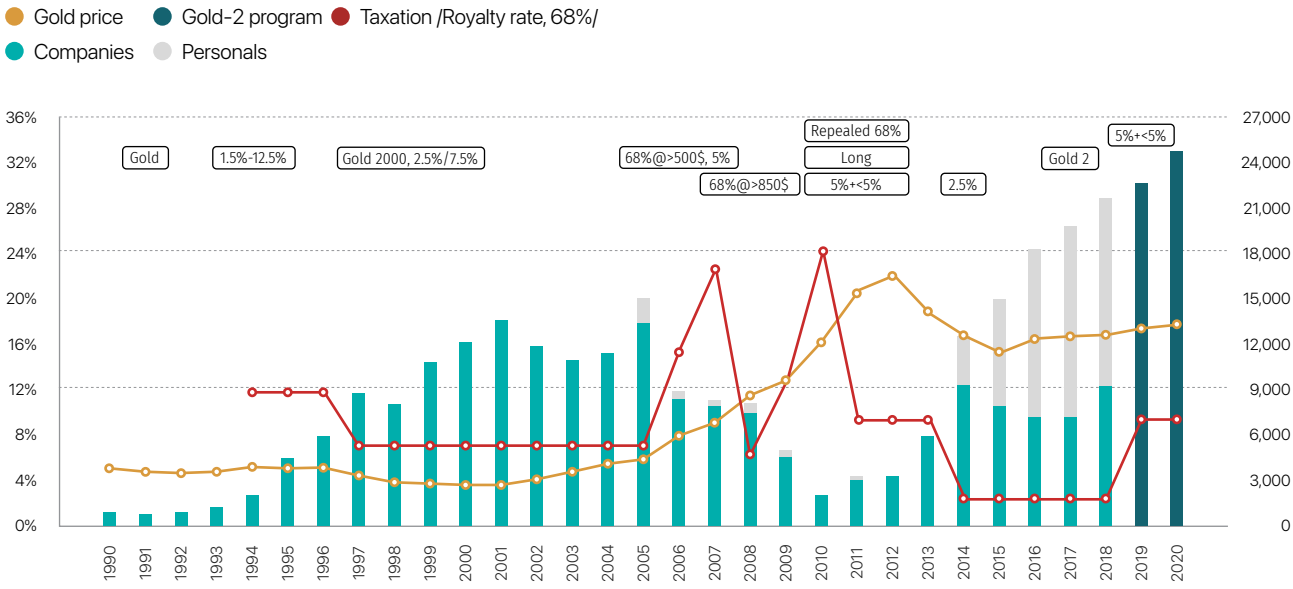


Figure 1.78

CENTRAL BANK'S GOLD PURCHASE, GOLD PRICE AND LEGISLATIVE CHANGES



Source: The Bank of Mongolia

- 1991: "Gold" program first launched
- 1994: Royalty rate is set at 1.5-12.5% in accordance with Minerals Law of Mongolia
- 1997: "Gold 2000" program launched
- 1997: Revised Mineral Law of Mongolia set royalty rate of hard rock mining at 2.5% and placer gold mining at 7.5%
- 2006: Revised Mineral Law of Mongolia set royalty rates at 5%
- 2006: Legalized tax rates of up to 68% in case price reaches $850 per ounce in accordance with Special Product Price Increase Tax Law
- 2008: Legalized tax rates of up to 68% in case price reaches $850 per ounce in accordance with Special Product Price Increase Tax Law
- 2009: Parliament passed the Law on the Prohibition of Minerals Exploration and Mining in Headwaters of Rivers, Protected Water Basins Zones and Forested Areas (the Long-named law)
- 2010: Revised Mineral Law of Mongolia legalized additional royalty rate of 5 % in case of price increase above $900 per ounce
- 2011: Repealed Special Product Price Increase Law (68%)
- 2014-2019: Royalty rates were kept at 2.5% in accordance with revised Mineral Law of Mongolia
- 2017: "Gold 2" program started
- 2019: Royalty rates increased to 5%, additional royalty set to 0%.

Gold exports

Mongolian gold is exported in two types of forms as pure gold and gold concentrate.

Mongolian gold export increased till 2008, and then dramatically dropped because of lower gold output as well as changes in policy and regulations in the sector. Even though the world gold price increased by 80% between 2008 and 2012, revenue of the gold export was significantly lower. The gold exports have rebounded since 2011 due to favorable changes in regulations and improvements in the world gold market.

According to the Economic Research Institute (ERI), Canada was the major destination of Mongolian gold during the period between 2010 and 2013. This is related to the fact that the Centerra Gold bakced Boroo Gold LLC sends its production directly to refineries in Canada.

Mongolia's pure gold export reached its peak in 2020 alongside the spread of Covid-19 pandemic, exceeding 30 tonnes for the first time, and as a result, revenue from gold exports reached $1.7 billion. In terms of physical amount, exports increased by 28 percent compared to 2005 while the revenue jumped 439%.

Mongolia exports the majority of its gold to two countries. In 2022, 92 percent was exported to Switzerland, and 8 percent to South Korea. The share of gold earnings in total exports accounted for 9 percent in the same year.

Oyu Tolgoi is the main exporter of gold concentrate whose main destination is China. It is indeed one of the largest copper-gold mine projects in the world and the company's gold sale in concentrates was 270,500 ounces in 2022.

5. Legal environment, policy framework, and regulatory agencies

Legal environment related to the gold industry

Mongolian government carried out several policy measures in the gold sector since 1990.
"Gold-1" financing program: Thanks to the investment attracted within the frames of "Gold-1" in 1992-2000, the annual gold output was increased from 0.7 tonne to 11.0 tonnes and several placer mines became operational, accumulating a significant amount of tax revenue and contribution to the sector development. In the beginning of 1990s, gold miners used to not take enough rehabilitation measures. In 1995-1997, certain actions, including environmental assessments and technical rehabilitation, were carried out by gold mining private entities.

In the early 1990s after the fall of the Soviet regime, the country faced the challenge of creating economic opportunities for its rural population and urban unemployed. It led to an increase in the number of artisanal miners which were later estimated to be around 100,000 full time and part time artisanal and small-scale miners in Mongolia. They became more widespread in gold placer mines in Sharyn Gol, Zaamar and Bayankhongor. The artisanal miners generally used mercury and occasionally cyanide for gold extraction without understanding the risks for their own health and the natural environment.

"Gold-2000" program: The development of the gold industry reached a new level in 2000-2010 and the annual output at the national level hit 24.1 tonnes, of which over 40 percent were mined from hard rock deposits. However, gold mining operations significantly declined later in the decade due to the enactment of "Windfall Tax on Some Products". The purpose of this law was to impose a tax on the additional income generated from increased prices of some minerals, including gold.

"Gold-2 program": The program was approved in 2017 to support the foreign exchange reserves of the Bank of Mongolia, and as a result the bank purchased 18.6 tonnes of precious metal in 2016, 20 tonnes in 2017, 21.9 tonnes in 2018, 15.2 tonnes in 2019, and a historic amount of 23.6 tonnes in 2020, amassing about $900 million to the foreign exchange reserves.

"State policy on mineral resources sector": The policy framework was approved by the Mongolian Parliament in 2014 and serves as the basis for developing the gold industry, and related laws and regulations.

2014 amendments to the Law on Minerals had a positive impact on the gold purchase of the Bank of Mongolia. The approval of the Law on Repealing the Law on Windfall Tax on Some Products in 2011 and the 2014 amendments to the Law on Minerals, which reduced the royalty on

gold from 10 percent to 2.5 percent, helped create transparency on gold trades and had a positive impact on gold purchase and exports. The Law on Minerals was amended once again in 2019 to set the royalty on gold up to 5 percent. The increase in tax did not reduce overall turnover.

Furthermore, 30 percent of revenue from royalties and 50 percent of fee income from exploration and mining licenses are now allocated to the local budget. This was an important step in promoting cooperation between gold miners and the local community.

Regulative agencies in the gold industry

The Ministry of Mining and Heavy Industry is the central body of the state in charge of policymaking, monitoring, and coordination of stakeholders in the mining sector.

The Mineral Resource and Petroleum Authority of Mongolia is an implementing agency under the Ministry of Mining and Heavy Industry. The agency develops mining policies, provides support on policy enforcement, collects information and data regarding gold mining activities, implements policy guidance, and offers licensing services.

Mongolbank - the Bank of Mongolia or the central bank manages the purchase, sale, storage, and refining of gold in accordance with the Treasury Law. Private entities and artisanal miners engaged in gold mining activities, as well as third-party intermediaries, are obliged to sell their gold to the central bank or its partnering commercial banks as specified in the Treasury Law. The purchasing price of the Bank of Mongolia shall be referenced from the London Metal Exchange.

Moreover, the Bank of Mongolia has the right to store gold on its own or in other foreign correspondent banks. It is also the only legal entity with the right to export gold in Mongolia.

The Bank of Mongolia makes gold payments based on the results of the analysis of gold and silver content in molten gold in the Precious Metals Laboratory of the Probation Inspection Agency and deducts 5 percent royalty under the seller's identification and transfers it to the General Department of Taxation.

With an aim to boost the implementation of the Gold-2 program, the Bank of Mongolia is providing long-term down payments and financing to gold mining companies that can be repaid in gold. The financing is offered in two forms. First, a short-term working capital financing of up to 6 months. Second, an investment financing of up to 24 months.

Agency for Standardization and Metrology - The Assay Office is responsible for the identification, quality control, registration, and monitoring of gold samples.

6. The opportunity of developing a gold refinery

The gold mined and processed in Mongolia has an average grade of 90 percent, which needs to be purified to 99.99 percent to be sold on the international market.

The country has been refining its gold in other countries, such as Russia, the United Kingdom, and Japan. As the production of gold increases and several new hard rock and placer mine projects are becoming operational, the government views that a domestic gold refinery is needed.

About 2 percent of gold is either lost or goes to waste when refining in other countries and the estimation of other metal contents, such as silver and platinum, gets complicated according to the "Gold 2025 Program Baseline Study Report" published in 2015. Furthermore, transportation, insurance, and protection costs and duration of refining gold are higher abroad and highly complex.

It is impossible to export, pledge, and trade gold that is not purified under the world standard of pure gold in a refinery guaranteed by the London Metal Exchange's certification.

Regardless, the country had a plan of building its own gold refinery for some time. Several meetings were held with a Swiss gold refinery Argor-Heraeus SA in 2019 to study the business operations of accredited refineries of the London Bullion Market Association. Also, a state-owned enterprise Erdenes Alt Resource obtained a patent for gold refining technology from a gold refinery in Kazakhstan. However, the refinery project is not on board at present.

