INDEPENDENT MARKET RESEARCH FOR GLOBAL, CHINA'S AND KAZAKHSTAN'S TUNGSTEN INDUSTRY

Confidential for

Jiaxin International Resources Investment Limited

Frost & Sullivan

Aug 2025

Date : _____

For and on behalf of
Frost & Sullivan (Beijing) Inc., Shanghai Branch Co.

_____

Name: Terry Tse
Title: Consulting Director

Agenda

Scope

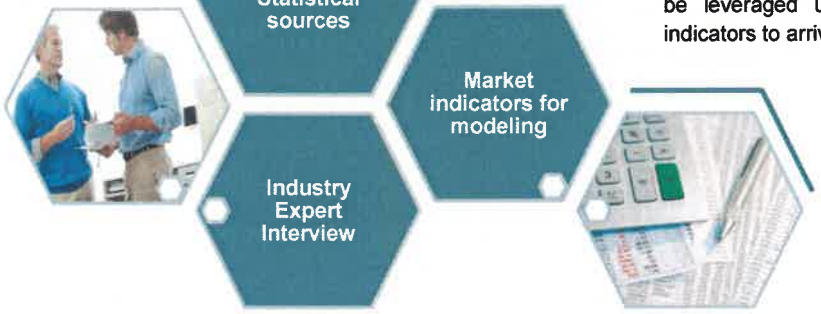
- **The project scope is defined as follows:**

Research Period	• Historical Year: 2019-2023 • Base Year: 2024 • Forecast Year: 2025E-2029E
Geographic Scope	• Global, China and Kazakhstan
Target Market	• Tungsten Market

Limitations

Source of Information

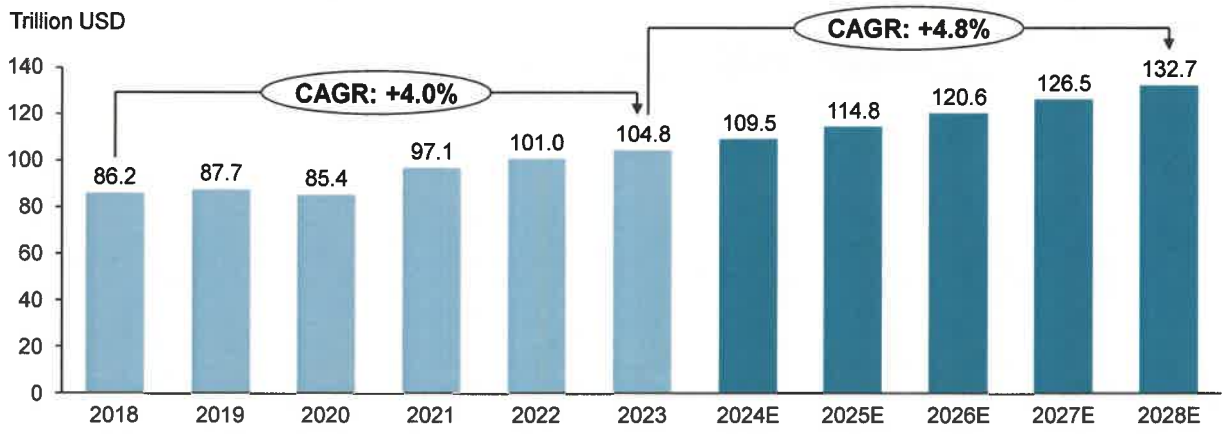
- Interviews with industry experts and competitors will be conducted on a best-effort basis to collect information for in-depth analysis for this report.
- Frost & Sullivan will not be responsible for any information gaps where Interviewees have refused to disclose confidential data or figures.
- The study took 2024 as the base year for analysis and 2025-2029 for forecast. However, as the point of this study being 2024, some of the figures of 2024 may not be available at the moment from public statistical sources. Frost & Sullivan will use the latest information available (e.g. 2023) or make projections based on historical trends.
- Under circumstances where information is not available, Frost & Sullivan in-house analysis will be leveraged using appropriate models and indicators to arrive at an estimate.
- Sources of information and data will be clearly stated in the bottom right hand corner on each slide for reference.



Agenda

Macro Economy Overview
Global Nominal GDP Analysis

Nominal GDP (Global), 2018 – 2028E

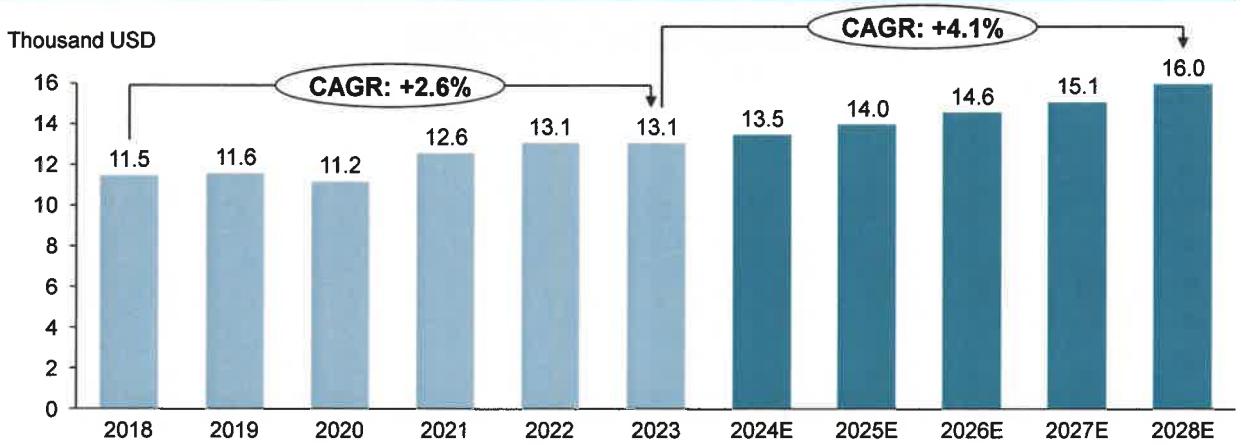


- The global nominal GDP has shown an upward trend in past years from 2018 to 2023. The global nominal GDP increased from USD8.2 trillion in 2018 to USD104.8 trillion in 2023 with a CAGR of 4.0%. There was a decrease in 2020 due to the outbreak of COVID-19 and a lot of countries suffer from it economically. Nevertheless, many countries recovered from the pandemic later in 2021 and the performance of the overall global economy started to bounce back in 2021.
- Looking forward, the global nominal GDP is expected to keep growing and reach USD132.7 trillion in 2028 at a CAGR of 4.8% with a forecasted stable global economic environment.

Source: IMF

Macro Economy Overview
Global Per Capita Nominal GDP Analysis

Per Capita Nominal GDP (Global), 2018 – 2028E



- Along with the steadily growing economy, the global per capita nominal GDP also presents a growing trend from 2018 to 2023. The global per capita nominal GDP increased from USD11.5 thousand to USD13.1 thousand from 2018 to 2023, representing a CAGR of 2.6%.
- Looking forward, the global per capita nominal GDP is estimated to reach USD16.0 thousand in 2028 with a CAGR of 4.1% as global citizens are expected to have a better economic environment for better living conditions.

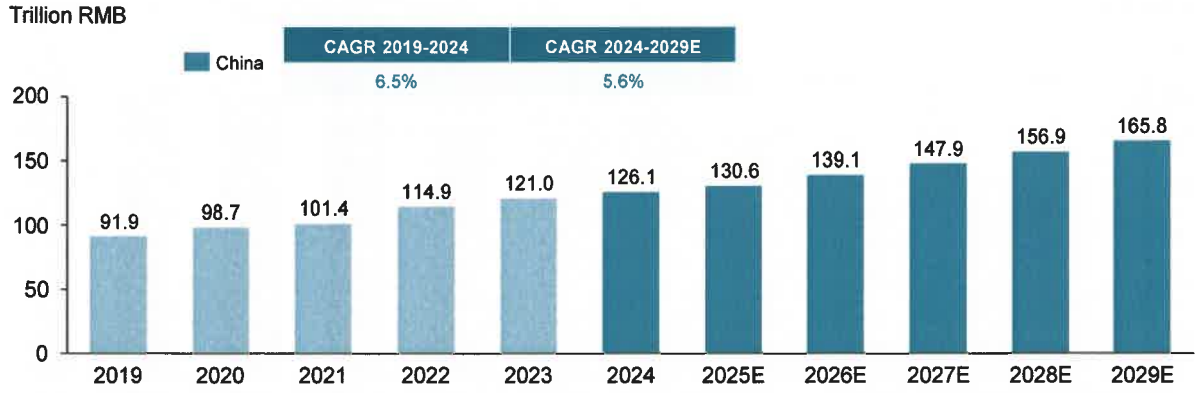
Source: IMF

Updated

Macro Economy Overview

China's Nominal GDP Analysis

Nominal GDP (China), 2019 – 2029E



- According to the Report on the Work of the Government (2024) (政府工作报告(2024)), China has been actively cultivating new growth drivers in foreign trade, continuously optimizing its import and export structure, with the contribution of export trade to economic growth increasing significantly. According to the National Bureau of Statistics of China, the Chinese economy grew at a CAGR of 6.5% from 2019 to 2024. Going forward, the Chinese authorities are likely to maintain the consistency and stability of macroeconomic policies so as to maintain macroeconomic stability. In the meantime, structural adjustment of the economy is predicted to be strongly pushed forward by the Chinese authorities to improve the quality and efficiency of economic development. The Chinese economy is likely to transfer from an investment-driven model to a consumption-driven model with the share of final consumption in GDP picking up. Under this trend, the Chinese economy is likely to maintain a sound and healthy development. According to the International Monetary Fund (IMF), the Chinese economy is forecasted to keep growing at a CAGR of 5.6% from 2024 to 2029.
- Looking forward, the nominal GDP is expected to keep growing and reach RMB177.4 trillion in 2029 at a CAGR of 5.6% with a forecasted stable economic environment.

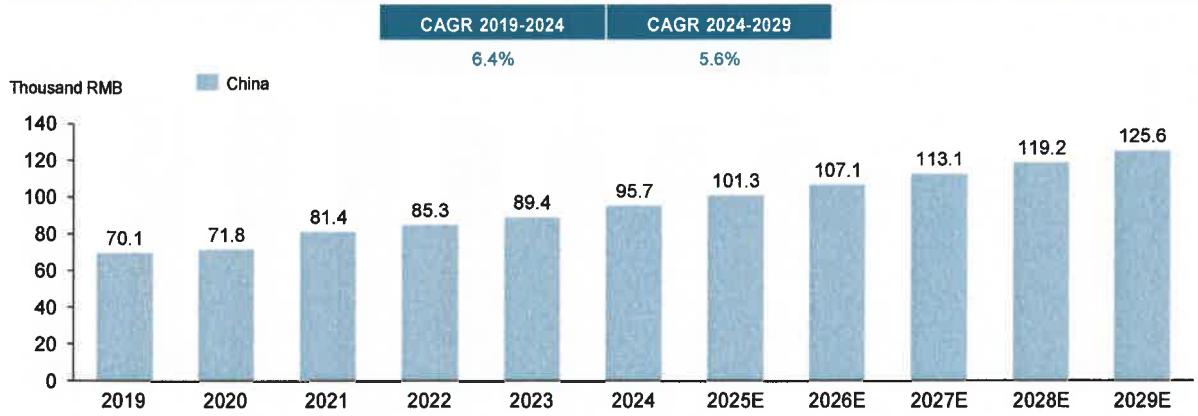
Source: National Bureau of Statistics of China, IMF

Updated

Macro Economy Overview

China's Per Capita Nominal GDP Analysis

Per Capita Nominal GDP (China), 2018 – 2028E



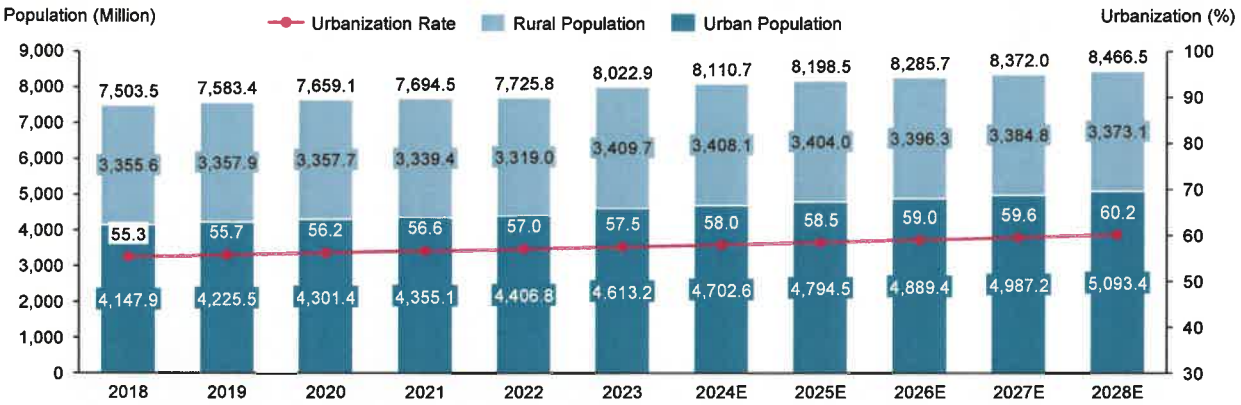
- As total population of China has remained and is expected to remain stable in the future, the growth of per capita nominal GDP is in line with the growing Chinese economy. Per capita nominal GDP in China has kept growing at a fast pace over the past years and is expected to maintain solid growth. For 2024, the per capita nominal GDP in China reached RMB95.7 thousand.
- In the future, with the sound growth of the Chinese macro economy, the per capita nominal GDP in China is also likely to maintain steady growth. According to the International Monetary Fund (IMF), the per capita nominal GDP in China is predicted to reach RMB125.6 thousand in 2029, growing at a CAGR of 5.6% from 2024.