STEPPE GOLD
Mongolia's Premier Precious Metals Company

TSX: STGO | **OTCQX: STPGF**
www.steppegold.com

MONGOLIA'S PREMIER PRECIOUS METALS COMPANY

Flagship project: Altan Tsagaan Ovoo
Location: Eastern region of Mongolia

Steppe Gold is Mongolia's premier precious metals company that already commenced production and is projected to produce +80,000 ounces of gold from the operational oxide zone of the ATO Gold Mine in 2023/2024. The Company has completed a feasibility study for expansion of ATO Gold Mine to produce **100,000 ounces of gold equivalent per annum** by developing the underlying fresh rock ores.

Altan Tsagaan Ovoo (ATO) Gold Mine

Fully permitted and commenced gold production in 2020.

Phase 1:
Steady & growing production from oxide heap leach operation
+80,000 oz of gold in 2023/2024

Phase 2:
Under development
100,000 oz of Au Eq per annum
+12.5-mine life
First concentrate production from Phase 2: Q1 2025

Key Financial Metrics:

NPV After-tax: $242M

Site AISC: $915/oz

LoM Phase 1&2 = 14 years

CAPEX Phase 2: $128M

Total Gross Revenue: $2.2B

Mineral Reserve Statement – Effective Date August 2022

	Cut- off	Tonnes	Grades					Metal		
	AuEq (g/t)	(Mt)	Au (g/t)	Ag (g/t)	Pb (%)	Zn (%)	AuEq (g/t)	Au (koz)	Ag (k oz)	AuEq (koz)
Measured	0.38	21.6	1.17	16.38	0.40	0.71	1.85	811	11,370	1,287
Indicated	0.38	16.4	0.84	14.52	0.34	0.63	1.45	444	7,672	765
Meas+Ind	0.38	38.0	1.03	15.58	0.37	0.68	1.68	1,255	19,042	2,052
Inferred	0.40	5.4	0.62	15.39	0.25	0.52	1.16	108	2,655	200

Exploration:

- Extensional and infill drilling ongoing.
- Aggressive exploration & acquisition programs are planned.

Uudam Khundii (UK) exploration project:

- Highly prospective area of Western Mongolia
- Exclusive rights: 14,400 hectares in 80/20 JV with the provincial government of Bayankhongor
- Identified 4 new discoveries: Drilling of 3,000m with assays results pending.

The company milestones

2016

August
The Company was founded in Mongolia

2017

January
Steppe Gold was established in Canada.

June
Acquired 80% of the "UK" project in Bayankhongor.

September
Acquired ATO project from Centerra Gold.

2018

May
Listed on TSX, raising CAD 25 million.

June
Commenced the development of the ATO gold mine.

2019

December
Mined, crushed, and stacked over 533,000 tonnes of ore at a grade of 2.0g/tonne on the leach pad.

Fully commissioned the mine with necessary permits and licenses.

ESG Commitments:

Environmental:

- 92.9% Implementation Score on 2021 Environmental Management Plan (EMP)
- Signatory to Mongolia's One Billion Tree Campaign
- Successful Biodiversity Offset Plan in collaboration with local community, including the repopulation of essential marmot community and conservation of natural habitats
- Recycling 98% of water waste

Social:

- Community Relations is at the core of Steppe's operating culture: local oversight with a 9 member council, and +75% of workforce from local community
- Corporate procurement policy to use only local suppliers & vendors for economic development purposes
- Successfully launched the UGAI CULTURE media project to preserve heritage of local Buryat group
- Scholarships for +1,600 Mongolian students

Governance:

- Regularly liaise and consult with all levels of government, while in compliance of all local regulatory requirements
- Committed to upholding governance best practices , as per our requirements through the TSX, OTC and FSE.
- Steppe's Board sets tone for our sustainability vision, through policies that safeguard our employees and the local environment, while creating long-term shareholder value
- 50% of managerial team are women.

2020

March
Commenced heap leach production.

July
Reached a production milestone of over 15,000 ounces of gold since starting in April.

2021

February
Increased resources to 41.6 Mt @1.67 g/t AuEq (for 2.24 Moz AuEq) and 210k oz reserve piled to ~1.6M oz AuEq (7-8x).

November
Landmark USD 65M project financing package for Phase 2 announced.

2022

March
With the borders closed and a curfew placed due to the pandemic, the company had 100% job retention and intensified ATO mining operations.

July
"UK" project in Bayankhongor began first exploratory drilling, and further exploration on the ATO gold mine started.

2023

February
Updated LOM Plan
1,320,000 oz Au Eq recovered, over oxide and fresh rock phases

A 14 year mine life

2.4

IRON ORE

Highlights

The central region of Mongolia has vast resources of iron ore. Iron ore exports have been steadily increasing since 2008 and have surged significantly since 2012. Prior to the Covid-19 pandemic in 2019, Mongolia's total exports of iron ore reached 8.5 million tonnes.

Reserve & exploration

Total geological reserves of crude ore are around 1.7 bn tonnes (source: MRPAM, 2016). In total, 63 deposits are registered, with 6 deposits having more than 50 m tonnes of ore. Mining of iron ore commenced in 2005. The majority of discovered reserves of iron ore in Mongolia is located near the Selenge and Darkhan provinces, considered as the industrial center of Mongolia.

Mongolia's iron ore products are mainly low grade. Since 2011, an average of six million tonnes of iron ore is exported to China annually. Tumurtei, Tsakhiurt-Ovoo, Tayannuur, and Ereen were included in the category of deposits with over 50 m tonnes of iron ore reserves. At the end of 2022, there are 80 valid iron ore mining licenses.

Table 1.11

MONGOLIAN MAJOR IRON ORE RESERVES, MT

Deposits	Crude ore (mt)	Owner	Details
Bayantsogt	249	Haranga Resources	The mine is located in Eruu soum, Selenge province. Average grade is 16.5% of iron.
Tumurtei	230	Darkhan Metalurgical Plant, 100%	The open pit mine is located in Khuder soum, Selenge province and 90 km from the main railroad. Ore grade is 50-51.6%. The mine is only strategic, iron ore deposit by Mineral Law of Mongolia. Started its operation in 2011.
Bayangol	174	Bold Tumur Eruu Gol LLC, 100%	This open pit mine is located in Eruu soum, Selenge province and has own rail facilities directly conneted to the main railroad. Ore grade is 49.6%. Started its operation in 2007.
Tayannuur	101	Altain Khuder LLC, 100%	The open pit mine is located in Tseel soum, Govi-Altai province and is 168km from the border of China. In 2008, Altain Khuder LLC signed a long-term supply contract with Bayi Steel, a Chinese subsidiary company of Baosteel, and has been shipping iron ore concentrate since 2009. (www.altainkhuder.mn)
Tumurtoltoi	25	Darkhan Metalurgical Plant, 100%	This open pit mine is located in Khongor soum, Darkhan province and is 28km from Darkhan Metalurgical Plant and 20km from main railroad. Started its operation in 2009. Ore grade is 57.2% (www.dmp.mn)

Source: Economic Research Institute, Mongolian Mining Journal (2014)

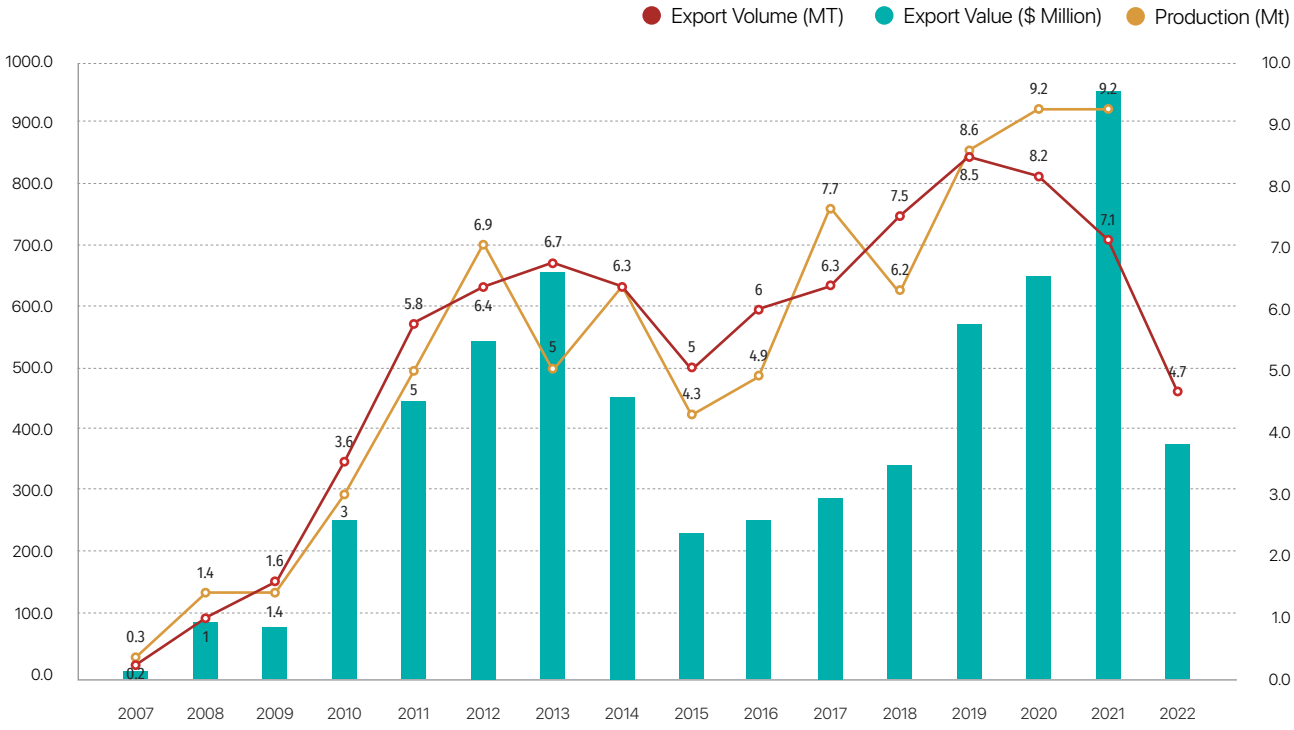
Production & exports

Mining activities and exports of iron ore picked up in 2008 and have been consistent ever since. In 2020, iron ore export accounted for 9% of total minerals export.

In 2022, iron ore export accounted for 3.1% of total export. In terms of annual production, a total of 4.7m tonnes of iron ore and concentrates were exported in 2022, which is about 34% lower than the previous year.

Figure 1.79

IRON ORE PRODUCTION AND EXPORTS, 2007-2022



Source: The National Statistical Office of Mongolia

Infrastructure

Mongolian iron ore is shipped mainly by rail due to the fact that local road transportation tariffs are higher than railroad tariffs. However, most of the iron ore deposits are small and far from the main railroad. So, building railroads for all of these deposits is not financially viable (MRAM, 2016).

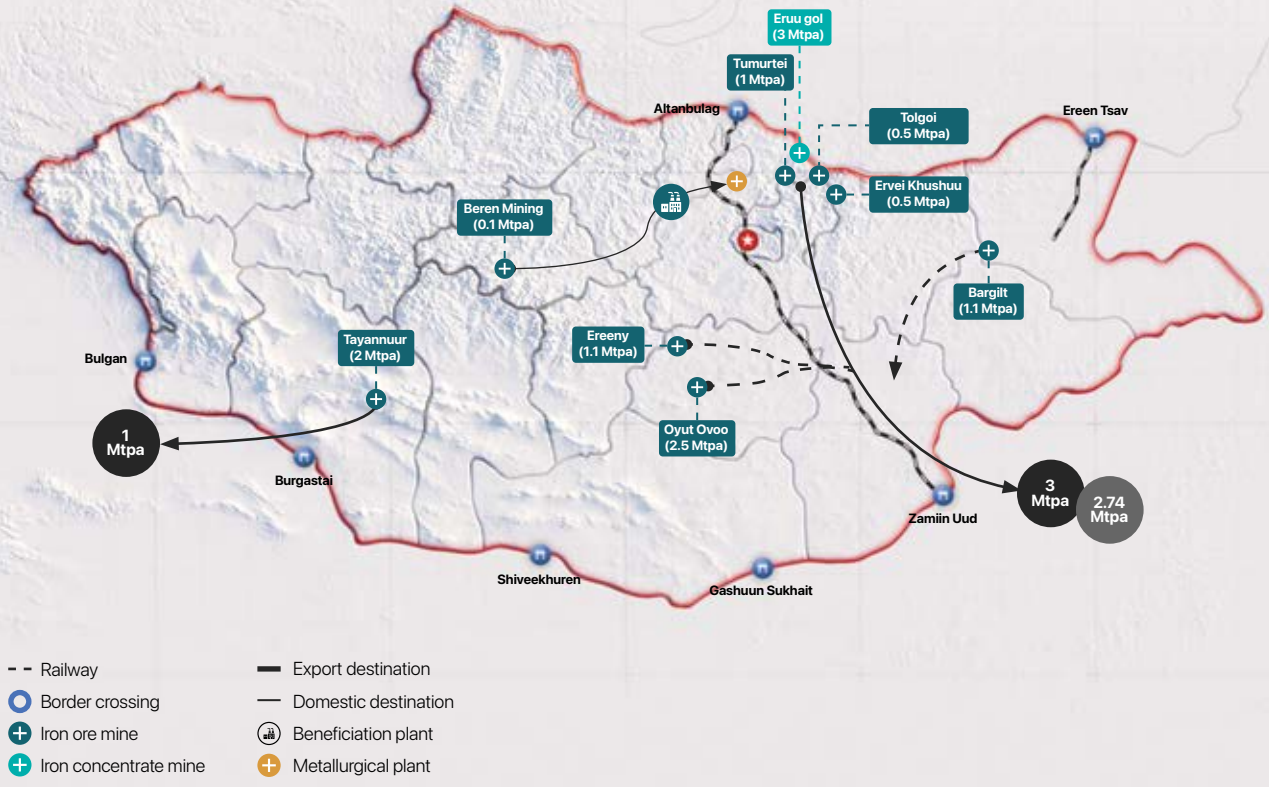
The major iron ore reserves in Northern Mongolia are connected to the main railroad and iron concentrates are shipped to Chinese steel mills directly via rail. However, Ulaanbaatar Railway holds a monopoly in Mongolia and charges relatively high tariffs on iron shipments. In order to mitigate these costs, there have been several instances where mining companies constructed self-financed railroads.

As a case in point, Bold Tumur Eruu Gol, the largest iron ore mining company, has built an 85km stretch of railway line between its mine in the Eruu district of Selenge province to Ulaanbaatar Railways (ADB, 2014). In total, the distance between the mine and the Chinese border is 1,100 km and it leads to a cost of $17 per tonne only for domestic transportation (Source: Economic Research Institute). Currently, most iron ore mines export to Baotou which is one of the major steel-producing regions of China through the Sainshand - Zamiinuud - Erlian - Baotou route.

The Government of Mongolia completed the development of the 227km long railroad project of Zuunbayan-Khangi route in 2022. It will be one of the key routes for iron ore and coal exports and 318km shorter than current iron ore export route. It is also estimated to cut transportation cost by $4-8 per tonne. The reduced cost is expected to create competitive prices for Mongolian iron ore against Chinese and Australian producers.

Figure 1.80

MAIN IRON PROJECTS, THEIR GEOGRAPHICAL DISTRIBUTION AND PROJECTED CAPACITY IN 2013



Source: Economic Research Institute, 2014

Figure 1.81

IRON ORE EXPORT PORTS

Source: General Authority for Border Protection of Mongolia

Market

External market:

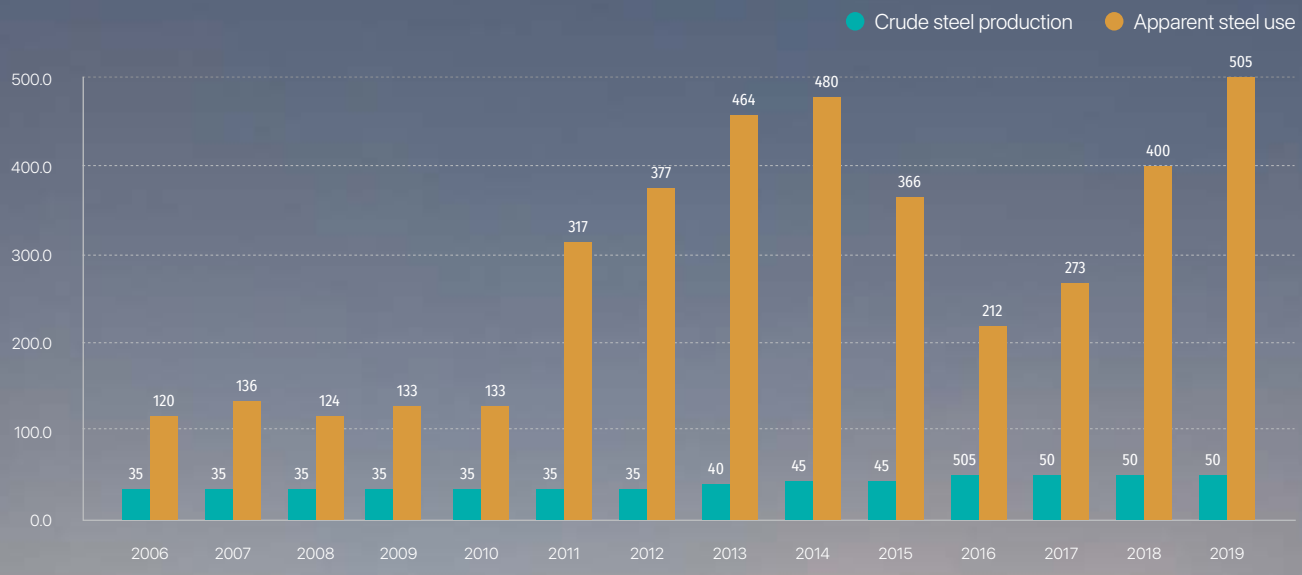
Chinese demand is the main factor of a doubling of global steel production in the last decade, the primary driver of iron ore demand. China imported a record 1.17 billion tonnes of iron ore in 2020, up 9.5% on the year. Although Mongolia's iron ore reserves are not as significant compared to major exporters, its geographical proximity to the biggest consumer China is a considerable advantage.

Domestic market:

Currently, Mongolia's steel production is lower than its consumption. The largest steelmaker is Darkhan Metallurgical Plant which uses local steel scraps for its steel production. Its capacity is 100,000 tonnes a year, but capacity usage is only 50-60%.

Figure 1.82

MONGOLIA'S STEEL PRODUCTION AND USE, THOUSAND TONNES



Source: World Steel Association,

2.5

OIL

Highlights:

Exploration & reserves

Mongolia's oil industry goes back around 80 years. American geologists first surveyed the Gobi region and speculated oil reserves in the 1930s. Since then, Mongolian, and Russian geologists have conducted numerous large-scale surveys and have discovered several reserves.

Later, oil exploration in Mongolia begun with the classification of Mesozoic and Tertiary sediments, and the discovery of oil shale outcrops in the Gobi region. Mesozoic sedimentary basins of Mongolia were divided into 13 basins and 59 sub-basin which cover 523,000 square km in 17 provinces or aimags.

In 1940, the Zuunbayan oil field was identified in the East Gobi. In 1950, Mongolia's first ever refinery started refining oil produced from the field, though, due to declined rates, a fire at the refinery and economic factors, the refinery and production ceased activities in 1969.

In the early 1990s, oil exploration projects resumed in Mongolia. The Petroleum Law of Mongolia was put into effect in 1991. Petroleum exploration and production in Mongolia are performed solely under Production Sharing Contracts (PSC) signed over each petroleum block between the investor and the Government of Mongolia.

The first Production Sharing Contract was signed in 1993. Four years later, exploration work on Block XIX identified the country's first free flowing oil. Soon after, oil production and exports to China was commenced.

After the exploration works in oil fields of Toson-Uul, Tamsag, Zuunbayan and Tsagaan-Els, geological petroleum reserves were recorded in the General Mining Reserves Database between 2010 and 2012. In 2021, reserves of a newly discovered Matad XX field were added to the database.