Source: National Bureau of Statistics of China, IMF

Macro Economy Overview

Global Population and Urbanization

Population and Urbanization (Global), 2018 – 2028E



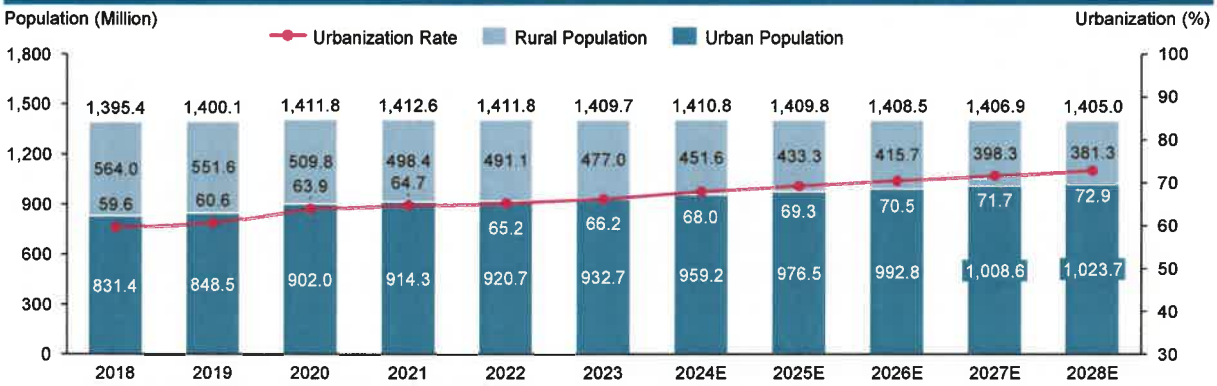
- As the global economy is growing healthy, the global population also steadily increased in past five years. From 2018 to 2023, the global population increased from 7,503.5 million to 8,022.9 million, with a CAGR of 1.3%. The global population is growing due to the increasing number of people surviving to reproductive age, increasing human life expectancy, growing urbanization, and accelerating migration from different countries. Significant changes in fertility rates have followed. These trends will have far-reaching consequences for future generations. The urbanization rate also experienced an increase from 55.3% to 57.5% from 2018 to 2023.
- Looking forward, the global population is expected to grow at a similar CAGR of 1.1% from 2023 to 2028 and finally reach to 8,466.5 million in 2028. In the meantime, the urbanization rate would also increase to 60.2% in 2028.

Source: IMF

Macro Economy Overview

China's Population and Urbanization

Population and Urbanization (China), 2018 – 2028E



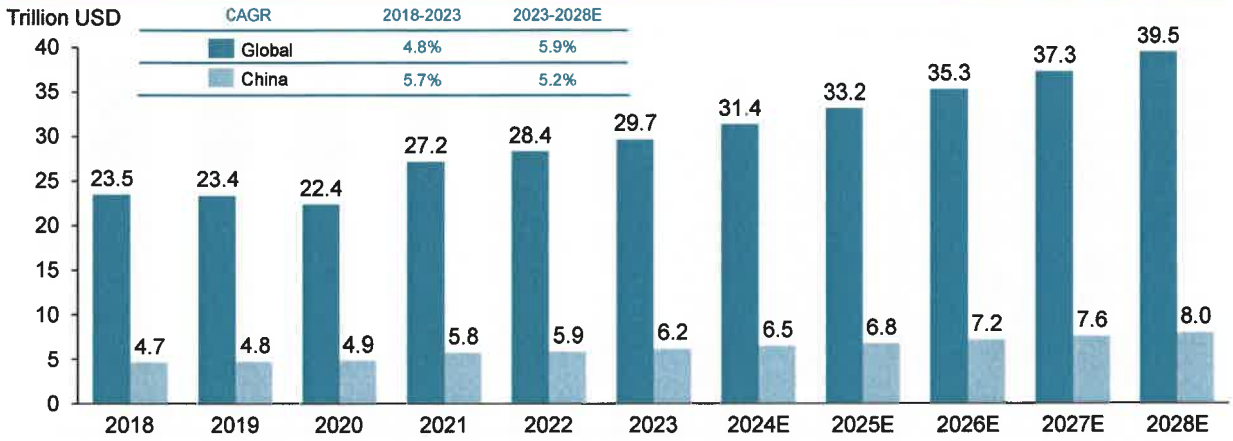
- China has the world's largest population. In 2023, China's total population reached 1,409.7 million. With the PRC Government investing a tremendous effort into controlling the enormous population, the population growth rate has been stable over the past five years. However, as a natural result of China's social and economic development, birth rates tend to fall after many decades of growth, China's population is estimated to decrease and reach 1,405.0 million in 2028, representing a CAGR of -0.1% from 2023 to 2028.
- Due to the rapid economic development of China and the influx of migrants from rural areas to developed areas, Chinese urban population has been steadily increasing. China's rapid economic growth has fuelled the unprecedented urbanization of its population since the 1990s. From 2018 to 2023, China's urban population increased from 831.4 million to 932.7 million, with a CAGR of 2.3%. During the same period, the urbanization rate in China increased by 6.6%, from 59.6% to 66.2%.
- With the continuous growth of urbanization, the urban population is expected to maintain a CAGR of 1.9% from 2023 to 2028. Frost & Sullivan forecasts that by 2028, China's urban population is expected to reach 1,023.7 million. Under the 'National Plan for Promoting Healthy Urbanization (《全国促进城镇化健康发展规划》)' raised in 2013, a new-style urbanization is expected to promote the urban-rural coordination and reasonable distribution. Accordingly, Frost & Sullivan forecasts China's urbanization rate is likely to increase gradually from 2023 to 2028, reaching 72.8% by 2028.

Source:
1. *Historical Data: National Bureau of Statistics of China;*
2. *Forecast Data: Frost & Sullivan*

Macro Economy Overview

Global and China's Gross Industrial Production

Gross Industrial Production (Gloabl & China), 2018 – 2028E



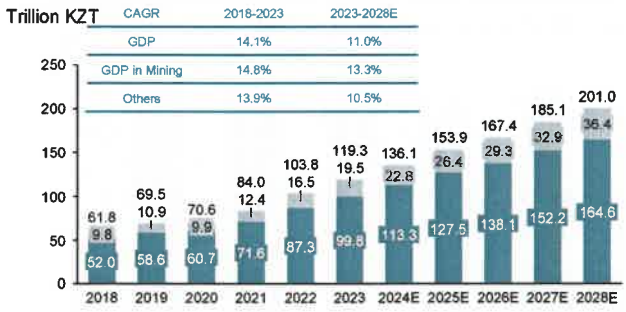
- Here, gross industrial production means the industrial value-added, referring to the final results of industrial enterprises engaged in industrial production activities expressed in monetary terms in the reporting period.
- Industrialization is playing an important role in today's modern world; therefore, gross industrial production is a great measure to illustrate the level of productivity of a country. The global gross industrial production increased from USD23.5 trillion in 2018 to USD29.7 trillion in 2023, with a CAGR of 4.8%. China, as one of the largest manufacturing countries in the world, also has an increasing trend in its gross industrial production. China's gross industrial production increased from USD4.7 trillion to USD6.2 at a faster CAGR of 5.7%. Looking forward, both Global and China's gross industrial productions are expected to reach USD39.5 trillion and USD8.0 trillion in 2028, representing CAGRs of 6.5% and 7.0%, respectively.

Source: National Bureau of Statistics of China, IMF

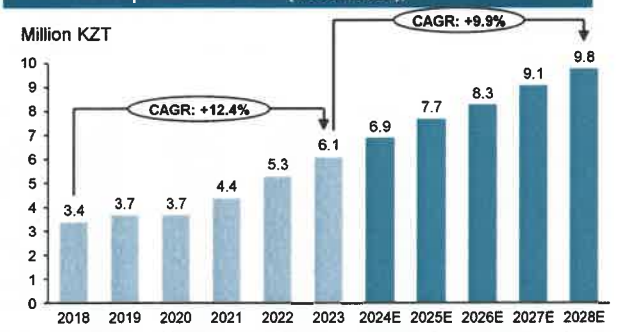
Macro Economy Overview

Kazakhstan's Macro Economy Analysis

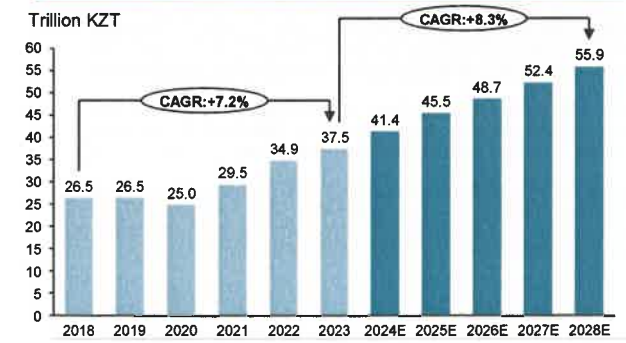
Nominal GDP (Kazakhstan), 2018 – 2028E



Per Capita Nominal GDP (Kazakhstan), 2018 – 2028E



Gross Industrial Production (Kazakhstan), 2018 – 2028E



- Kazakhstan, officially the Republic of Kazakhstan, is the largest landlocked country in the world, located in the Central Asian region.
- Kazakhstan's nominal GDP increased from KZT61.8 trillion in 2018 to KZT119.3 trillion in 2023, with a CAGR of 14.1%. The mining and quarrying sector took around 15% of GDP in previous years and the percentage rate showed an increasing trend. GDP in the mining and quarrying sector increased from KZT9.8 trillion in 2018 to KZT19.5 trillion in 2023 with a CAGR of 14.8%. Per capita nominal GDP grows with the development of the overall economy from KZT3.4 million to KZT6.1 million with a CAGR of 12.4%. The gross industrial production of Kazakhstan experienced a generally upward trend and increased from KZT26.5 trillion to KZT37.5 trillion from 2018 to 2023 with a CAGR of 7.2%.
- Looking forward, Kazakhstan is still in a quick developing stage and its nominal GDP, per capita nominal GDP, and gross industrial production are expected to reach KZT201.0 trillion, KZT9.8 million, and KZT55.9 trillion in 2028, representing CAGRs of 11.0%, 9.9% and 8.3% from 2023 to 2028, respectively

Source: IMF

Agenda

Updated

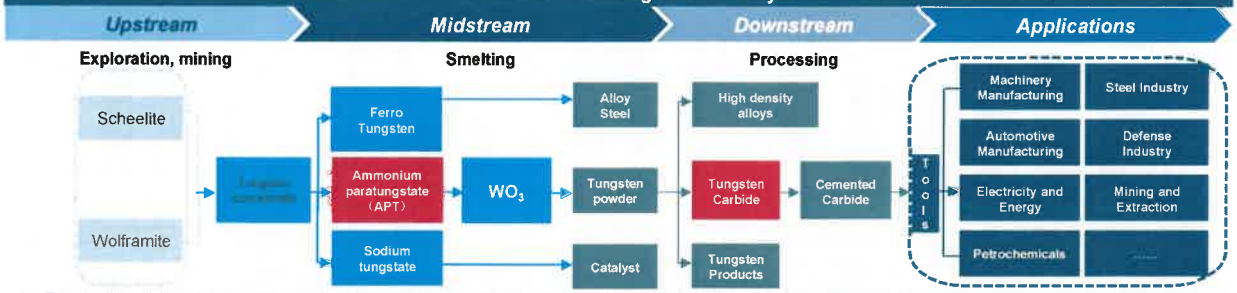
Global, China's and Kazakhstan's Tungsten Industry Overview

Definition and Value Chain

Definition and Segmentation

- Tungsten is a scarce strategic resource, and the Chinese government controls tungsten and rare earths as strategic materials, issuing quota targets to each Chinese producer every year. Tungsten is a rare refractory metal with a series of excellent and unique properties such as high melting point, high density, high hardness, strong wear resistance, strong corrosion resistance, good thermal conductivity, good electrical conductivity, and stable chemical properties. Due to the rarity of tungsten resources in the world, its irreplaceability in industrial applications, and its increasing importance in the national economy, national defense construction, and high-tech industries, its strategic position is prominent.
- At present, China is the world's largest tungsten resource country, mainly possessing two types of wolframite (manganese and iron tungstates) and scheelite (calcium tungstate ore). According to Frost & Sullivan, the global reserve volume of tungsten in 2024 was approximately 4.6 million tons. In 2024, China had tungsten resource reserves of 2.4 million tons, accounting for over 50% of the world's reserves, and its mine tungsten production is also world-leading.
- Globally, most tungsten primary end products are used in the production of cemented carbide. The ultimate end-use products of tungsten are mainly concentrated in transportation and mining tools. The global tungsten end-use sectors are still mainly concentrated in the transportation, mining, and industrial manufacturing industries.