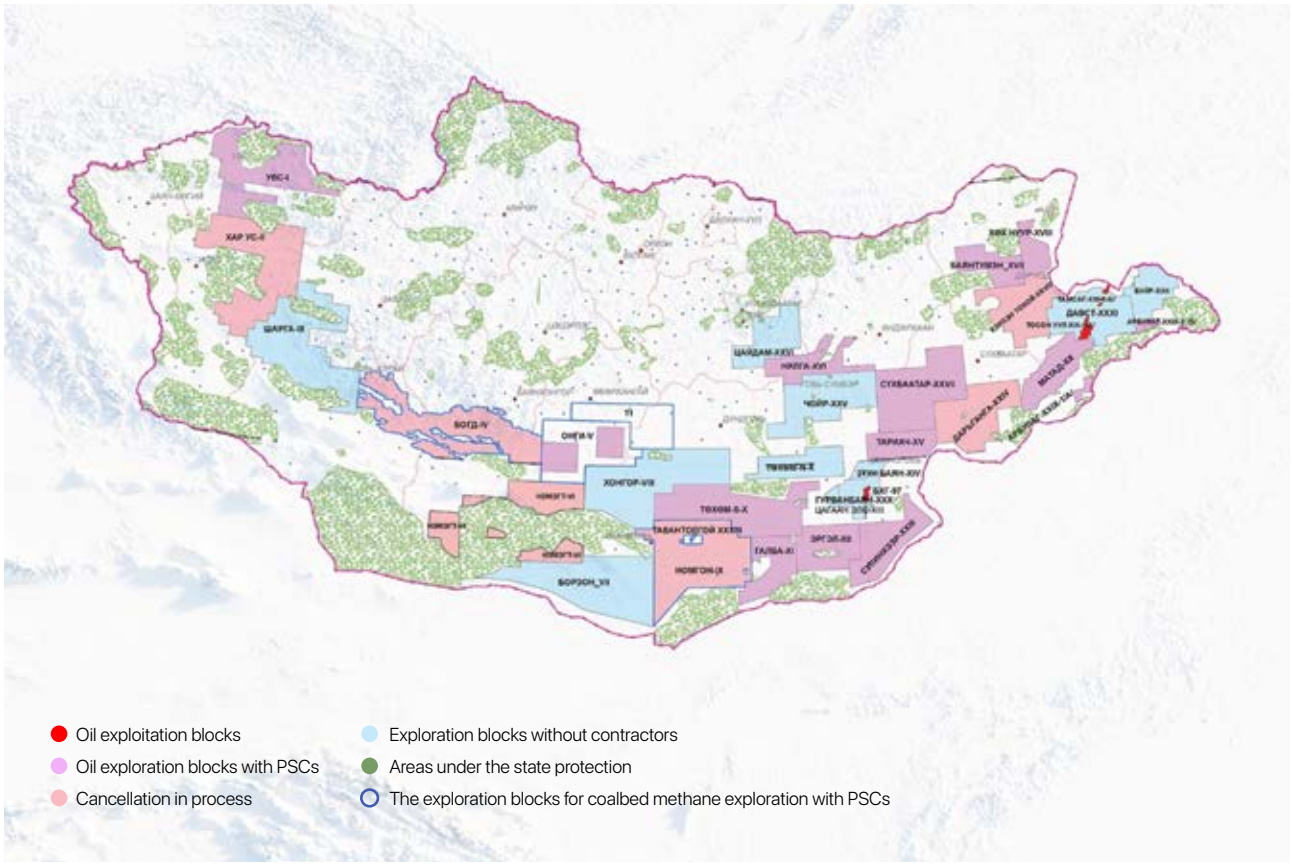
As of 2021, the total geological petroleum reserves in Mongolia were recorded as totaling 333.8m tonnes, of which 43.4m tonnes in the proven reserves.

Today, there are 33 petroleum blocks. 4 of these blocks have advanced to production, while exploration is being conducted on 14 blocks under 18 PSCs. The Government of Mongolia has PSCs with 31 contractors on 28 petroleum blocks, according to MRPAM.

In terms of unconventional petroleum exploration, the Government has Production Sharing Contracts in place for five coalbed methane fields and exploration contracts for nine fields.

Figure 1.83

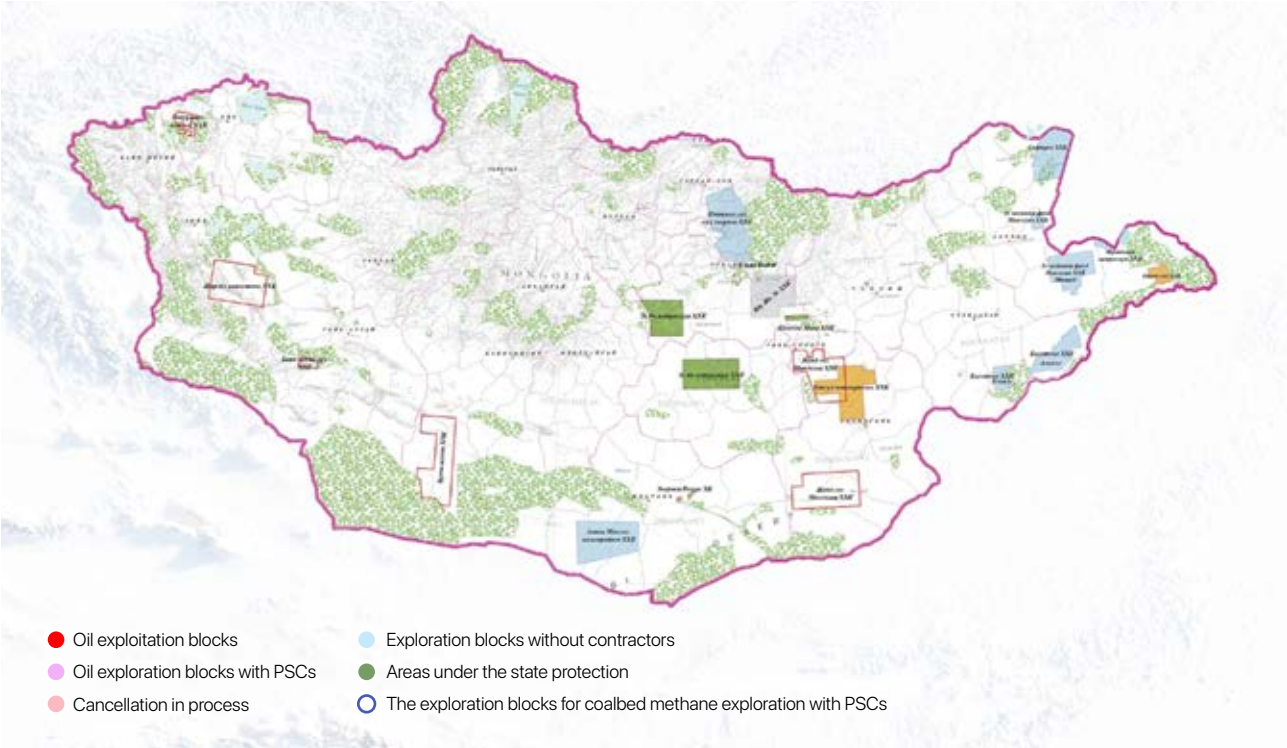
LOCATION OF OIL AND UNCONVENTIONAL OIL BLOCKS WITH CONTRACTS



Source: MRPAM

Figure 1.84

LOCATION OF OIL AND UNCONVENTIONAL OIL EXPLORATION FIELDS



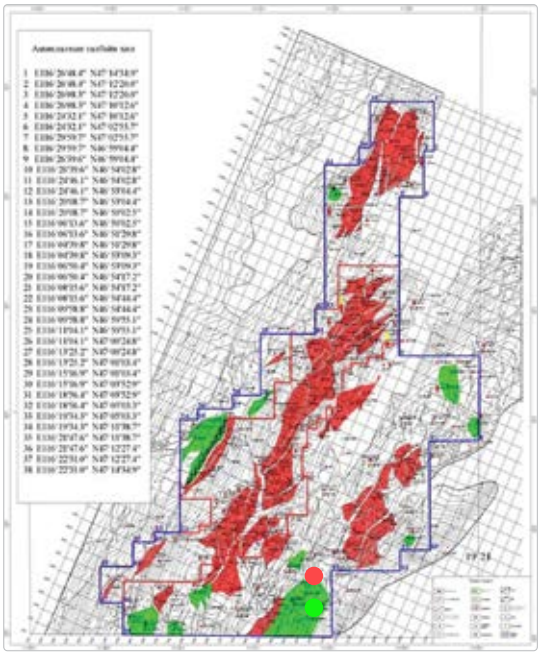
Source: MRPAM

Production & Export

PetroChina Daqing Tamsag currently accounts for more than 95% of total oil production & exports and Dongsheng Oil around 5%. PetroChina Daqing Tamsag exports to Chinese refineries by truck via the Bayankhoshuu border point, while the Dongsheng Petroleum Mongol Company exports by rail. In addition, Mongolian government granted Petro Matad Limited a 25-year exploitation license for Block XX in Eastern Mongolia in 2021 and the company is planning to commence its production in 2023.

Figure 1.85

KEY INDICATORS OF TOSON-UUL OIL FIELD (AS OF 2021)

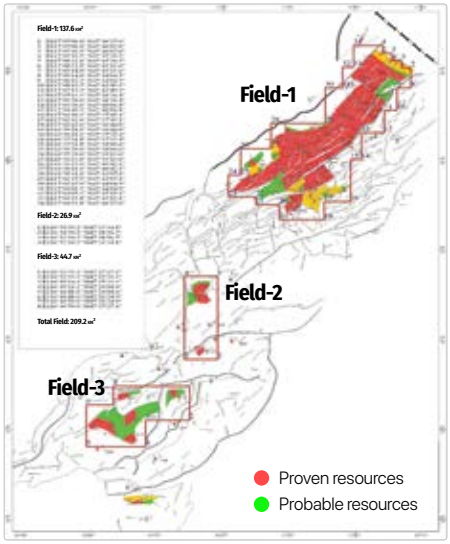


Toson-Uul
Location: Matad soum, Dornod province
Contractor: PetroChina Daqing Tamsag (Mongolia) LLC
Effective date: 1993
Extraction area: 650 square km (8.4% of exploration area)
Number of wells drilled: 982
Oil extraction wells: 491
Oil extraction per day: 1,115 tonnes
Oil: 836 kg/m3, 0.1% of sulfur, 5.75 mPa.s

Source: MRPAM

Figure 1.86

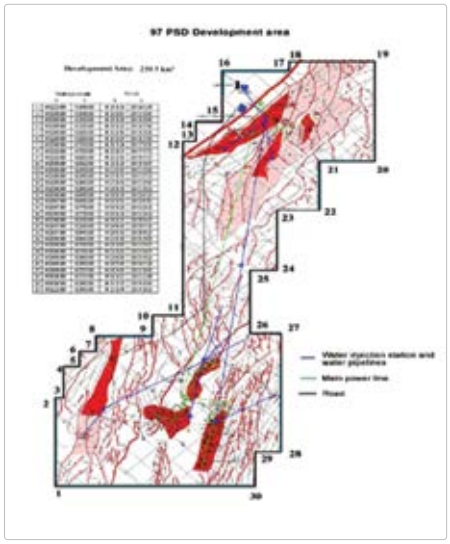
KEY INDICATORS OF TAMSAG OIL FIELD (AS OF 2021)