Value Chain of Tungsten Industry



- The tungsten industry chain extends from exploration and mining, smelting to processing and end-use of tungsten products. The upstream of the industry chain includes the exploration and extraction of scheelite and wolframite. The midstream of the industry chain is the smelting of ore, which yields tungsten concentrate, ammonium para tungstate, WO3 and other products. The downstream of the industry chain is the deep processing of tungsten, which produces products such as ammonium paratungstate and cemented carbide. The tungsten products are widely used in machinery manufacturing, new resources, defense industry and other fields.
- Global tungsten primary end products are mainly used in the production of carbide. In mechanical manufacturing, carbide tools have both strength and toughness to achieve excellent overall performance, and dominate the main base material for cutting tools. At the same time, because of its high precision, high hardness and high wear resistance, carbide tools are also the dominant material for inserting computer numerical control and pairing computer numerical control of machine tool operating characteristics. In terms of new resources, due to its high hardness, good wear resistance, strong corrosion resistance, high precision and other properties, carbide products are also widely used in photovoltaic and new energy vehicle industry. In the defense industry, due to its properties such as high hardness, high wear resistance, high temperature resistance and high strength, cemented carbide can be used in missile manufacturing for high temperature parts such as warheads and shells, as well as components such as control systems and fuzes for missiles. Carbide tungsten carbide is also in demand in the aerospace industry and military industry and other fields. With the development of the downstream application industries, there will naturally be a positive impact on the upstream and midstream as well, prompting an increase in upstream tungsten mining activities and promoting the smelting and processing of midstream such as tungsten trioxide and tungsten powder.
- APT and tungsten carbide powder hold an important position in the value chain of tungsten industry. APT is an advanced atomic probe technology used in materials research and development, nanomaterials research, and metal alloy research. The importance of tungsten carbide powder is mainly in the preparation of super hard materials, electronic industry applications, high temperature materials and so on. With the increase in demand for downstream carbide, it will have a positive impact on the demand for APT and tungsten carbide powder, providing stable demand for the Company's future performance.

Note: Data for downstream application industries is unavailable.

Source: Frost & Sullivan

Global, China's and Kazakhstan's Tungsten Industry Overview
Segmentation

Segmentation of Cemented Carbide

Categories	Abbreviations	Main components	Features and Applications
Tungsten and Cobalt Cemented Carbide	YG	Contains only WC, Co (both phases) and some trace elements	▪ High bending strength can be obtained at higher hardness. It is particularly suitable for working at lower cutting speed. Mainly used for machining cast iron, non-ferrous alloys and insulating materials
Tungsten, titanium and cobalt cemented carbide	YT	Contains Tungsten carbide, titanium carbide (TiC) and cobalt	▪ Compared with YG type, the hardness and wear resistance are increased and the toughness is reduced. Not suitable for processing brittle materials, such as cast iron. Mainly used for processing plastic materials, such as steel
Tungsten, titanium and tantalum (niobium) carbide	YW	Contains Tungsten carbide, titanium carbide, tantalum carbide (or niobium carbide) and cobalt	▪ Higher strength than YT type and good resistance to high temperature oxidation. Suitable for machining alloy steel, cast iron and carbon steel. Often referred to as general purpose carbide

- Globally, majority of tungsten primary end products are mainly used in the production of cemented carbide. The ultimate end-use products of tungsten are mainly concentrated in transportation and mining tools. The global field of tungsten end-use products is still mainly concentrated in the transportation, mining, and also industrial manufacturing fields. The transportation and mining tools sectors together account for more than half of the total.
- Cemented carbide is a powder metallurgy product made of carbide (WC, TiC) micron-level powder of high hardness refractory metals as the main component, with cobalt (Co) or nickel (Ni), molybdenum (Mo) as the binder, sintered in a vacuum furnace or hydrogen reduction furnace. According to the composition, it can be divided into: tungsten cobalt cemented carbide, tungsten titanium cobalt cemented carbide, tungsten titanium tantalum (niobium) cemented carbide. Among them, tungsten cobalt carbide is mainly used for processing cast iron, non-ferrous alloy, etc., tungsten titanium cobalt carbide is mainly used for processing plastic materials, while tungsten titanium tantalum (niobium) carbide is mainly used for processing alloy steel, cast iron and carbon steel, etc.

Source: Frost & Sullivan

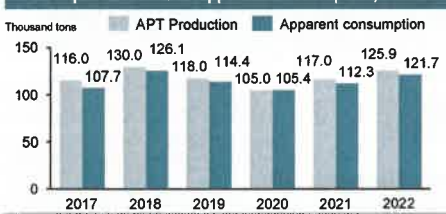
Global, China's and Kazakhstan's Tungsten Industry Overview
Definition and Segmentation

Definition and Segmentation of APT

- Ammonium Paratungstate is a chemical compound with the molecular formula (NH4)10W12O41-5H2O. fine transparent crystals or white crystals of monoclinic crystal system. Relative density is 2.3. Ammonium Paratungstate (APT) is an important intermediate product of tungsten and is available in flake or needle form. It can be used to make WO3 or blue tungsten oxide. The quality of tungsten products largely depends on the chemical purity, particle size and particle size distribution of APT.

	Categories
By Type	Neutralization method
	Tungsten acid method
	Pyrolysis method
	Tungsten metal
By Application	Alloy Steel
	Ceramic

APT production and Apparent consumption, China



APT export volume and unit price, China

APT import volume and unit price, China

With the gradual normalization of the epidemic and the gradual recovery of tungsten downstream market demand, the demand for ammonium paratungstate will also continue to grow. The global ammonium paratungstate (APT) industry mainly relies on imports from China, which is the world's largest producer and supplier of ammonium paratungstate (APT) and ranks first in the world in terms of ammonium paratungstate (APT) resource reserves, production and exports, and has abundant tungsten ore in Hunan and Jiangxi, etc. Resources.

- **Supply:** According to the data published by China Tungsten Association and Tungsten Molybdenum Cloud Business, the fluctuating changes in China's ammonium paratungstate production from 2018-2023 are mainly due to the withdrawal of some production capacity, while technological reform and expansion have increased some new production capacity. 2022, China's ammonium paratungstate production rises to 125,900 tons.
- Export and Import: China's exports of ammonium paratungstate fluctuate down from 2018-2023, with ammonium paratungstate exports falling sharply to 1041.4 tons in 2020 and rebounding to 2,447.1 tons in 2022, with ammonium paratungstate exports much higher than imports. The import volume of ammonium paratungstate of China in 2022 is 1kg. From the point of view of the export unit price of ammonium paratungstate, its export unit price fluctuates and changes from 2017 to 2022, and the export unit price of the product picks up in 2022, reaching USD 28.8/kg.
- As the demand in Europe and the United States continues to be released, the output of tungsten mines remains tight, the supply of raw materials continues to tighten and the price of tungsten keeps growing steadily. Besides raw material cost, downstream demand is also one of the factors considered to influence the price change. The current situation is that for tungsten demand, there is no other product available for substitution.
- Demand: From 2017-2021, the apparent consumption of ammonium paratungstate in China fluctuates and changes, reaching a peak of 126,100 tons in 2018, and the apparent consumption of ammonium paratungstate in China reaches 121,700 tons in 2022.

Source: China Tungsten Industry Association, General Administration of Customs, Frost & Sullivan

Updated

Global, China's and Kazakhstan's Tungsten Industry Overview

Global, China's and Kazakhstan's Tungsten Industry

Global Tungsten Industry

- The global tungsten market is expected to maintain continuous growth. Electrodes, heating elements, and field emitters, as well as filaments in light bulbs and cathode ray tubes, are some of the current applications. Tungsten is commonly found in heavy metal alloys like high-speed steel, which are used to make cutting tools. It's also used to make wear-resistant coatings in so-called super alloys. Growing end use industries such as automotive, aerospace and electrical and electronics and increase in the demand of wear resistant materials is expected to drive the global tungsten market.

China's Tungsten Industry

- China is a major tungsten producing country, with the world's largest production and export volume. Hunan, Jiangxi and Henan provinces have the top three tungsten resource reserves in China, of which only Hunan and Jiangxi provinces account for 55.5% of the country's tungsten resource reserves in 2013. Hunan is mainly wolfram, and Jiangxi is mainly wolfram, whose wolfram resources account for 42.4% of the total wolfram resources in China in 2015.
- China's tungsten ores are largely distributed along the eastern coast of Guangdong on both sides of the Nanling Mountains in China, especially in the south of Jiangxi, with reserves accounting for more than one-half of the world's total. In addition, tungsten ores are found in Dayu in Jiangxi, Rucheng, Zixing and Tuanling in Hunan, and in Guangxi and Yunnan provinces.
- According to the USGS, by the end of 2024, the global reserve volume of tungsten was 4.6 million tons, and the distribution of tungsten ore resources was extremely uneven, with China's tungsten reserves accounting for more than 50% of the world's absolute advantage, in addition to countries or regions such as Russia, Vietnam, North Korea, Canada, the United Kingdom and Mongolia.
- Since 2002, in order to curb the over-exploitation of tungsten ore, the total mining control policy has been implemented in China for tungsten ore resources. The state released the national mineral resources plan, which listed tungsten as a national strategic mineral and clearly proposed the protective development of tungsten, tin, antimony and other minerals. And in the following years, it continued to strengthen the management of tungsten mining industry, so that the tungsten mining industry can be developed in a reasonable, healthy and sustainable way. From 2015-2021, the national tungsten concentrate (WO3 65%) mining total control indicator shows an overall growth, reflecting the gradual liberalization of tungsten ore mining at the policy level.

Kazakhstan's Tungsten Industry

- Kazakhstan has the largest and strongest performing economy in Central Asia. Before 2013, Kazakhstan's economy growth was mainly supported by rising oil output prices, but then suffered a slowdown in 2014 and 2015 as the international oil prices tumbled. Over the past five years, the nominal GDP of Kazakhstan has increased from KZT69.5 trillion in 2019 to KZT136.1 trillion in 2024, representing a CAGR of 14.4%. The growth was mainly attributed to the increasing domestic demand and stronger exports. The rapid macro economic development has injected great power into the real estate market, especially the commercial real estate market.
- Kazakhstan is rich in mineral resources, ranking second in the CIS after Russia in terms of total volume, and is one of the major international mining economies.
- In contrast to China's restrictions on mining tungsten resources, Kazakhstan does not have a clear limit on the annual amount of tungsten resources that can be mined. Chinese companies also have cooperative development projects in Kazakhstan, for example, Xiamen Tungsten of Fujian Province took a stake in mining the tungsten mine of Kazakhstan State Mining Company.
- The Boguty tungsten project is one of the key projects of the capacity cooperation between China and Kazakhstan, and is also the largest tungsten mine in Kazakhstan. The project plans an annual output of 5 million tons of ore, which is of great significance to increase jobs in towns along the route and promote the economic and social development of Kazakhstan.

Source: Frost & Sullivan

Global, China's and Kazakhstan's Tungsten Industry Overview

Top 5 Tungsten Mines in the World

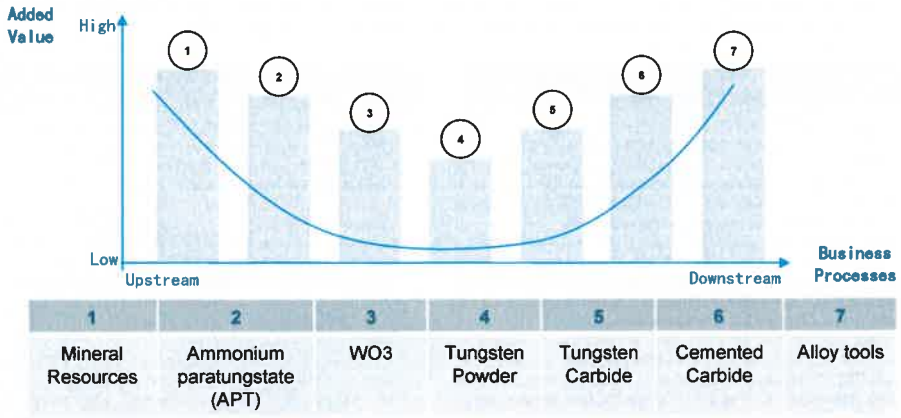
	Top 5 Tungsten Mine Background	Reserve Volume of Tungsten trioxide (Million tons)	Annual Production Volume
Dahutang, China	The Dahutang tungsten mine was discovered by the 916th Brigade and the Northwest Ganxi Brigade under the Jiangxi Geological and Mineral Exploration and Development Bureau back in 2012, and was the largest tungsten deposit in the world at that time.	0.93	• Jiangxi Province accounts for more than half of the country's tungsten ore production
Shizhuyuan, China	In 1963, the South Central Geological Bureau went to Shizhuyuan to explore for mines. Various kinds of mineral search and prospecting such as geological survey and sample analysis were applied successively. 3 years later, the final geological exploration detailed report was submitted. A total of 180 kinds of minerals have been found in the world, and 148 kinds of minerals and minerals have been found here.	0.62	• Nearly 7,000 tons of tungsten concentrate
Hemerdon, UK	Planning permission was granted for the Hemerdon tungsten-tin mine in 1986. Tungsten deposits were discovered at Hemerdon in 1867 and subsequent exploration in 1916 identified low-grade tungsten-manganese iron ore deposits in the area, which were mined from 1919 to 1920 and again from 1934 to 1944.	0.36	• 5,000 tones of tungsten concentrate
Boguty, Kazakhstan	The Boguty Tungsten Mine is discovered by Soviet experts in the late 1960s, it is a world-class, very large open-pit tungsten mine.	0.23	• 15,000 tons of 65% wolframite concentrate
Sisson, Canada	The Boguty Tungsten Mine is discovered by Soviet experts in the late 1960s, it is a world-class, very large open-pit tungsten mine.	0.22	• 5,700 tons of APT

Source: USGS, Frost & Sullivan

Global, China's and Kazakhstan's Tungsten Industry Overview

Profit Chain Analysis of Tungsten Industry

Profit Chain Analysis of Tungsten Industry



- The profit chain of tungsten industry is a typical "smile curve" profit chain, i.e., the profit of tungsten products is high at both ends and low in the middle.
- The upstream resource side has the highest profit elasticity. In the downward price cycle of the whole industry chain, upstream profits have the greatest impact.
- A complete tungsten industry chain with scale can lay out the downstream deep processing carbide tool business and enjoy the high gross profit space at both ends of the smile curve.