Tamsag oil field
Location: Khalkha Gol soum, Dornod province
Contractor: PetroChina Daqing Tamsag (Mongolia) LLC
Effective date: 1995
Extraction area: 209.2 square km (2.1% of exploration area)
Number of wells drilled: 589
Oil extraction wells: 311
Oil extraction per day: 1,242 tonnes
Oil: 875 kg/m3, 0.17% of sulfur, 18.9 mPa.s

Figure 1.87

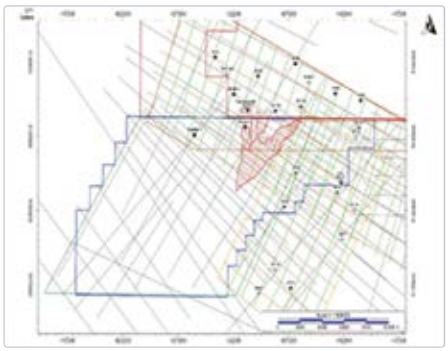
KEY INDICATORS OF ZUUNBAYAN, TSAGAAN-ELS OIL FIELDS (AS OF 2021)



Oil fields of Tsagaan Els, Zuunbayan
Location: Zuunbayan bagh, Sainshand soum, Dornogovi province
Contractor: Dongsheng Petroleum Mongolia LLC
Effective date: 1997
Extraction area: 239.5 square km (4.5% of exploration area)
Number of wells drilled: 131
Oil extraction wells: 102
Oil extraction per day: 134 tonnes
Oil: 878 kg/m3, 0.1% of sulfur, 29.6 mPa.s

Figure 1.88

KEY INDICATORS OF HERON OIL FIELD (AS OF 2021)

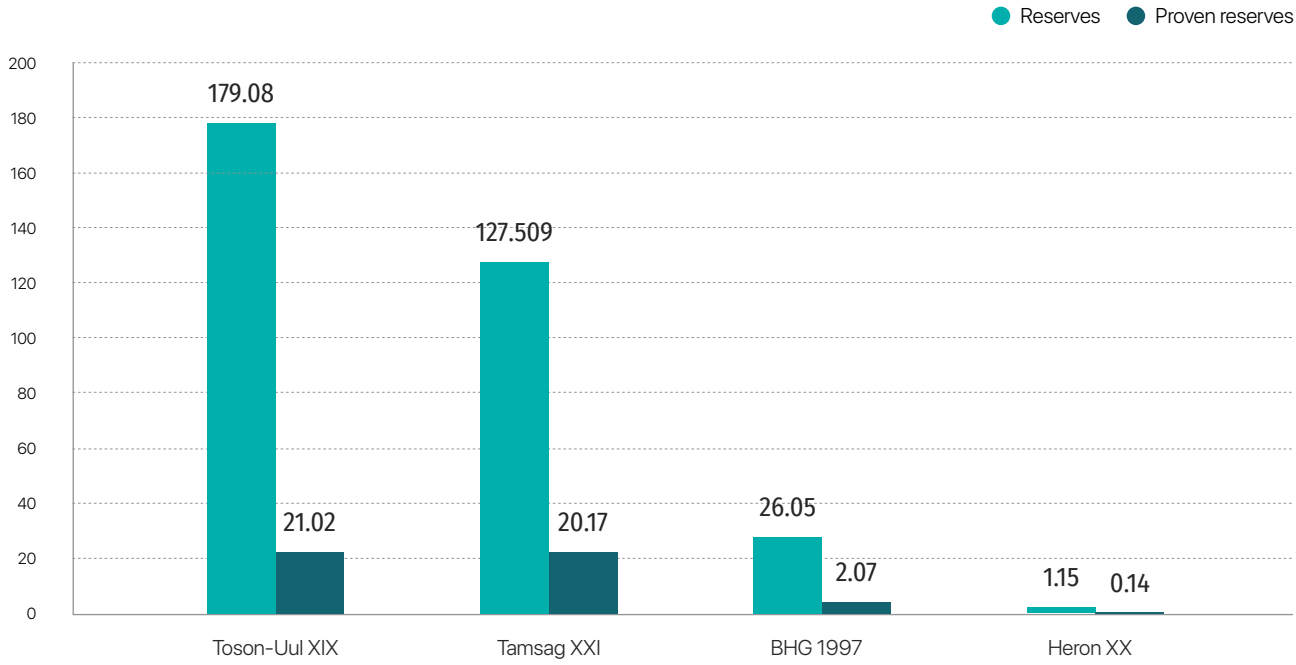


Heron field (Tsen Togoruu)
Location: Matad soum, Dornod
Contractor: Petro Matad LLC
Effective date: 1993
Extraction area: 218 square km (1.2% of exploration area)
Number of wells drilled: 8
Oil extraction wells: Haven't started yet.
Oil: 807 kg/m3, 0.03% of sulfur, 27.2 mPa.s

Source: MRPAM

Figure 1.89

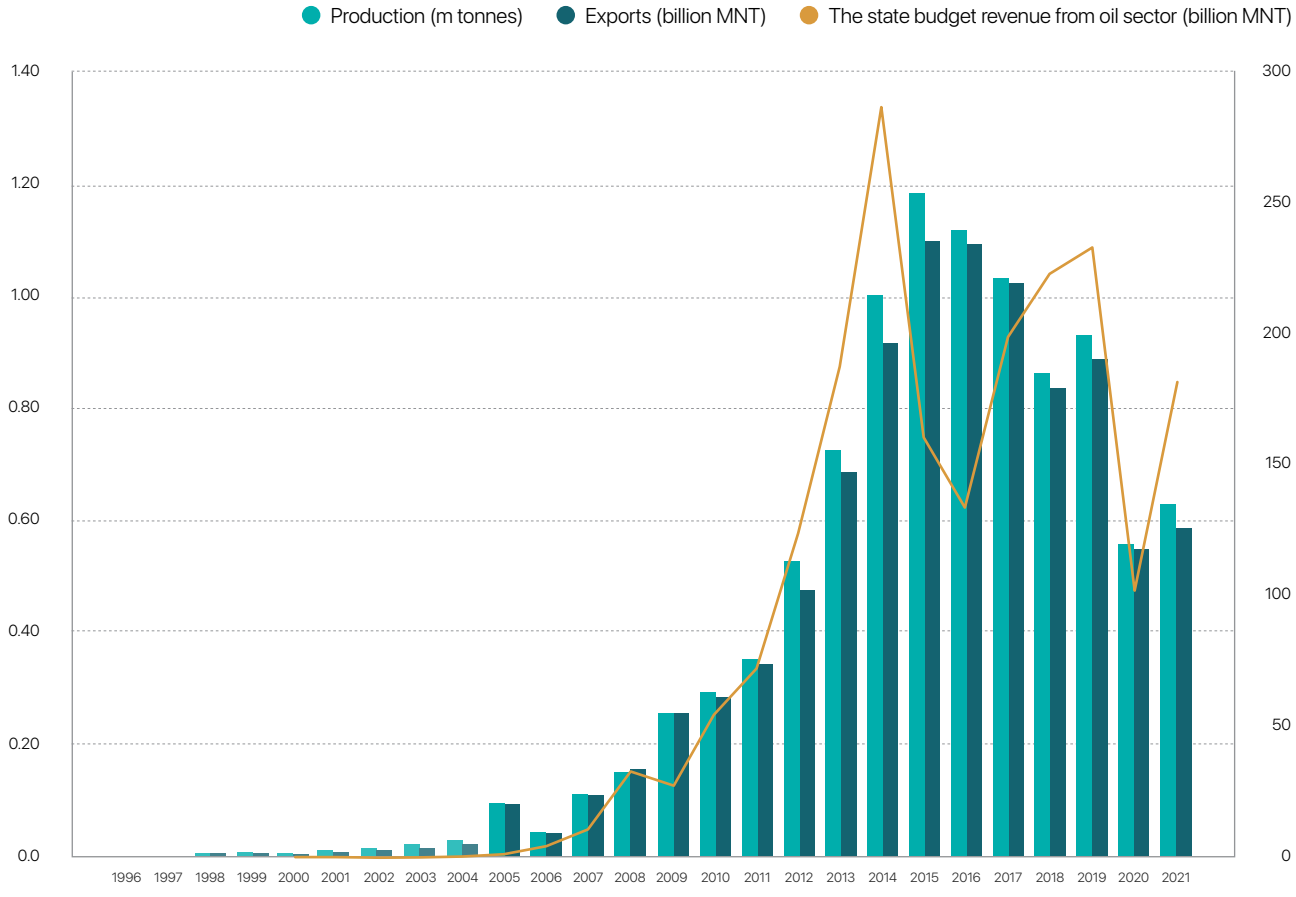
RESERVES OF OIL FIELDS IN MONGOLIA (MILLION TONNES)



Source: MRPAM

Figure 1.90

OIL PRODUCTION, EXPORTS AND BUDGET REVENUE FROM OIL SECTOR



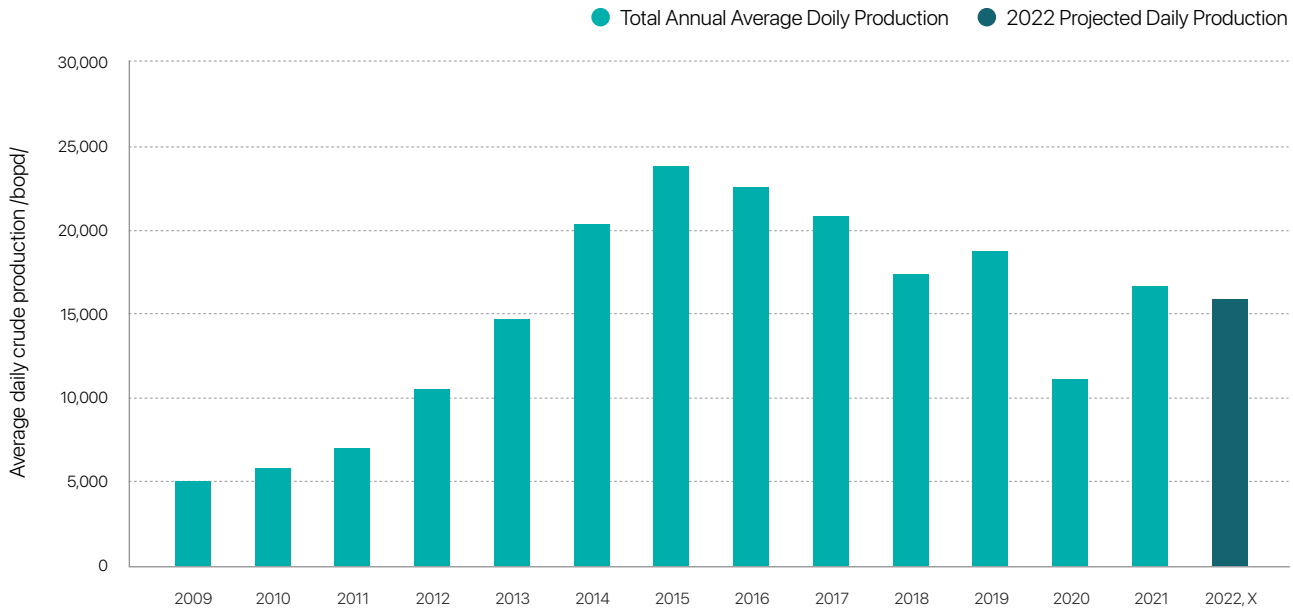
Source: MRPAM

Mongolia produced a total of 75.9 million barrels, or 10.17 million tonnes of oil and exported 72.7 million barrels, or 9.74 million tonnes of oil to China in 1996-2022, generating MNT 2 trillion to the state budget from oil exports.