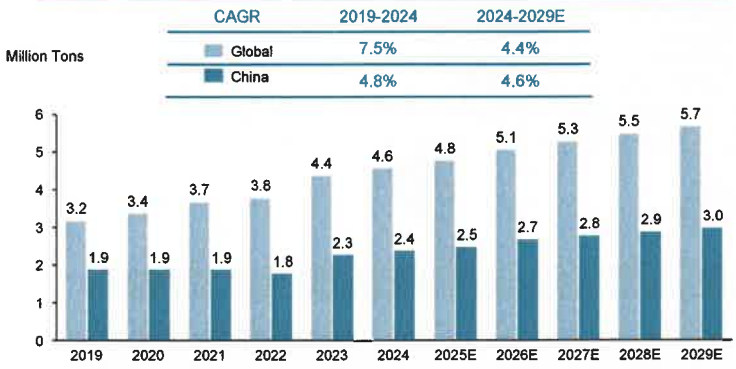
Source: Frost & Sullivan

Updated

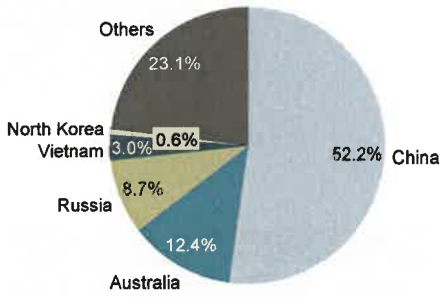
Global, China's and Kazakhstan's Tungsten Industry Overview

Reserve Volume of Tungsten Industry

Reserve Volume of Tungsten (Global & China), 2019 – 2029E



Share of Leading Countries(Global), 2024



- Generally, there are three major indicators in global tungsten industry: reserve volume is measured by volume of metal tungsten; mineral resources are measured by tungsten trioxide (WO3); and designed production capacity is measured by volume of tungsten concentrates.
- The reserve volume of tungsten is relatively stable. The global reserve volume of tungsten increased from 3.2 million tons in 2019 to 4.6 million tons in 2024 with a CAGR of 7.5%. With a stable exploration of different tungsten ores in various countries, the global reserve volume of tungsten is expected to reach 5.7 million tons in 2029, representing a CAGR of 4.4% from 2024 to 2029.
- China was the largest country in terms of the reserve volume of tungsten in 2024 and it takes over 50% of the global reserve volume. China's reserve volume fluctuated between 2019 and 2024 and the reserve volume was 2.4 million tons in 2024. In the future, China's reserve volume of tungsten is expected to experience a slight growth, reaching 3.0 million tons in 2029, representing a CAGR of 4.6% from 2024 to 2029.

Note: (1) According to the U.S. Geological Survey (USGS), reserve volume refers to the part of the reserve base that could be economically extracted or produced at the time of determination. The term "reserve volume" does not signify that extraction facilities are in place and operative. Reserve volume includes only recoverable materials; thus, terms such as "extractable reserves" and "recoverable reserves" are redundant and are not a part of this classification system. (2) Reserve volume of tungsten refers to reserve volume of metal tungsten.

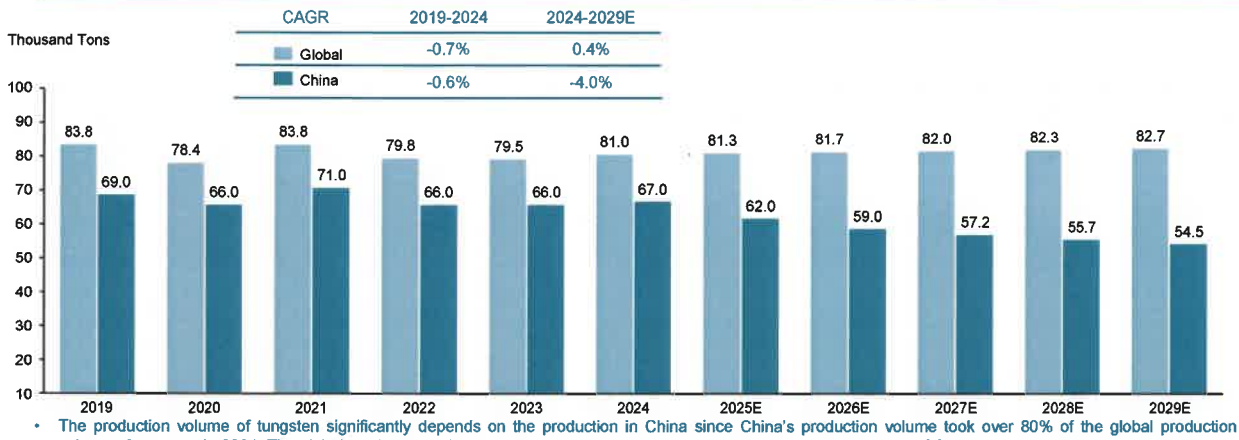
Source: USGS, Frost & Sullivan

Updated

Global, China's and Kazakhstan's Tungsten Industry Overview

Production Volume of Tungsten Industry

Production Volume of Tungsten (Global & China), 2019 – 2029E



- The production volume of tungsten significantly depends on the production in China since China's production volume took over 80% of the global production volume of tungsten in 2024. The global production volume dropped significantly in 2020 mainly due to the outbreak of COVID-19, which caused many enterprises to temporarily shut down their business. With the ease of COVID-19's impact, the global production volume started to bounce back and increased to 83.8 thousand tons in 2021. Looking forward, with new technologies for better mining efficiency and the reopening of mines in Australia, Korea, and the United Kingdom, the global production volume is expected to reach 82.7 thousand tons in 2029, with a CAGR of 0.4% from 2024 to 2029.
- China was the largest country in terms of the production volume of tungsten in 2024. With the efforts to protect national reserves coming from the Ministry of Natural Resources of China, which issues an annual quota for tungsten mining, these quotas have been effective since 2002. China's 2024 tungsten mining quota was the set at 114 thousand tons of tungsten concentrates. Since China's government imposed restricted quotas on concentrated products of tungsten and the relatively low rate of operation in previous years, China's production volume of tungsten has decreased from 69.0 thousand tons in 2019 to 67.0 thousand tons in 2024 at a CAGR of -0.6%. According to a notice from China's Ministry of Natural Resources in 2025, the first batch of total restricted quota (65% tungsten trioxide content) in 2025 was 58,000 tons, a year-on-year decrease of 6.5%. As a result, the market expects domestic tungsten production to reach 54.5 thousand tons in 2029, with a CAGR of -4.0% from 2024 to 2029.

Note: Production volume refers to the volume of metal tungsten.

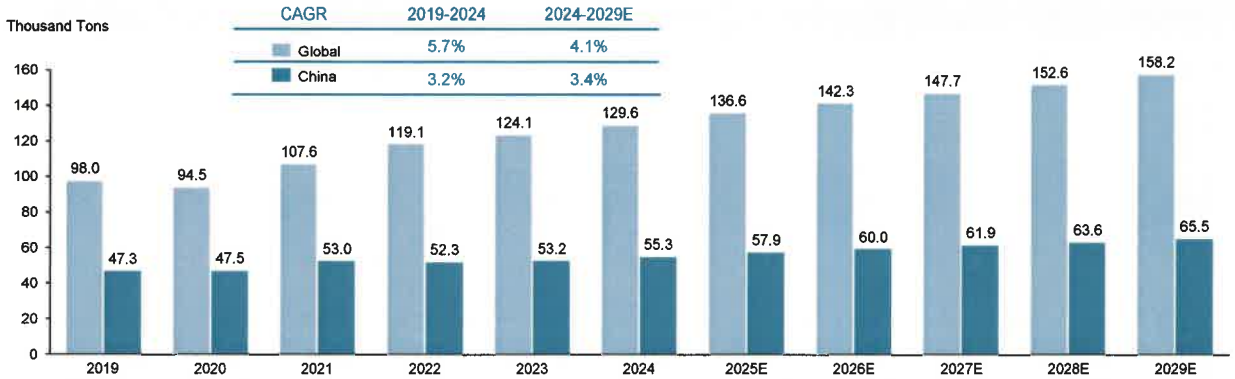
Source: USGS, Ministry of Natural Resources of the PRC, Frost & Sullivan

Updated

Global, China's and Kazakhstan's Tungsten Industry Overview

Consumption Volume of Tungsten Industry

Consumption Volume of Tungsten (Global & China), 2019 – 2029E



- Due to the natural characteristics of tungsten and the wide utilization of tungsten in different fields, the consumption volume of tungsten increased from 98.0 thousand tons in 2019 to 129.6 thousand tons in 2024, with a CAGR of 5.7%. Looking forward, with the increasing use of tungsten in fast-growing downstream markets, such as the PV industry and the new energy vehicles industry that also consume a lot of tungsten, the consumption volume of tungsten is expected to reach 158.2 thousand tons in 2029, with a CAGR of 4.1%.
- China's consumption volume of tungsten increased from 47.3 thousand tons in 2019 to 55.3 thousand tons in 2024, representing a CAGR of 3.2%. Going forward, with the continuous development of technologies and demand for tungsten, especially for cemented carbide products, the consumption volume of tungsten in China is expected to reach 65.5 thousand tons in 2029, with a CAGR of 3.4%.
- With the steady growth of the economy in China, tungsten consumption in various industries also keeps growing. Compared with other materials, tungsten has more compelling competitive advantages, leading to the rapid development of tungsten market. For example, tungsten is often made into cemented carbide products, which are widely used in aerospace industry, military industry, and PV (photovoltaic) industry and many other industries. Tungsten and tungsten wires can be used for producing materials with hardness, wear resistance, and high corrosion resistance. With foreseeable expansion of production and large-scale application, the cost performance ratio of tungsten wire will be higher than carbon diamond wire and it is going to be a reliable alternative product in PV industry. Meanwhile, because of the stagnation of industrial production caused by the COVID-19 epidemic in 2022, there is a small reduction in the tungsten consumption in China. Before 2022, the consumption of tungsten has increased steadily with a CAGR of 5.9% from 2019 to 2021. In the foreseeable future, along with continuous demand from downstream industries, the CAGR growth of consumption of tungsten in China is expected to be approximately 3.4% from 2024 to 2029.
- China was one of the major countries that consumed tungsten in 2024. The new energy vehicle (NEV) market was one of the main markets that require a large number of tungsten materials and the penetration rate of NEV in China was higher than the rate in other countries; therefore, China had experienced a faster consumption of tungsten in the past. Looking forward, with the development goal for NEV and renewable energy, China is expected to have more NEVs stations, which is expected to drive the fast-growing consumption of tungsten in China.
- Global tungsten consumption is higher than production because more tungsten had been consumed in the past. In addition, China's tungsten consumption is lower than production due to the fact that China exports tungsten products to a number of other countries, as it is a major tungsten reserve and producer. China's tungsten export restriction policy was implemented to protect domestic tungsten resources and ensure their sustainable supply. In recent years, with the gradual depletion of China's tungsten resources and increased awareness of environmental protection, the Chinese government has taken a series of measures to restrict tungsten exports. The implementation of this policy will have a significant impact on the global tungsten market. As a result of China's tungsten export restrictions, as well as the large gap between tungsten production and tungsten consumption, tungsten export demand in Kazakhstan will likely see strong growth.

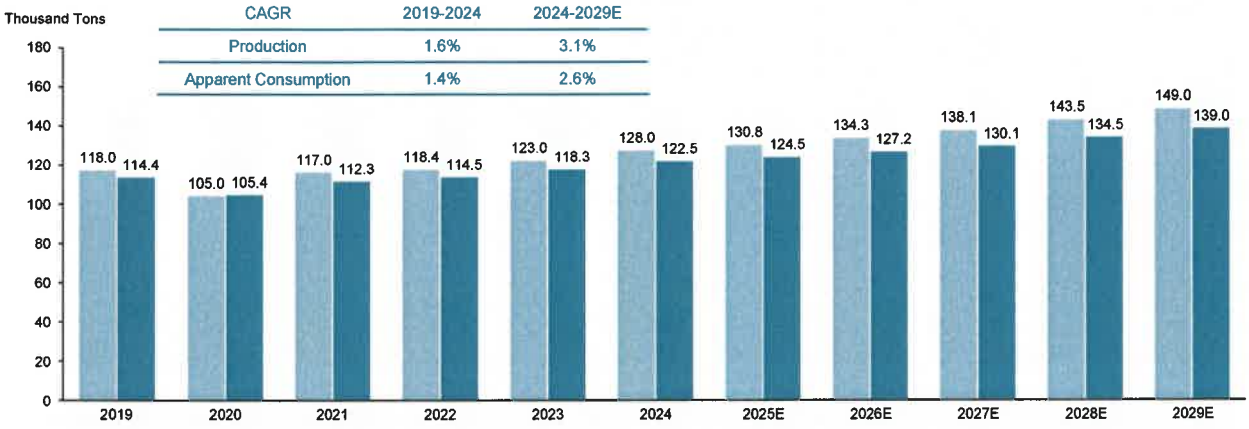
Source: Ministry of Natural Resources of the PRC, Frost & Sullivan

Updated

Global, China's and Kazakhstan's Tungsten Industry Overview

Downstream Products in Tungsten Industry (1/2)

Production Volume and Apparent Consumption Volume of APT (China), 2019 – 2029E



- APT (ammonium paratungstate) is one of the most applicable downstream products for the tungsten industry. The global APT industry mainly relies on imports from China, which is the world's largest producer and supplier of APT. This mainly causes the apparent consumption volume of APT in China is usually lower than the production volume due to the large exporting amounts. The production volume of APT in China has increased from 118.0 thousand tons in 2019 to 128.0 thousand tons in 2024 at a CAGR of 1.6%. In the meantime, the apparent consumption volume also increased from 114.4 thousand tons to 122.5 tons at a CAGR of 1.4%.
- Looking forward, with the gradual recovery of the domestic manufacturing industry, the production volume of APT may continue to rise. In addition, the consumption volume of APT is expected to grow as well since APT is the main raw material to produce cemented carbide products which are widely used in construction machines, metal cutting machines, auto manufacturing, aerospace, and military industries. Under this situation, the production volume and apparent consumption volume are expected to reach 149.0 thousand tons and 139.0 thousand tons in 2029, at CAGRs of 3.1% and 2.6%, respectively.

Source: China Tungsten Industry Association, Frost & Sullivan

Updated

Global, China's and Kazakhstan's Tungsten Industry Overview

Downstream Products in Tungsten Industry (2/2)

Price of APT, Tungsten Carbide Powder and Tungsten Concentrate (Global and China), 2017 – 2030E

Thousand US$/MTU

	2017	2018	2019	2020	2021	2022	2023	2024	2025E	2026E	2027E	2028E	2029E	2030E
Global-APT	21.1	24.0	18.7	17.3	20.9	23.4	24.0	27.0	29.5	30.5	31.6	33.0	34.8	37.0
Global-Tungsten Carbide Powder	33.5	38.1	29.7	27.4	32.3	35.7	35.6	39.7	42.5	43.2	45.7	48.9	52.5	56.1
Global-Tungsten Concentrate	13.7	14.6	11.7	11.2	13.5	15.0	16.2	18.0	20.2	21.9	23.0	24.0	25.1	26.2
China-APT	20.5	24.9	20.2	18.9	22.8	25.8	26.6	30.0	33.7	35.4	36.9	38.9	41.1	43.6
China-Tungsten Carbide Powder	32.6	39.6	32.0	29.9	35.2	39.3	39.5	44.1	48.5	50.1	53.5	57.7	61.9	66.2
China-Tungsten Concentrate	13.3	15.1	12.6	12.2	14.7	16.5	18.0	19.9	23.0	25.4	26.9	28.3	29.6	30.9

- The price of APT fluctuated in the past but generally showed an upward trend from 2017 to 2024. APT is an important material in the tungsten smelting industry and is mainly used to manufacture WO_3 or blue tungsten oxide to make tungsten metal powder, thus manufacturing tungsten material, tungsten alloy and other products. Since the production of tungsten concentrate, the raw material for manufacturing APT, is restricted, there has been an increased pressure on the production of APT in China, leading the price of APT to rise, which also leads to an increase in the price of the downstream product, the tungsten carbide powder.
- From the beginning of 2017 to the mid of 2018, the price of APT increased due to the stricter government regulation on environmental protection. In the meantime, the price of tungsten carbide powder and tungsten concentrate also increased. In 2020, due to the shortage of the global supply and the constraints of energy resources, the price of APT increased during that period of time as well.
- Looking forward, with the gradual normalization of the COVID-19, tungsten downstream market demand is expected to gradually recover, and the demand for APT, tungsten carbide powder and tungsten concentrate is expected to continue to grow. In this case, prices are expected to grow again in the short term and show a fluctuating upward trend in the long term.

Note: (1) The forecast prices take inflation into account; (2) MTU refers to Metric ton unit; (3) Tungsten Concentrate refers to Tungsten Concentrate (65% WO3); (4) The price of APT, tungsten carbide power, and tungsten concentrate is VAT included.

Source: China Tungsten Industry Association, Frost & Sullivan

Updated

Global, China's and Kazakhstan's Tungsten Industry Overview

Downstream Products in Tungsten Industry (2/2)

	Unit	2019	2020	2021	2022	2023	2024	2025E	2026E	2027E	2028E	2029E
Export Volume of Tungsten Products	Thousand Tonnes	10.4	9.1	11.3	12.1	12.1	12.6	12.9	13.4	13.8	14.3	14.8
Production Quota of Tungsten Concentrate	Thousand Tonnes	105.0	105.0	108.0	111.0	111.0	114.0	114.0	117.0	117.0	117.0	117.0
Production Volume of Tungsten Concentrate	Thousand Tonnes	69.0	66.0	71.0	66.0	66.0	67.0	62.0	59.0	57.2	55.7	54.5
Consumption Volume of Tungsten Concentrate	Thousand Tonnes	47.3	47.5	53.0	52.3	53.2	55.3	57.9	60.0	61.9	63.6	65.5
Production Volume of Tungsten Concentrate minus Consumption Volume of Tungsten Concentrate	Thousand Tonnes	21.7	18.5	18.0	13.7	12.8	11.7	4.1	(1.0)	(4.7)	(7.9)	(11.0)
Import Volume of Tungsten Concentrate	Thousand Tonnes	4.1	5.3	5.8	5.9	5.8	12.4	14.2	16.1	18.1	19.3	20.3

China was the largest country in terms of the production volume of tungsten concentrate in 2024. Meanwhile, China is also a major supplier of tungsten products. In 2024 in terms of export volume of tungsten products. In 2024, China's export of tungsten products accounts for about 40% of world consumption outside of China. The export volume of tungsten products have increased from 10.4 thousand tonnes in 2019 to 12.6 thousand tonnes in 2024.

Tungsten is considered an important strategic mineral and China has stockpiled a portion of its tungsten concentrate production each year during the historical period. Therefore, although during the historical period China produced more tungsten concentrate than it consumed, it didn't use all of the tungsten concentrate it produced for the production of tungsten products, and imported an increasing volume of tungsten concentrate to meet its consumption demand. Also, due to China's generally decreasing domestic tungsten concentrate production and generally increasing domestic tungsten concentrate consumption, the surplus between China's domestic production and consumption of tungsten concentrate has been narrowing and it is expected to turn to a shortfall in around 2026, leading to a further increase in import demand for tungsten concentrate.

Source: China Tungsten Industry Association, Frost & Sullivan

Updated

Global, China's and Kazakhstan's Tungsten Industry Overview

Import and Export

Export and Import Volume of Tungsten Concentrate (China), 2019 – 2029E

Note: (1) Export volume of tungsten products refer to tungsten products that use tungsten concentrate as raw material

Source: China Tungsten Industry Association, Frost & Sullivan

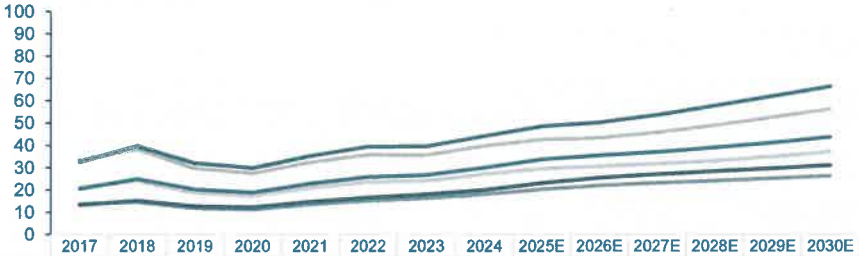
Updated

Global, China's and Kazakhstan's Tungsten Industry Overview

Downstream Products in Tungsten Industry (2/2)

Price of APT, Tungsten Carbide Powder and Tungsten Concentrate (Global and China), 2017 – 2030E

Thousand US$/MTU



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China-Tungsten Carbide Powder	32.6	39.6	32.0	29.9	35.2	39.3	39.5	44.1	48.5	50.1	53.5	57.7	61.9	66.2
China-Tungsten Concentrate	13.3	15.1	12.6	12.2	14.7	16.5	18.0	19.9	23.0	25.4	26.9	28.3	29.6	30.9

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Source: China Tungsten Industry Association, Frost & Sullivan

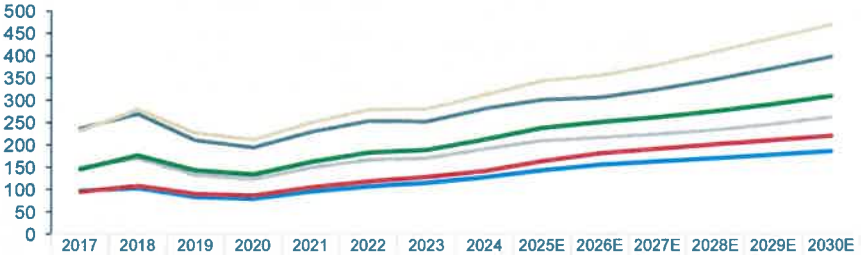
Updated

Global, China's and Kazakhstan's Tungsten Industry Overview

Downstream Products in Tungsten Industry (2/2)

Price of APT, Tungsten Carbide Powder and Tungsten Concentrate (Global and China), 2017 – 2030E

Thousand RMB/MTU



	2017	2018	2019	2020	2021	2022	2023	2024	2025E	2026E	2027E	2028E	2029E	2030E
Global-APT	149.3	169.9	132.5	122.6	148.2	165.8	169.8	191.0	209.1	216.1	223.6	233.3	246.4	261.8
Global-Tungsten Carbide Powder	237.2	269.5	210.1	194.2	228.9	253.0	252.1	281.3	301.2	305.8	323.7	346.1	371.4	397.0
Global-Tungsten Concentrate	96.8	103.1	82.8	78.9	95.4	106.4	114.7	127.2	143.0	155.2	162.6	169.9	177.7	185.6
China-APT	145.2	176.6	142.9	133.6	161.5	182.3	188.5	212.1	238.3	250.7	261.6	275.3	290.8	308.9
China-Tungsten Carbide Powder	230.6	280.2	226.6	211.7	249.5	278.3	279.8	312.2	343.4	354.8	378.7	408.4	438.3	468.5
China-Tungsten Concentrate	94.1	107.2	89.3	86.1	104.0	117.0	127.4	141.2	163.0	180.0	190.3	200.4	209.7	219.0

Note: (1) The forecast prices take inflation into account; (2) MTU refers to Metric ton unit; (3) Tungsten Concentrate refers to Tungsten Concentrate (65% WO3); (4) The price of APT, tungsten carbide power, and tungsten concentrate is VAT included.