Figure 1.91

DAILY CRUDE PRODUCTION OF MONGOLIA

Government fully supportive of domestic oil industry

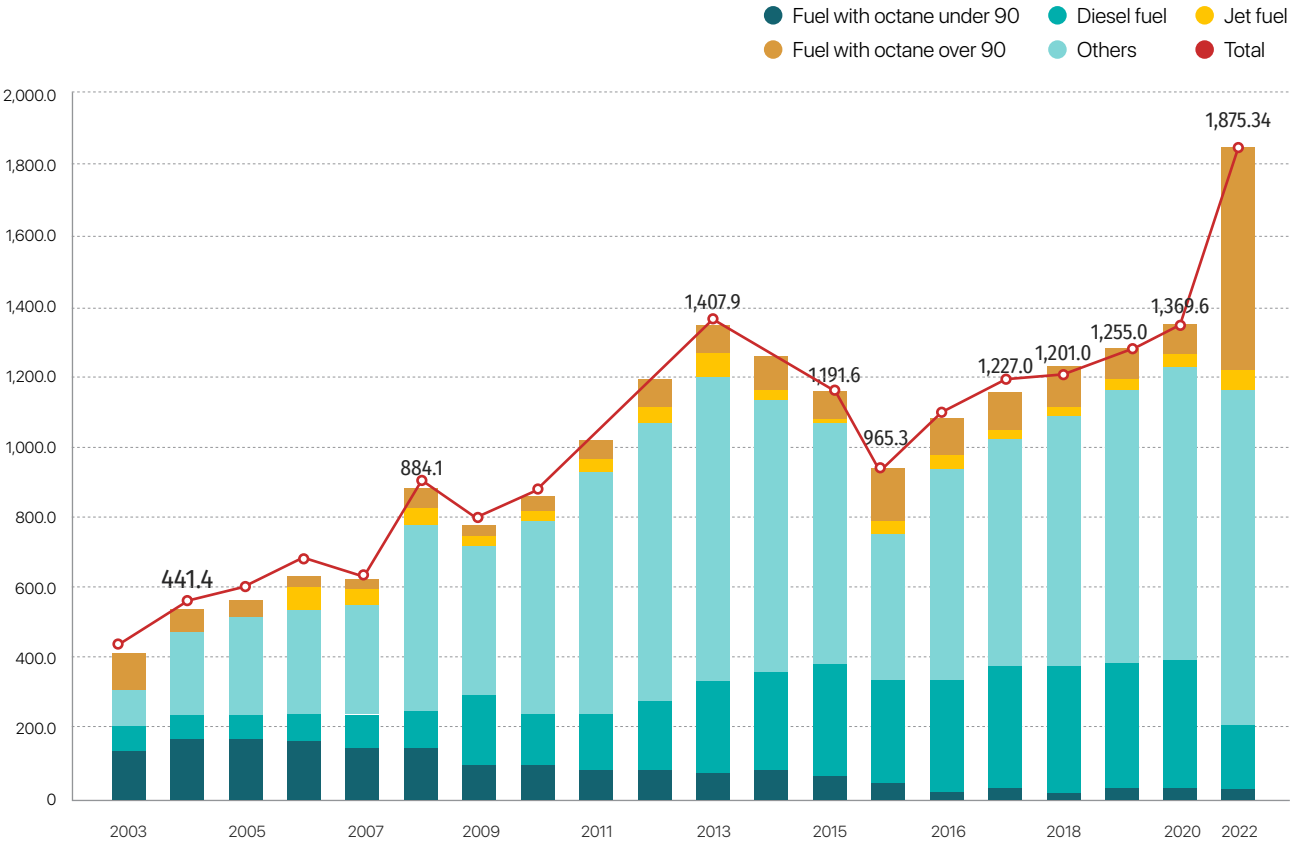


Mongolia's petroleum consumption and imports

Mongolia's fuel supply is 100% reliant on imports. About two million tonnes of oil products are imported annually. More than 90% is imported by Russia's state-owned Rosneft and the rest from China and South Korea.

Figure 1.92

FUEL IMPORT OF MONGOLIA (THOUSAND TONNES)



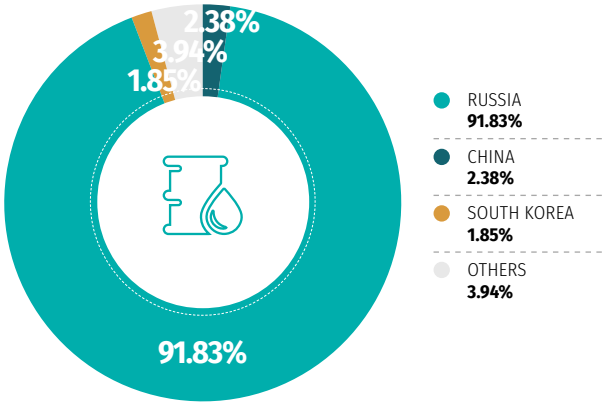
Source: MRPAM

Imports of gasoline and diesel fuel jumped 10% between 2006 and 2013. But the dimnishing economic activity lowered the overall imports of gasoline in recent years.

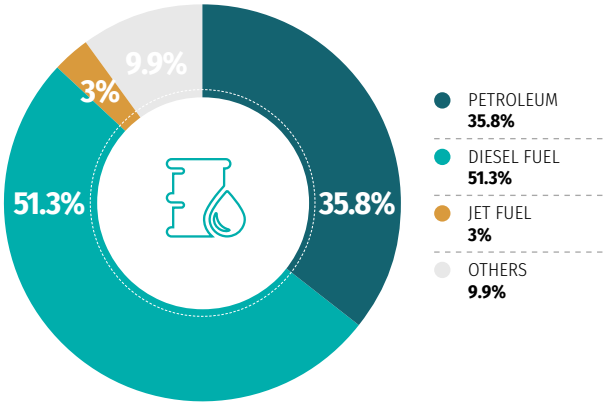
Figure 1.93

PETROLEUM PRODUCTS IMPORT BY COUNTRY AND TYPE

Petroleum-based imports, by country: 2022



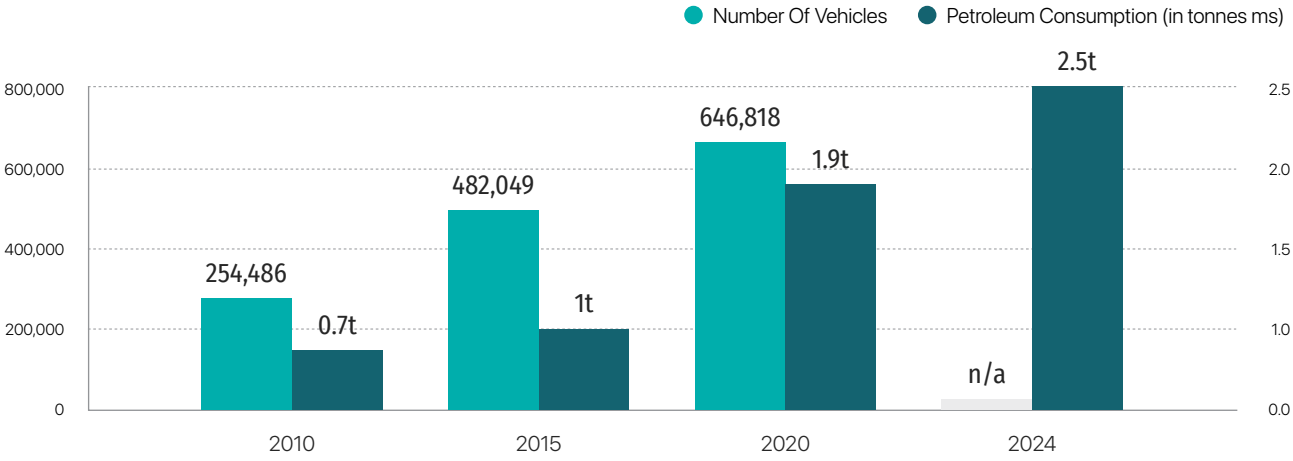
By type



In terms of grade, the imports of A-80 fuel shrank over years, while A-92 fuel import increased consistently. However, a growth scenario is highly likely for diesel fuels with the expansion of the mining sector in Mongolia.

Figure 1.94

MONGOLIA'S PETROLEUM CONSUMPTION AND VEHICLE NUMBERS



Petroleum products are imported on a monthly basis, based on the average of the previous month's price on the Singapore Commodity Exchange. A total of 78 importers petroleum products locally. Nationwide, fuel is sold through a network of 97 warehouses owned by petroleum companies, over 1,200 gas-fueling stations, 10 liquefied gas storage facilities, and 78 natural gas vehicle filling stations.

Oil refinery project

Mongolia is building an oil refinery to decrease its reliance on petroleum imports. The Indian government is investing $1.24 billion in the project, which is taking place in Altanshiree soum, Dornogovi province. The refinery, with an initial annual capacity of 1.5 million tonnes, is expected to be in operation by 2024.

Details:
Annual capacity: 1.5 million tonnes of oil production
Location: Altanshiree soum, Dornogovi province
Raw oil sources: Toson Uul XIX and Tamsag XXI
Quality of petroleum production: MNS and Euro V
Annual operating hours: 8,000 hours
Power source: 35 MW power station.

Laws and regulations

Matters pertaining to petroleum and unconventional petroleum prospecting, exploration, and exploitation within the territory of Mongolia are regulated by the Petroleum Law of Mongolia.