Source: China Tungsten Industry Association, Frost & Sullivan

Updated

Global, China's and Kazakhstan's Tungsten Industry Overview

Market Drivers of Global, China's and Kazakhstan's Tungsten Industry (1/2)

	Major Drivers
1	**Rare Non-ferrous Metal Tungsten Resources and Continuously Innovative Mining Technology**
2	**Increasing Demand for Tungsten from Downstream Industries**
3	Advanced technology in Mineral Processing and Metallurgy
4	Improved Tungsten Utilization Efficiency Driven by Intelligent Technology
5	Favored Policies by Both Chinese and Kazakh Governments

Major Drivers	Description
Rare Non-ferrous Metal Tungsten Resources and Continuously Innovative Mining Technology	➢ Tungsten is a rare material with a high melting point, high density, high hardness, strong wear resistance, stable chemical performance, and other excellent characteristics. Tungsten products are usually used in various fields such as machinery manufacturing, power resources, and defense industry. The reserve volume of tungsten increased from approximately 3.2 million tons in 2019 to 4.6 million tons in 2024, representing a CAGR of 7.5%. In 2024, the global tungsten production was approximately 81,000 tons and the global tungsten consumption was about 129,600 tons, leading to a gap of up to 48,600 tons, reflecting the scarcity of tungsten resources and strong demand. Although the world's tungsten resources are geographically widespread, China currently ranks first in terms of tungsten resources and reserves, accounting for around 50% of the world's tungsten resources and reserves. China implements the principle of controlling the total tungsten resources mining index, i.e., the state departments unify the planning and distribution of tungsten resources mining indexes in various places. Besides, Canada, Kazakhstan, and Russia also have relatively high tungsten resources compared to other countries. As technology advances and the reserve volume continues to grow, to match the relatively scarce tungsten resources, tungsten production and steadily rising tungsten consumption, continued innovation in mining technology will be a major factor in the growth and development of the tungsten industry.
Increasing Demand for Tungsten from Downstream Industries	➢ With the steady growth of the world economy, tungsten consumption in various industries also keeps growing, and the global tungsten consumption is expected to reach approximately 158,200 tons by 2029. Tungsten is often made into cemented carbide products, which are widely used in aerospace industry, military industry, and PV (photovoltaic) industry and many other industries. Tungsten and tungsten wires can be used for producing materials with hardness, wear resistance, and high corrosion resistance. With foreseeable expansion of production and large scale application, the cost performance ratio of tungsten wire will be higher than carbon diamond wire and it is going to be a reliable alternative product in photovoltaic industry. In addition, tungsten carbide tools are widely used in CNC machine tooling. CNC machine tools require tools with high hardness, wear resistance and high temperature resistance to meet the demands of high speed cutting and heavy load machining. Tungsten, as one of the main components of Cemented Carbide, can provide excellent hardness and wear resistance, making the tool more durable and longer life. In addition, Carbide drills are a common industrial cutting tool used for drilling holes in metals, wood, plastics and other materials. Tungsten carbide particles give tungsten carbide drills high hardness and wear resistance, enabling them to cut effectively at high rotational speeds and under heavy loads. Moreover, tungsten carbide drills offer good cutting stability and long service life for a variety of drilling applications. Compared with other materials, tungsten has more compelling competitive advantages, leading to the rapid development of tungsten market.

Global, China's and Kazakhstan's Tungsten Industry Overview

Market Drivers of Global, China's and Kazakhstan's Tungsten Industry (2/2)

	Major Drivers
1	Favored Policies by Both Chinese and Kazakh Governments
2	Rare Non-ferrous Metal Tungsten Resources and Continuously Innovative Mining Technology
3	**Increasing Demand for Tungsten from Downstream Industries**
4	**Advanced technology in Mineral Processing and Metallurgy**
5	**Improved Tungsten Utilization Efficiency Driven by Intelligent Technology**

Major Drivers	Description
Advanced technology in Mineral Processing And Metallurgy	➢ In the direction of tungsten smelting technology, before 1980s, soda sintering, hydrochloric acid decomposition (for high-quality scheelite concentrate), soda pressure cooking, NaOH decomposition are the main commonly used tungsten ore decomposition processes globally. From the early 1980s to the end of the 1990s, the revolutionary breakthrough was made in NaOH decomposition method represented by hot ball milling (mechanically activated) and alkali pressure cooking. Since then, almost all tungsten minerals have been treated by NaOH decomposition method. In recent years, the development of sulfur and phosphorus mixed acid synergistic leaching technology of scheelite has realized the decomposition of tungsten minerals at atmospheric pressure. With the development of mineral processing and metallurgy technology, enterprises continue to increase technological research, improve the utilization rate of mineral resources, upgrade automated processes, and reduce energy costs. Furthermore, advancements in mining and processing technologies have improved the efficiency and cost-effectiveness of tungsten extraction, making it an attractive market for investors. Sustainable mining practices and environmental regulations have also influenced the tungsten market.
Improved Tungsten Utilization Efficiency Driven by Intelligent Technology	➢ Tungsten is a scarce, non-renewable and strategic resource worldwide. Therefore, the recycling of tungsten is also very important. With the widespread adoption of smart mineral processing and intelligent mining, the overall utilization rate of tungsten has been increasing in the past few years. Enterprises can now mine tungsten more efficiently and safely with the adoption of intelligent technologies. A set of intelligent systems can track the status of tungsten mines or ores 24/7 to ensure safety and productivity, and the intelligent system will improve the overall utilization of tungsten. Therefore, the intelligent technologies available in the industry are one of the main drivers of the tungsten market.
Favored Policies by Both Chinese and Kazakh Governments	➢ Kazakhstan is the first country where "The Belt and Road Initiative" ("一带一路) was initiated. China and Kazakhstan have achieved great results in the process of building "The Belt and Road Initiative" and more than 50 production capacity cooperation projects have been established between the two countries. China and Kazakhstan signed the " Cooperation Outline on Docking the Silk Road Economic Belt Construction and the New Economic Policy of the "Bright Road" ("关于 "丝绸之路经济带" 建设与 "光明之路" 新经济政策对接合作规划"). Boguty Tungsten is one of the key projects of cooperation between China and Kazakhstan. In the list of Sino-Kazakh cooperation projects, investment in the oil and gas sector accounts for about half, and the rest is distributed in industries such as mining and ore processing, machinery manufacturing, energy, and food production. Building "The Belt and Road Initiative" injects new vitality into Sino-Kazakh cooperation and promotes the synergistic development effect of the tungsten mining industry at the policy level. In addition, the Kazakhstan government has also issued a number of favorable regulations and plans beneficial to the mining industry. For instance, "Strategy Kazakhstan 2050" is a strategic plan issued by the government in 2012 to define new markets in which Kazakhstan can form productive partnerships and create a favorable investment environment. Since China has already established a long-term partnership with Kazakhstan, these favorable policies significantly provide a friendly environment for Chinese enterprises to operate in Kazakhstan and promote the development of the tungsten industry in both China and Kazakhstan.

Global, China's and Kazakhstan's Tungsten Industry Overview
Market Trends and Opportunities

Trends and Opportunities

Innovation in Tungsten Waste Recycling and Reuse

- Currently, most leading enterprises in tungsten industry can complete the preparation and mining process of tungsten. However, to achieve a better result in utilizing global tungsten resources, leading enterprises not only need to mine tungsten resources, but also need to recycle and reuse tungsten waste. Leading enterprises are expected to innovate a low-cost but high-efficiency method to recycle tungsten waste. As the growth of tungsten resources slows down, leading enterprises are paying more attention to reusing and recycling tungsten waste instead of simply consuming tungsten resources. Currently, around 75% of global tungsten supply comes from primary tungsten, only the remaining 25% comes from recycled tungsten. Although the initial investment in advanced technology is relatively high, this technology can significantly improve the efficiency of recycling and reuse of tungsten resources, thereby gradually reduce the operational cost of mining enterprises. Due to the strategic position and scarcity of tungsten, many leading enterprises attach great importance to the recycling of tungsten from waste materials. In recent years, the supply share of recycled tungsten has been increasing and it will continue to be the development trend of the tungsten industry in the future.

Technology Upgrades Bring More Tungsten Applications

- With the upgrading of technologies, leading enterprises are able to produce more refined products. Take China as an example, some of the leading tungsten enterprises have introduced advanced technology and equipment to implement technology absorption, transformation, and independent research and development and achieved localization of some key equipment such as spray drying and gas pressure sintering. In the future, with the continuous improvement of the technologies in the tungsten industry, the deep processed tungsten products of some leading enterprises are expected to contain more specifications in terms of thickness, width, length, density, etc. These advanced tungsten products will gradually develop towards high performance, high precision, and high value-added. Therefore, technological upgrading is an opportunity for large enterprises to strive for in the future.

Sustainable Mining Practices:

- There will be an increased focus on sustainable mining practices, including reducing environmental impact and promoting responsible resource extraction. This may involve utilizing advanced technologies for efficient extraction, implementing strict environmental regulations, and promoting reclamation and rehabilitation of mining sites. Compared to underground mining, open-pit mining offers better resource utilization, higher recovery rates, higher yields, higher labor productivity, and lower costs. Therefore open-pit mining is more sustainable and will become a major trend in the industry in the future.

Source: Frost & Sullivan

Updated

Global, China's and Kazakhstan's Tungsten Industry Overview
Threats and Challenges

Threats and Challenges

Increasing Operational Cost and Environmental Awareness

- Labor force is an important factor in the tungsten industry. As the economy develops, labor costs in China and Kazakhstan have been rising in recent years. The average annual salary of employees in China and Kazakhstan increased from US$12.7 thousand and US$9.6 thousand in 2019 to US$20.9 thousand and US$19.8 thousand in 2024, with CAGRs of 14.0% and 10.5%, respectively. The number of employees in the mining industry has also shown a decreasing trend in recent years. In addition, the price of raw materials used for producing downstream products also impacted the tungsten industry. For example, liquid sodium hydroxide and sulfuric acid are the key raw materials for producing tungsten downstream products and their price increased in 2021, which in turn significantly affected the price of tungsten products. Additionally, the increasing global awareness of ESG policies and environmental protection will also bring obstacles to the mining industry, as mining enterprises usually face potential environmental damage issues.

Uncertainty about the World Economic Situation

- The uncertainty of the world economic situation will also affect the tungsten mining industry to a certain extent. Russia is another large tungsten mining country in terms of the reserve volume and production volume of tungsten. The Russian-Ukrainian war caused short-term fluctuations in the tungsten market. Going into war, Russia is expected to use most of its domestic tungsten reserves to prepare weapons and reduce the global supply of tungsten, leading to a possible increase in the price of tungsten products due to supply shortages in Russia. When the situation of the conflict eases and strategic reserves and operational needs are met, the price of tungsten resources is likely to return to normal levels.

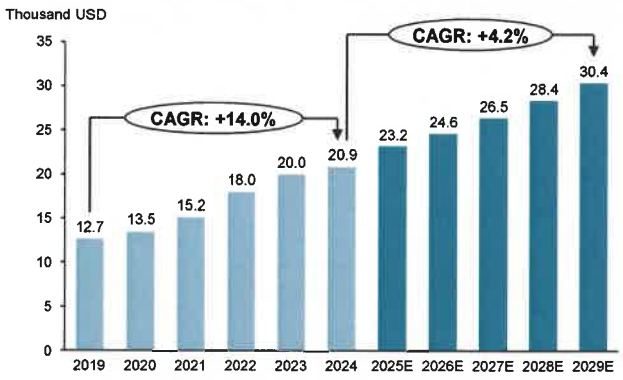
Source: Frost & Sullivan

Updated

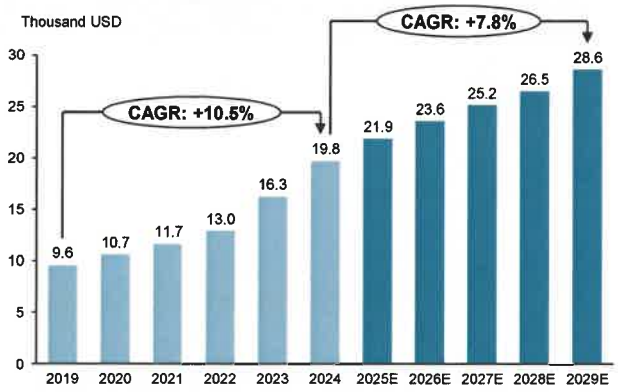
Global, China's and Kazakhstan's Tungsten Industry Overview

Cost Analysis (1/2)

Average Annual Salary of Employees (China), 2019 – 2029E



Average Annual Salary of Employees (Kazakhstan), 2019 – 2029E



- In line with the growing macro economy in China and Kazakhstan, the average annual salary of employees in the mining industry has also experienced a rapid increase in the past. The average annual salary of employees in China and Kazakhstan increased from US$12.7 thousand and US$9.6 thousand in 2019 to US$20.9 thousand and US$19.8 thousand in 2024, with CAGRs of 14.0% and 10.5%, respectively. Going forward, the average annual salary of employees in the mining industry is also expected to increase along with the growing economic environment in each country.

Note: (1) Annual salary in China refers to the average annual salary of employed persons in enterprises above designated size in the mining industry.
(2) Annual salary in Kazakhstan refers to the average annual salary of the mining and quarrying sector.

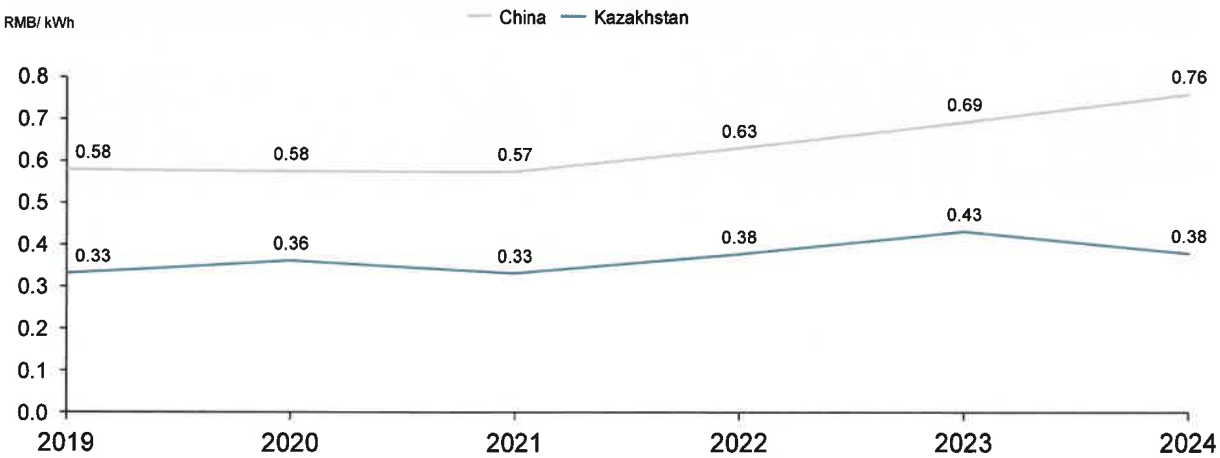
Source: NBS, Bureau of the National Statistics of the Republic of Kazakhstan

Updated

Global, China's and Kazakhstan's Tungsten Industry Overview

Cost Analysis (2/2)

Industry Electricity Price (China & Kazakhstan), 2019 – 2024



- As China's economy continues to grow, China's government proposed several rules and policies to lower the industrial electricity price in order to promote the development of China's enterprises. The industrial electricity price in China decreased from RMB0.58 per kWh to RMB0.57 per kWh from 2019 to 2021. In 2023 and 2024, due to the increasing demand for electricity with the continuous development of the industrial field, the industrial electricity price increased to RMB0.69 per kWh in 2023 and RMB0.76 per kWh in 2024.
- The industrial electricity price in Kazakhstan is generally lower than the price in China. The industrial electricity price in Kazakhstan generally fluctuated between RMB0.3 per kWh to RMB0.4 per kWh from 2019 to 2024.

Note: (1) Industry electricity price in China refers to the industry with 315KVA or more.
(2) Industry electricity price in Kazakhstan refers to the electricity for enterprises.

Source: National Energy Administration, Bureau of the National Statistics of the Republic of Kazakhstan

Content

Updated

Competitive Landscape of Global, China and Kazakhstan Tungsten Industry

Global Tungsten Mine Ranking in terms of Mineral Resources

- *The Group was the fourth largest Tungsten company in Global as of 2024 in terms of mineral resources in single tungsten mine.*

Ranking of Leading Mines in Global in terms of Mineral Resources, by Mine (Global), 2024

Rank	Tungsten Mine	Mine Location	Company	Identities or Background	Mineral Resources Million tons 2024	WO_3 (%)	Mining Method	Designed production capacity Thousand tons 2024	Statuses
1	Dahutang	Jiangxi, China	Xiamen Tungsten Co.,Ltd.	*Established in 1997 and headquartered in Fujian. The company is a listed company on Shanghai Stock Exchange. The company focuses on three core businesses: tungsten and molybdenum, rare earths and lithium battery materials, and also engages in real estate development.*	1.22	0.16%	Underground	~8.0	In development
2	Shizhuyuan	Hunan, China	China Minmetals Corporation	*Established in 1950 and headquartered in Beijing. The company is a non-listed company. The company is an enterprise with metal minerals as its core business. The company has 8 listed companies and has been ranked in the top 100 of the world's top 500 companies for many years.*	0.62	0.31%	Underground	~7.8	In development
3	Hemerdon	Devon, UK	Tungsten West Plc	*Established in 2018 and headquartered in UK. The company is a listed company on London Stock Exchange. The company is a mining development company focused on restarting the world-class tungsten and tin mine on the outskirts of Plymouth.*	0.36	0.17%	Underground	Estimate ~2.9	Undeveloped
4	**The Group's Boguty Mine**	**Boguty, Kazakhstan**	/	/	**0.23**	**0.21%**	**Open pit**	**Estimate 9.3**	In development
5	Sisson	Vancouver, Canada	Northcliff Resources Ltd.	*Established in 2010 and headquartered in Vancouver. The company is a listed company. It holds an 88.5% controlling interest in and is the operator of the advanced-stage Sisson Tungsten-Molybdenum Project in New Brunswick.*	0.22	0.07%	Open pit	~4.6	Undeveloped

- The Group's Boguty mine was the fourth largest single tungsten mine globally with 0.23 million tons Mineral Resources. In terms of designed production capacity, the capacity of tungsten concentrate of the Group is the largest in the world.
- Boguty tungsten mine, which is a world-class large open-pit tungsten mine, was the largest tungsten mine under development outside China as of 2024.

Note: (1) Dahutang tungsten mine are developed by Xiamen Tungsten, the government and Jiang Tungsten Holdings Group. Among them, Xiamen Tungsten has a larger share and coordinates the development; (2) Designed production capacity refers to the processing capacity of tungsten concentrate per year. (3) Mineral resources refer to mineral resources of WO_3.

Source: Independent Technical Report, Data of the Company is provided by the Company, USGS, Frost & Sullivan Analysis

For IO

Competitive Landscape of Global, China and Kazakhstan Tungsten Industry

Global Tungsten Mine Ranking in terms of Mineral Resources

- *The Group was the fourth largest Tungsten company in Global as of 2024 in terms of mineral resources in single tungsten mine.*

Ranking of Leading Mines in Global in terms of Mineral Resources by Mine (Global), 2024

Rank	Tungsten Mine	Location	Mineral Resources (Million tons) 2024	WO_3 (%)	Mining Method	Designed production capacity (Thousand tons) 2024	Statuses
1	Mine A	Jiangxi, China	1.22	0.16%	Underground	~8.0	In development
2	Mine B	Hunan, China	0.62	0.31%	Underground	~7.8	In development
3	Mine C	Devon, UK	0.36	0.17%	Underground	Estimate ~2.9	Undeveloped
4	**The Group's Boguty Mine**	**Boguty, Kazakhstan**	**0.23**	**0.21%**	**Open pit**	**Estimate 9.3**	In development
5	Mine D	*Vancouver, Canada*	0.22	0.07%	Open pit	~4.6	Undeveloped

- The Group's Boguty mine was the fourth largest single tungsten mine globally with 0.23 million tons Mineral Resources. In terms of designed production capacity, the capacity of tungsten concentrate of the Group is the largest in the world.
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Source: Independent Technical Report, Data of the Company is provided by the Company, USGS, Frost & Sullivan Analysis

Updated

Competitive Landscape of Global, China and Kazakhstan Tungsten Industry

Global Tungsten Groups Ranking in terms of Mineral Resources

- *The Group was the fourth largest Tungsten company in Global as of 2024 in terms of mineral resources*

Ranking of Leading Players in Global in terms of Mineral Resources, (Global), 2024

Rank	Company	Identities or Background	Mineral Resources (Million tons) 2024
1	Xiamen Tungsten	*Established in 1997 and headquartered in Fujian, this company is a listed company on the Shanghai Stock Exchange. This company focuses on three core businesses: tungsten and molybdenum, rare earths, and lithium battery materials, and also engages in real estate development.*	1.59
2	China Minmetals Corporation	*Established in 1950 and headquartered in Beijing, this company owns a total of eight listed subsidiary companies. This company is engaged in the production and trading of metals and minerals, including copper, aluminum, tungsten, tin, antimony, lead, zinc, and nickel.*	1.23
3	Tungsten West	*Established in 2018 and headquartered in UK, this company is a listed company on London Stock Exchange. This company is a mining development company focused on world-class tungsten and tin mine on the outskirts of Plymouth.*	0.36
4	**The Group**	/	**0.23**
5	Northcliff Resources	*Established in 2010 and headquartered in Vancouver, this company is a listed company on Toronto Stock Exchange. It holds an 88.5% controlling interest and is the operator of one Tungsten-Molybdenum Project in New Brunswick.*	0.22

- The Group was the fourth largest Tungsten company in Global with 0.23 million tons as of 2024 in terms of mineral resources.

Note: (1) Mineral resources refer to mineral resources of WO_3.

Source: Independent Technical Report Report, Data of the Company is provided by the Company, USGS, Frost & Sullivan Analysis

For IO

Competitive Landscape of Global, China and Kazakhstan Tungsten Industry

Global Tungsten Groups Ranking in terms of Mineral Resources

- *The Group was the fourth largest Tungsten company in Global as of 2024 in terms of mineral resources*

Ranking of Leading Players in Global in terms of Mineral Resources, (Global), 2024

Rank	Company	Identities or Background	Mineral Resources (Million tons) 2024
1	Company A	*Established in 1997 and headquartered in Fujian, this company is a listed company on the Shanghai Stock Exchange. This company focuses on three core businesses: tungsten and molybdenum, rare earths, and lithium battery materials, and also engages in real estate development.*	1.59
2	Company B	*Established in 1950 and headquartered in Beijing, this company owns a total of eight listed subsidiary companies. This company is engaged in the production and trading of metals and minerals, including copper, aluminum, tungsten, tin, antimony, lead, zinc, and nickel.*	1.23
3	Company C	*Established in 2018 and headquartered in UK, this company is a listed company on London Stock Exchange. This company is a mining development company focused on world-class tungsten and tin mine on the outskirts of Plymouth.*	0.36
4	**The Group**	/	**0.23**
5	Company D	*Established in 2010 and headquartered in Vancouver, this company is a listed company on Toronto Stock Exchange. It holds an 88.5% controlling interest and is the operator of one Tungsten-Molybdenum Project in New Brunswick.*	0.22

- The Group was the fourth largest Tungsten company in Global with 0.23 million tons as of 2024 in terms of mineral resources.

Note: (1) Mineral resources refer to mineral resources of WO_3.

Source: Independent Technical Report Report, Data of the Company is provided by the Company, USGS, Frost & Sullivan Analysis

Competitive Landscape of Global, China and Kazakhstan Tungsten Industry

Company Profile of Leading Players

Company	Company Name	English Abbreviation	Identities or Background
Company A	Xiamen Tungsten Co.,Ltd.	Xiamen Tungsten	Company A is a listed company on SHSE which was established in 1997 and headquartered in Xiamen, Fujian Province, China. The company involved in fields such as tungsten, molybdenum, rare earths, new energy materials, and real estate. The company has a complete tungsten and rare earth industry chain.
Company B	China Minmetals Corporation	China Minmetals Corporation	Company B is a listed company which was established in 1950. This company focuses on metal minerals as the core business and owns several listed subsidiaries on SHSE, SZSE, HKEX. The company headquartered in Beijing, China and is a member of the Fortune 500. The company covers mining business including copper, zinc, lead, antimony and other resources and has over 30 domestic and foreign mines in Asia, Oceania, South America, and Africa.
Company C	Tungsten West Plc	Tungsten West	Company C is a listed company on London Stock Exchange and was established in 2018 and headquartered in UK. The company focuses on mining development and restarting mine that has been suspended mining operations. The company also own one of the largest tungsten resource in the world.
Company D	Northcliff Resources Ltd.	Northcliff Resources	Company D is a listed company on Toronto Stock Exchange and was established in 2010 and headquartered in Vancouver, British Columbia, Canada. The Company is primarily engaged in the acquisition and development of mineral properties and holds a major economic interest in a Tungsten and Molybdenum Project located in Canada.

Source: Frost & Sullivan

Updated

Competitive Landscape of Global, China and Kazakhstan Tungsten Industry
Major Competitors' Profiles

Company Name	Xiamen Tungsten Co.,Ltd. [600549.SH]
Headquarter Location	Fujian Province
Revenue in 2024	35,196.46 Million
Production capacity (At the end of 2024)	• APT:25,327 tons, • Tungsten powder: 13,295 tons • Tungsten carbide: 7,571 tons
Number of Mines owned	• 4
Total tungsten reserves	• 358,488 tons
Features / Characteristics	• Most of the company's APT products are for self-use and a small portion is exported. The production and sales of tungsten powder have been on an upward trend since 2016, with APT production of 25,327 tons in FY24.

厦门钨业

Establish in 1997, this company is a listed company headquartered in Fujian Province, China. The company focuses on three core businesses: tungsten and molybdenum, rare earths and lithium battery materials, and also engages in real estate development.c

Source: Data of the Company is provided by the Company, Frost & Sullivan Analysis

Updated

Competitive Landscape of Global, China and Kazakhstan Tungsten Industry
Major Competitors' Profiles

Company Name	Chongyi Zhangyuan Tungsten Co.,Ltd. [002378.SZ]
Headquarter Location	Jiangxi Province
Revenue in 2024	3,673.25 Million
Key products sales volume (At the end of 2024)	• Tungsten powder: 3,980 tons • Tungsten carbide: 4,923 tons • Cemented carbide: 1,111 tons
Number of Mines owned	• 6
Total tungsten reserves	• 79,400 tons
Features / Characteristics	• Deeply engaged in the tungsten industry for more than 20 years, the company has gradually developed into a group enterprise integrating tungsten mining, smelting, powder making and cemented carbide production and deep processing, and trading.

ZW 章源钨业 ZHANGYUAN TUNGSTEN

Establish in 2000, this company is a listed company headquartered in Jiangxi Province, China. The company is one of the domestic manufacturers with a complete tungsten industry chain, which has established a complete production system from tungsten upstream mining and beneficiation, to midstream smelting, to downstream deep processing, and its main products include tungsten concentrate, ammonium paratungstate, tungsten oxide, tungsten powder, tungsten carbide powder and cemented carbide.