The Petroleum Law of Mongolia was adopted in 1991. The law was revised in 2014 providing clear and transparent legal environment and creating more

favorable conditions for investors. The law regulates the operations of Mongolian and foreign entities or individuals on exploration, production, transportation, storage, and marketing of oil in Mongolia.

The MRPAM is the government agency overseeing the implementation of the law and relevant regulations.

The term "oil exploration" refers to geological, geochemical, geophysical, drilling, and extraction testing work to be performed for the purpose of oilfield discovery and establishing oil reserves. "Exploitation" refers to development and extraction operations for exploiting a petroleum and unconventional petroleum deposit.

Petroleum exploration and production in Mongolia are performed solely under Production Sharing Contracts (PSC) signed over each petroleum block between the investor and the Government of Mongolia.

Table 1.12

EXPLORATION LICENSE GRANTING PROCESS

Steps	Responsible Organization	Processes
1	The Ministry of Mining and Heavy Industry	**Submit application requesting exploration license to the Ministry of Mining and Heavy Industry:** • Copy of Mineral Product sharing agreement • An environmental impact assessment • Annual action plan • Mining companies are obliged to fulfill their duty to rehabilitate the environment and must make a deposit as a guarantee that any establishment related to the mining operations shall be taken down after the operation. • The deposit shall equal 3% of the exploration investment of the relevant year, or 1% of its profit-bearing oil during an exploitation phase. • The deposit shall be made within 60 years after the approval of its annual plan to an escrow account of a correspondent bank in Mongolia.
2		**Granting an exploration license** • A term for petroleum exploration shall be granted for a period of up to 8 years, and the Petroleum Agency may extend this period twice by up to 2 years each. • A term for unconventional petroleum exploration shall be granted for a period of up to 10 years, and the Petroleum Agency may extend this period once by a period of up to 5 years. • An exploration term shall take effect since the day signing the production sharing agreement by both parties. • The Ministry of Mining shall notify the respective local administrative body that an exploration license has been issued or extended.

Source: The Mineral Resource and Petroleum Authority of Mongolia

Table 1.13

EXPLOITATION LICENSES GRANTING PROCESS

Steps	Responsible Organization	Processes
1	The Ministry of Mining and Heavy Industry	The contractor shall make a request to conduct exploitation within 30 days after the Ministry of Mining and Heavy Industry's decision on designating the area as oil reserves.
2		**The following documents shall be appended to the application for an exploitation license:** • A decision by the Ministry of Mining registering the oil reserve. • A draft of the work plan and budget for the respective year. • A deposit mining operations plan. • A detailed environmental impact assessment for the current exploitation period. • An image on which the coordinates of the corner points of the exploitation area are marked in degrees and seconds on a topographical map of a design proposed by the competent state agency. • Mining companies are obliged to fulfill their duty to rehabilitate the environment and must make a deposit as a guarantee that any establishment related to the mining operations shall be taken down after the operation. • The deposit shall equal 3% of the exploration investment of the relevant year, or 1% of its profit-bearing oil during an exploitation phase. • The deposit shall be made into an escrow account of a correspondent bank in Mongolia.
3		The Ministry of Mining shall notify the respective local administrative body that an exploration license has been issued or extended.

Source: The Mineral Resource and Petroleum Authority of Mongolia

Table 1.14

TECHNICAL AND FINANCIAL REQUIREMENTS FOR GRANTING AN EXPLORATION LICENSE

Steps	Responsible Organization	Processes
1	The Ministry of Mining and Heavy Industry	The Petroleum Authority shall announce an open tender notification for a geographical area available for geological exploration on its webpage and through the daily press and mass media no fewer than three times
2		The period for accepting bids to participate in an open tender shall be up to 60 days, and the Petroleum Authority shall arrange and announce the end of the period to accept exploration area bids within five days of acceptance of a first bid for the exploration area. Bids shall be submitted in a sealed envelope to the Petroleum Authority, and the following documents shall be appended thereto: • Documents evidencing a bidder's legal status. • A prospectus for the bidder and its investment. • The full name, position, address, phone number, fax number, and email address of a person representing the bidder, evidence proving that the right of representation has been granted to that person. • Documents evidencing the bidder's technical, equipment, and professional capabilities. • A guarantee of the funds to be spent on exploration work. • A work plan and budget to be performed during the exploration term. • Proof that the service fee for the exploration area bid of $20,000 has been paid. • If a bidder is a consortium, the obligations of each party in exploration and exploitation operations and the percentage and amount of their participation.
3		The bidder shall be notified in writing within five business days as to whether or not its bid has been accepted.
4	The Ministry of Mining and Heavy Industry and The Petroleum Authority	The Ministry of Mining or the Petroleum Authority shall not disclose information on the bidders to a third party until such time that a contract has been awarded.
5	The Petroleum Authority	The Petroleum Authority shall evaluate bids in accordance with the regulation on "selecting a contractor under the tender process" and define the bidder that submitted the most profitable proposal: • The percentage of profit allotted from oil to the budget • The percentage of royalties; • The limit of the percentage for oil • The exploration investment amount; • The amount of funds allocated to environmental restoration; • The amount of the premium for instruction/training; • The bonus amount paid upon commencement of extraction works; • The bonus amount for increasing production; • the bonus amount for developing the local provinces and soums; • Operational support by the representative office; • Other profitable conditions proposed to the Government.

2.6

FLUORSPAR

Highlights

Mongolia is the third biggest producer of fluorspar in the world after China and Mexico, and fourth in the world with its fluorspar reserves. In addition to neighboring China being one of the largest producers, it also purchases fluorsphor from Mongolia.

Reserve & Exploration

Figure 1.95

FLUORSPAR RESERVES WORLWIDE IN 2020 BY COUNTRY

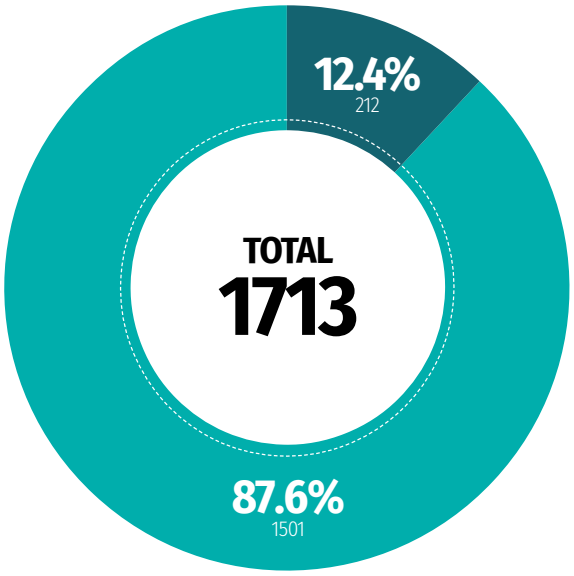
(in 1,000 metric tons)

Source: statista.com

At the end of 2022, Mongolia has 212 valid fluorspar exploration and mining licenses, which accounts for 12.4% of all total mining licenses issued and 2.3% of the total area licensed for exploitation.

Figure 1.96

NUMBER OF VALID FLUORSPAR LICENSES FOR EXPLOITATION (AS OF 2022)



There is a a total of 163 deposits and 545 points of mineral discovery located in Mongolia, with 48.3 m tonnes of mineral reserves in 122 m tonnes of ore.

According to the Mongolian Fluorspar Association *"exploration has not been carried out at a depth of 100 to 200 meters, and if exploration and research expand in this area, it is possible to increase estimated reserves."*

FLUORSPAR - **12.4%** 212

OTHER - **87.6%** 1501

Source: MRPAM

There is a a total of 163 deposits and 545 points of mineral discovery located in Mongolia, with 48.3 m tonnes of mineral reserves in 122 m tonnes of ore. According to the Mongolian Fluorspar Association *"exploration has not been carried out at a depth of 100 to 200 meters, and if exploration and research expand in this area, it is possible to increase estimated reserves."*

Production & export

Figure 1.97

FLUORSPAR MINE PRODUCTION WORLDWIDE IN 2021, BY COUNTRY

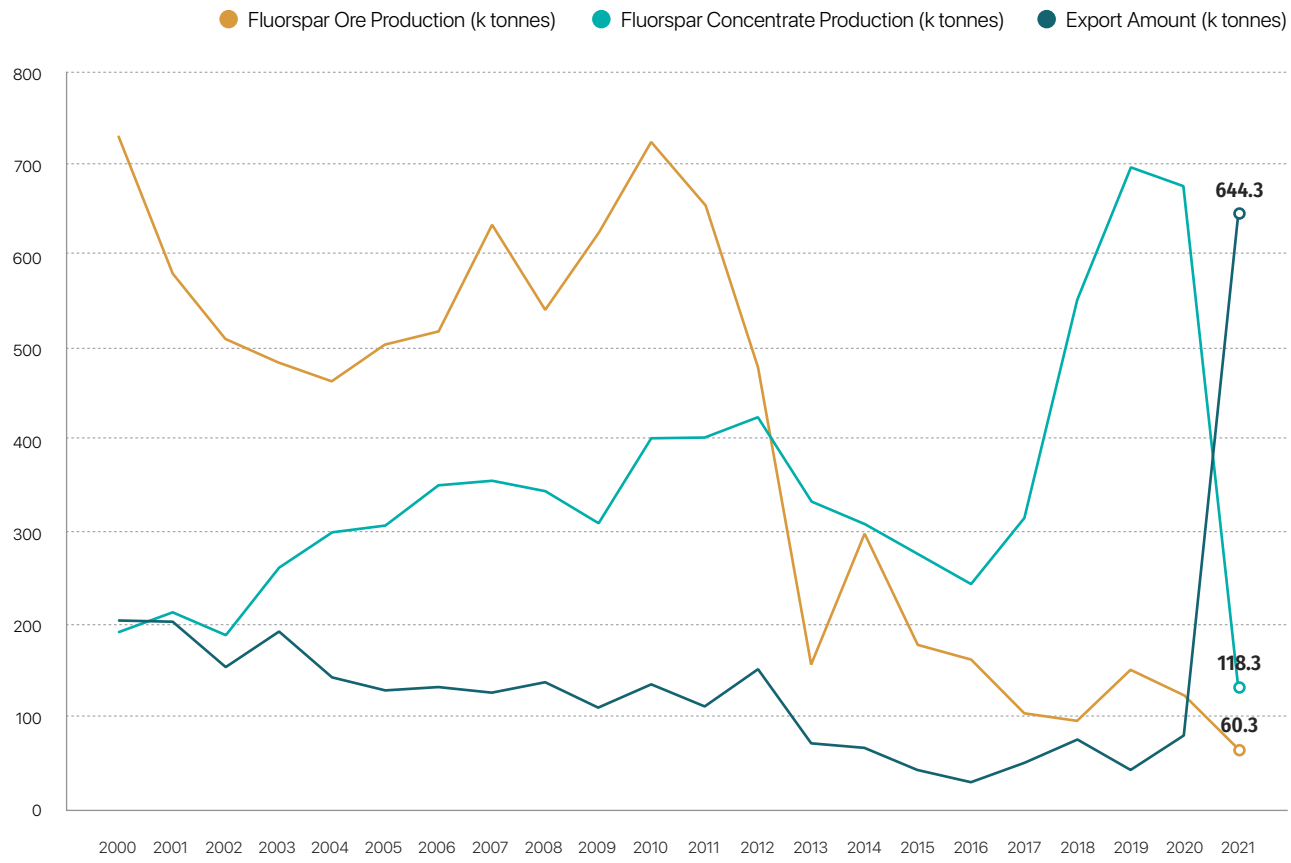
(in 1,000 metric tons)