Source: Data of the Company is provided by the Company, Frost & Sullivan Analysis

Updated

Competitive Landscape of Global, China and Kazakhstan Tungsten Industry
Major Competitors' Profiles

Company Name	China Tungsten And Hightech Materals Co.,Ltd [000657.SZ]
Headquarter Location	Hainan Province
Revenue in 2024	14,742.77 Million
Production capacity (At the end of 2024)	• Cemented carbide:14,600 tons • APT: 15,300 tons
Number of Mines owned	• 5
Total tungsten reserves	• 1,230,000 tons
Features / Characteristics	• In 2024, the company's production of cemented carbide products will exceed 14,600 tons, ranking first in the world. The company's cemented carbide products have a complete range of specifications, among which the scale of cutting tools, cemented carbide rolls, precision parts, hard facing materials and ball teeth, molybdenum wire and other varieties rank first in China.

中国五矿 CMT 中钨高新

Establish in 1993, this company is a listed company headquartered in Hainan Province, China. The company's cemented carbide products account for more than 25% of the domestic reserve share, and its cemented carbide production is the first in the world. The company has a complete range of cemented carbide products, from tungsten powder products for primary processing to high value-added carbide inserts and tools, including more than 30,000 kinds of CNC inserts.

Source: Data of the Company is provided by the Company, Frost & Sullivan Analysis

Updated

Competitive Landscape of Global, China and Kazakhstan Tungsten Industry
Major Competitors' Profiles

Company Name	Tungsten West Plc [TUN.L]
Headquarter Location	United Kingdom
Revenue in 2024	722,036 £
Production capacity (At the end of 2024)	• Tungsten West is still in the pre-production phase of operations and meets its day to day working capital requirements by utilising cash reserves from investment made in the Tungsten West.
Number of Mines owned	• 1
Total tungsten reserves	• 101,200,000 tons
Features / Characteristics	• Tungsten supply remains of strategic importance as China continues to dominate, controlling 85% of global tungsten mine production. Tungsten West also looks to leverage off the high value in tin as the global use of tin is expected to increase rapidly through use in electronics and solar panels.

TUNGSTEN WEST

Establish in 2018, this company is a listed company on UK Stock Exchange and headquartered in UK. The company is a mining development company focused on restarting the world-class Hemerdon tungsten and tin mine on the outskirts of Plymouth.

Note: (1) In the year revenue has mainly related to the sale of aggregates produced from the mining waste from previous mining operations. This is recognised upon pick up by customers at the fair value of consideration receivable at that date. Tungsten West has not yet commenced commercial sales of tungsten and tin.

Source: Data of the Company is provided by the Company, Frost & Sullivan Analysis

Global, China's and Kazakhstan's Tungsten Industry Overview
Entry Barrier and Key Success Factor Analysis

Observations

- Exploration and mining capability is crucial to the tungsten industry, industry participants need to accurately explore the exact location of tungsten mines, mining methods, economic value, etc. For instance, some mines have mineralization prospects in the deep parts and need to strengthen deep search according to geological studies; some mines have large reserves, but the depth exploration degree is low, far from meeting the mining needs; and some mines have been exhausted, and are on the verge of pit closure, which urgently need to explore the deep mineralization mechanism and make a definite geological conclusion. Therefore, new entrants to the industry require a long time to develop their exploration and mining capability.

- As downstream customers are paying more attention to the tungsten raw materials, product quality has become one of the main barriers to entering the tungsten industry. Major domestic and foreign high-end tungsten carbide manufacturers have strict requirements for their main raw material, ultra-fine and ultra-thick tungsten carbide resources. For example, ultra-fine tungsten carbide powders are required to have small particle size, high purity, and narrow particle size distribution. Some companies that fail to meet the relevant quality requirements will be gradually eliminated. In addition, downstream customers pay special attention to the stability of product quality. It is very difficult to survive and develop in the tungsten market if a company cannot continue to provide products with stable quality.

- With the development of global tungsten technology, tungsten products tend to have high performance, high precision, and high added value. This trend puts forward higher technical requirements for enterprises entering the tungsten industry, e.g. the gradual application of nanomaterials, nanostructure coatings, coating technologies, etc. Tungsten cemented carbide tools, require higher technical standards and requirements for the powder morphology, chemical purity, and powder particle size of the main raw material tungsten carbide. Therefore, new companies entering the industry need to constantly overcome such technical barriers.

Source: Frost & Sullivan

Global, China's and Kazakhstan's Tungsten Industry Overview
Entry Barrier and Key Success Factor Analysis

Observations

- Sufficient capital investment is necessary for the tungsten industry. This is mainly because mining requires a large amount of capital investment upfront as it takes several years before the mine to start producing and making a profit. During this process, exploration costs, geological exploration equipment, mining equipment and infrastructure and a lot of labor need to be purchased and employed. In addition, sufficient capital is also critical for companies in the tungsten industry to establish and maintain their leading market position. Therefore, it can be difficult for new entrants without sufficient capital to enter the industry.

- The tungsten industry has higher requirements for management talent in all aspects. In the production process, the production personnel are required to precisely control the key parameters in each process flow. Therefore, a company is required to have a variety of management talent with many years of experience in tungsten industry. The demand for management talent in the industry is not only a requirement for professional knowledge but also a certain amount of experience. At present, there are few professionals in the tungsten industry, and the management talent training cycle is long. Finding professional management talent can become one of the difficulties faced by newcomers.

- Tungsten ore is a specific mineral species regulated by China's central government for protective mining. In order to protect and rationally develop and utilize the advantageous mineral resources, China's central government has continued to postpone the acceptance of new mineral exploration and mining registration applications. The China Ministry of Natural Resources mainly determines the total mining control indicators based on the national mineral resources planning, while combining the national industrial policy, ecological and environmental protection, retaining resource reserves, mining rights, mining capacity production, and other factors to determine the total annual mining control indicators of tungsten mines, and allocates to the provincial departments in charge of natural resources. For new entrants to the industry, the lack of exploration and mining licenses can become a serious barrier.

Source: Frost & Sullivan

Content

Company List for Industry Overview

Company Name (Chinese)	Company Name (English)	Company Name (Abbreviation)
厦门钨业股份有限公司	Xiamen Tungsten Co.,Ltd.	Xiamen Tungsten
/	Tungsten West Plc	Tungsten West
中国五矿集团有限公司	China Minmetals Corporation	China Minmetals
/	Northcliff Resources Ltd.	Northcliff Resources

Updated

Industry Norm

- In 2024, China's imports of tungsten ore and concentrates reached 12,413 tons, an increase of 113.9% compared to 5,803 tons in 2024.
- The mining industry involves a number of risks and hazards, including industrial accidents, labor disputes, unusual or unexpected geological conditions, mine collapses, fires, explosions, equipment failure, delays in supplies and loss of key inputs, including electricity, water and coal, changes in the regulatory environment, environmental hazards, and weather and other natural phenomena such as earthquakes and floods.
- Historically, the market prices for tungsten products has exhibited volatility.
- The prices of tungsten products have been affected by numerous factors beyond our control, including, among others, international economic and political conditions, government policies, levels of supply and demand, cost of production and technology development.
- According to Frost & Sullivan, the prices of major tungsten products such as tungsten ore concentrate, are expected to grow in the short term and show a fluctuating upward trend in the long term.
- The primary factors driving competition are strong exploration and mining capacity with progressive mining methods, high-quality and stable product, new technology development, sufficient capital investment, professional talent management and retention and obtaining exploration and extraction permits. Other factors that could affect competition in the tungsten marketplace include additional discoveries of tungsten reserves by our competitors, access and capacity to transportation, political and economic factors and other factors beyond our control.
- Labor costs in Kazakhstan have been increasing in recent years.
- According to Frost & Sullivan, the Group has maintained insurance in line with customary industry practice.
- According to Frost & Sullivan, the major factors of competition in the tungsten ore mining industry include abundance and quality of mineral reserves, costs of operation, accessibility to infrastructure, access to capital and the ability to carry out downstream processing to offer higher value-added products.
- According to Frost & Sullivan, the tungsten exploration and production industry in Kazakhstan is consolidated and there were approximately 50 registered enterprises involved in tungsten mining, exploration and production in 2024 in Kazakhstan.
- In particular, the life-of-mine (LOM) stripping ratio (i.e., the ratio between the volume of waste material required to be handled in order to extract ore, which is an important factor for determining the economics of mining activities. According to Frost & Sullivan, the stripping ratio of the Group's Boguty tungsten mine is reasonably low and superior to industry average.
- Among these projects, the Group's Boguty Project was the largest mining project in terms of the investment scale and the only integrated mining and processing project invested by a PRC enterprise as of the Latest Practicable Date.
- Jiangxi Copper is a leading international mining company listed on both the Stock Exchange and the Shanghai Stock Exchange with comprehensive experience in the entire mining industry chain, including exploration, mining, ore dressing, smelting and processing.
- Jiangxi Copper owns Dexing copper mine (the largest copper mine in China as of the Latest Practicable Date, according to Frost & Sullivan) and a number of other copper mines in the production phase.
- According to Frost & Sullivan, Jiangxi Copper was the largest copper producer in China as of the Latest Practicable Date.

Updated

Industry Norm

- CRCCII and CCECC HK are also Shareholders of the Group and both are wholly-owned subsidiaries of CRCC, which is an international construction company listed on both the Stock Exchange and the Shanghai Stock Exchange with extensive experience in engineering contracting, planning, design and consulting, and project investment and operations.
- According to Frost & Sullivan, CRCC is one of the largest project contractors in China and one of the largest comprehensive construction companies globally.
- Tungsten products such as APT and WC tend to enjoy a higher profit margin, which are expected to improve our profitability and sustainability in the future.
- The group's products are commodities and we expect the biggest factor affecting their price will be the corresponding commodity prices on international exchanges, which is in turn affected by global supply and demand.
- In addition, according to the Frost & Sullivan Report, high-end tungsten products are expected to be in higher demand and command higher selling prices.
- As advised by Frost & Sullivan, it is common for a mining company to construct specific water supply systems depending on the actual environment surrounding a mine and accordingly, there is no set market price for water use in the mining industry.
- The group's final product before we carry out any deep processing activities is expected to comprise a scheelite concentrate containing 65% WO_3. Scheelite concentrate containing 65%WO_3 is an intermediate in the recovery of tungsten from its minerals, and tungsten has a higher melting point and density, and good high-temperature resistivity and thermal stability, leading to a growing demand globally, according to Frost & Sullivan.
- The group's products are commodities and we expect the biggest factor affecting their price will be the corresponding commodity prices on international exchanges, which is in turn affected by global supply and demand. We expect pricing terms in sales contracts we enter into will explicitly make reference to such exchange prices and databases, subject to adjustment based on the quality of the tungsten ore concentrates. In addition, according to Frost & Sullivan, high-end tungsten products are expected to be in higher demand and command higher selling prices.
- In global and China tungsten industry, buyers lock in tungsten quotas by making advance payments to tungsten companies like the group, which is a normal practice.

Appendix
Abbreviations and Terms

Limitations in Source of Information

- Interviews with industry experts and market participants are conducted to collect information for this report, based on a best-efforts basis.
- Frost & Sullivan will not be responsible for any information gaps where interviewees have refused to divulge confidential data or figures.
- In instances where information is not available, figures based on similar indicators combined with Frost & Sullivan in-house analysis will be deployed to arrive at an estimate.
- Frost & Sullivan will state the information sources at the bottom right-hand corner of each slide for easy reference.

Note to Numeric Calculations

- Value and figures in this report are all rounded. Figures may not add up to the respective totals owing to rounding. CAGRs may not be reproducible from the rounded figures exhibited in the charts.
- The base year is 2024. The historic period is from 2019 to 2023. The forecast period is from 2025 to 2029.

Source: Frost & Sullivan

Appendix
Methodologies

- Frost & Sullivan is an independent global consulting firm, which was founded in 1961 in New York, United States of America. It offers industry research and market strategies and provides growth consulting and corporate training. Its industry coverage in China includes automotive and transportation, chemicals, materials and food, commercial aviation, consumer products, energy and power systems, environment and building technologies, healthcare, industrial automation and electronics, industrial and machinery, and technology, media and telecom.
- The Frost & Sullivan's report includes information on the global, China's and Kazakhstan's macro economy overview, the global, China's and Kazakhstan's tungsten industry and the competitive landscape of China's tungsten industry
- In compiling the F&S Report, Frost & Sullivan has (a) conducted detailed primary research which involve discussing the status of China's passenger vehicle market with leading industry participants and industry experts and (b) conducted secondary research which involve reviewing company reports, independent research reports and data based on Frost & Sullivan's own database.
- Frost & Sullivan's report was compiled based on the below assumptions at the time of compiling this report:
  - The COVID-19 pandemic is likely to pose short-term impact on China's economy and tungsten industry. The short-term impact of COVID-19 pandemic has been taken into consideration in this report;
  - China's economy is likely to maintain steady growth in the next decade;
  - China's social, economic, and political environment is likely to remain stable from 2024 to 2028 ("Forecast Period"); and;
  - Market drivers such as global economic development, abundant resources and distributions of tungsten, increasing demands for various products and industries, developing technology in the mining industry, increasing utilization of recycling tungsten and favored policies from China's and Kazakhstan's governments are likely to further drive the development of global, China's and Kazakhstan's tungsten industry.

Source: Frost & Sullivan

Thank You!

Partner with you on the Road to Growth

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