China	5,400
Mexico	990
Mongolia	800
South Africa	420
Vietnam	220
Canada	140
Spain	130
Germany	80
Morocco	80
Kazakhstan	77
Pakistan	70
Iran	56
Other countries	110

Global production of fluorspar in 2018 reached 6m tonnes, of which 9.3% was produced in Mongolia. In 2020, Mongolia produced more than 10% of the world's total production of 7.2m tonnes. Excluding its two neighbors, Mongolia has exported small quantities of fluorspar to South Korea on a trial basis before. Export to China first started in 2002. According to statistics fluorspar production and exports declined in 2010-2015 but have been steadily recovering since 2016.

Figure 1.98

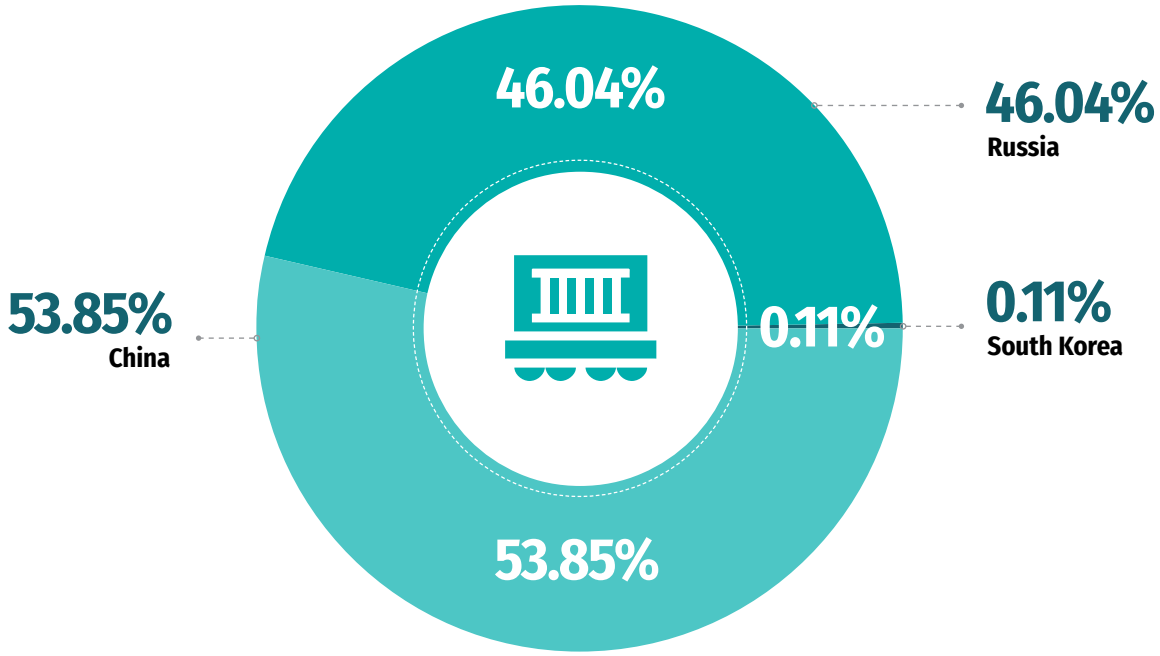
FLUORSPAR PRODUCTION AND EXPORT (2000-2021)



Source: The National Statistical Office of Mongolia

Figure 1.99

MONGOLIA'S FLUORSPAR EXPORT BY COUNTRY AS OF 2020



The Government of Mongolia is seeking to adopt a *"Special Program to Support Fluorspar Production and Exports."* The draft proposal estimates that by 2025, annual fluoride exports will reach $350 m.

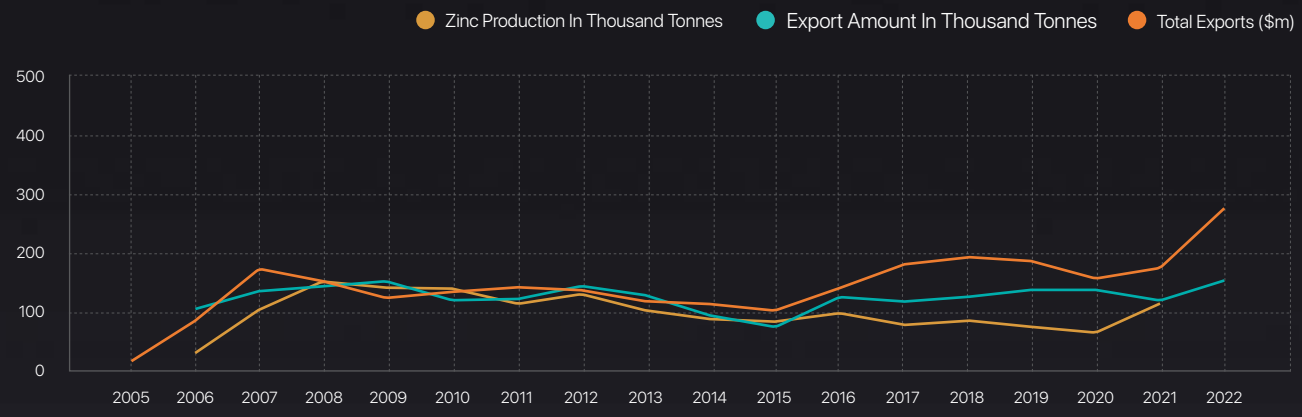
2.7

ZINC

Mongolia has proven reserves of 1.7 m tonnes of zinc, and as of 2022, five valid iron and zinc licenses have been issued. About 75% of Mongolia's zinc exports are produced by Tsairt Minerals LLC, a China-Mongolian joint venture and the remaining 25% by Shin Shin LLC, a Chinese company. In 2021, 100% of locally produced zinc or 112,600 tonnes of zinc ores and concentrates was exported to China.

Figure 1.100

ZINC PRODUCTION AND EXPORTS (2005-2020)



Source: The National Statistical Office of Mongolia

Figure 1.101

ECONOMICALLY IMPACTFUL ZINC DEPOSITS

	Deposit Location	Main Product (Metal)	By Product (Metal)	Standardized Ore (in k Tonnes)	Standardized Metal In Thousand Tonnes
1.	Kukh Adar, Tolmo Soum, Bayan-Ulgii province		Zinc	3,2362.8	409.5
2.	Mungun Undur, Umnudelger Soum, Khentii province		Zinc	7,156.5	135.4
3.	Tsav, Choibalsan Soum, Dornod province	Zinc		3,490	123.3
4.	Kharaat Uul, Govi-Ugtaal, Dundgobi province		Zinc	37,746.7	284,3
5.	Ulaan, Dashbalbar Soum, Dornod province	Zinc		38,068.9	738.4
6.	Erdene Undur, Tuvshin Shiree Soum, Sukhbaatar province		Zinc	2,204	58.2
7.	Zuun Tumurtei, Gobi Ugtaal Soum, Dundgobi province	Zinc	Iron	704.1	23.4
8.	Tumurtein ovoo, Sukhbaatar Soum, Sukhbaatar province	Zinc	Cadmium	7,689.4	885.3

Source: MRPAM

2.8

LITHIUM

Reserves

Mongolia's probable lithium reserves are estimated at 203,000 tonnes and lithium ore reserves at 2.26m tonnes respectively. Currently, two deposits are registered by MRPAM. The Khukh Del deposit in Dundgovi province has proven reserves of 37,700 tonnes and measured reserves of 151,300 tonnes, with lithium ore reserves totalling 122,300 tonnes. The measured reserves of the Munkhtiin Tsagaan Durvuljin deposit located in Dundgovi province are estimated at 14,575 tonnes.

To date, foreign investors have shown an interest and of particular note is a subsidiary of the South Korean conglomerate Posco Group who recently contacted Mongolian state-owned Erdenes Resources LLC to conduct joint exploration of rare minerals. Lately, Ion Energy company has been actively exploring lithium in Mongolia for the first time.

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MONGOLIA'S FIRST LITHIUM BRINE EXPLORER & DEVELOPER

01

PROVEN IN-COUNTRY TEAM

Proven track record. Strong social license to operate and strong shareholder base.

02

STRONG EXPLORATION POSITION

With one of the largest exploration licenses in Mongolia, ION Energy is poised to become a significant player in Asia's booming Lithium market. Exploration efforts are now underway.

03

STRATEGIC ADVANTAGE VS. PEERS

Mongolia is a low-cost year round operating environment. Early work indicates shallow aquifers. Gobi desert is an arid environment with high evaporation rates.

04

AGGRESSIVE GROWTH STRATEGY

ION is now fully funded to commence an aggressive growth strategy for the remainder of the year.

BAAVHAI UUL PROJECT

- 24km from the Chinese border
- +81,000 hectares, highly prospective for Lithium brine
- Maximum grade seen of 1502 ppm Lithium
- High evaporation and low precipitation endorheic basin, no outflow to external bodies of water
- All holes drilled contain significant levels of Lithium

URGAKH NARAN: RISING SUN PROJECT

- Located in the infrastructure rich Dornogovi Province, within kilometers from rail transportation routes to China and national grid system
- 29,000 hectares in a fault-bound, closed basin, highly prospective for Lithium
- Surface brine sample assayed at 918 mg/L Lithium
- 22.7 billion cubic metres of low resistivity seen across basin

LITHIUM & COPPER – A BATTERY METALS STRATEGIC ALLIANCE

ION Energy enters into a JV agreement with Aranjin Resources

- Strong indications at ION's flagship project Baavhai Uul show significant copper and nickel anomalies
- Alliance leverages the teams' technical expertise, and CEO & Board's strong track record in Mongolia