
INDUSTRY OVERVIEW

Certain information and statistics set out in this section and other sections of this document were extracted from the F&S Report prepared by Frost & Sullivan, which was commissioned by us, and from various official government publications and other publicly available publications. We engaged Frost & Sullivan to prepare the F&S Report, an independent industry report, in connection with the [REDACTED]. The information from official government sources has not been independently verified by us, the Sole Sponsor, [REDACTED], the [REDACTED], the [REDACTED], the [REDACTED], the [REDACTED], any of their respective directors and advisers or any other persons or parties (other than Frost & Sullivan) involved in the [REDACTED], and no representation is given as to its accuracy. Unless and except for otherwise specified, the market and industry information and data presented in this “Industry Overview” section is derived from the F&S Report.

SOURCE OF INFORMATION

We commissioned Frost & Sullivan to conduct an analysis of the global and China’s gold industry. We have agreed to pay a fee of approximately RMB1.4 million for the F&S Report, which will be paid prior to the [REDACTED]. Our Directors are of the view that the payment of the fee does not affect the fairness of conclusions drawn in the F&S Report.

Frost & Sullivan is an independent global market research and consulting firm founded in 1961 and based in the United States. It offers industry research and market strategies and provides growth consulting and corporate training. The F&S Report includes both historical and forecast information on global and China’s gold mining markets and other economic data. To prepare the F&S Report, Frost & Sullivan undertook both primary and secondary independent research through various resources within global and China’s gold mining markets. Primary research includes interviewing industry insiders, competitors, downstream customers and recognised third-party industry associations. Secondary research includes reviewing corporate annual reports, databases of relevant official authorities, independent research reports and publications, as well as the exclusive database established by Frost & Sullivan over the past decades. Frost & Sullivan has adopted the following primary assumptions while compiling and preparing the F&S Report: (i) government policies on gold and gold mining industries in China and major overseas countries will remain consistent during the forecast period; and (ii) the gold and gold mining market in mainland China and the globe will be driven by market drivers stated in the report. Frost & Sullivan has also obtained the figures for the estimated total market size from historical data analysis plotted against the macroeconomic data as well as the industry key drivers. Our Directors confirm that, after making reasonable enquiries, there have not been any material adverse changes to the market information set out in the F&S Report since the date of such report which may qualify, contradict or have an impact on the information contained in this section.

THE GLOBAL GOLD INDUSTRY

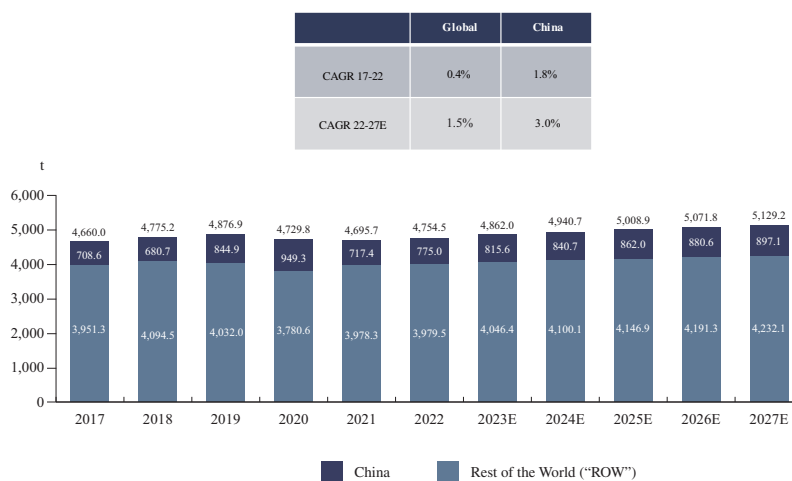
Global gold supply

Generally, gold supply is positively correlated to gold price, as gold miners are motivated to produce more gold when gold price goes up. Globally, countries such as China, Australia, Russia and the U.S. are major gold supply countries. China is the world’s largest gold mine production country since 2007 and accounted for more than 15% of gold supply. Global gold supply has a modest increase from 2017 to 2022. Gold supply decreased in 2020 and 2021 due to the pandemic and decrease in China gold supply due to safety accidents in Shandong. In 2022, gold supply recovered mainly due to the

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global economy recovering in post-pandemic time period and China’s gold mine production resuming from previous safety check especially for Shandong Province. Moving forward, under the context of the continuation of global economy recovery, global gold supply is expected to grow at CAGR of 1.5% during 2022 to 2027, driven by robust gold demand, rising in gold price, and exploitation and exploration technology advancement. As for China gold supply, due to temporary stoppage on gold mining activities for safety check after the occurrence of safety accidents in Shandong, China’s gold production in 2021 decreased by around 24% compared with 2020 supply level. Such decrease is considered to be temporary, and in 2022, gold production recovered, as China gold mine companies resumed production after the safety check. Going forward, China’s gold supply is expected to grow at approximately 3.0% from 2022 to 2027, driven by the continuous improvement in gold production, such as replacing low-efficient and ecologically unfriendly production capacities with innovative technologies and equipment, rising gold price and steady growing gold demand in downstream sectors.

Gold Supply, Global and China, 2017–2027E



Note: Gold Supply includes mining production and recycled gold.

Source: World Gold Council, China Gold Association and Frost & Sullivan

Global gold demand

Gold is mainly demanded for the purpose of jewellery fabrication, investment, technology/industry and central banks reserves, with jewellery and investment as the key drivers for gold demand. The increase in gold demand as compared with 2021 is mainly attributed to the increase in gold reserve demand by central banks. The Russia-Ukraine tensions, the climb of global crude oil price leading to expensive energy consumption, and worries on potential global economy recession in 2023 as the Federal Reserve is continuously raising interest rates, which result in central banks raising gold reserve for hedging risks.

Consumers’ purchase of jewellery is closely associated with gold price fluctuation and purchasing power, as well as political environment change. During 2017 to 2021, there was a slight decrease in gold demand from jewellery, mainly due to (i) the imposition of import tariff on gold by the Indian government since 2016 which caused an increase in local gold price; and (ii) the weak demand for gold in China due to economic slowdown and tightened credit policy in 2016. Due to the government lockdown policy, rising gold price and economic recession, demand for gold jewellery fell drastically in 2020. Driven by an effective COVID-19 vaccine rollout, improved consumer sentiment and economic recovery, jewellery demand realised a rebound in 2021, with an increase of more than 60% compared with 2020. In 2022, a modest decline is noted, which is due to China, as one of the major gold jewellery consumption countries, shrank its demand caused by the pandemic lockdown. Going forward, global demand for gold jewellery is anticipated to have an increase, considering the steady recovery from the pandemic and resumption of gold jewellery retailing activities, as well as the continuous rise of people’s income level and consumption upgrade.

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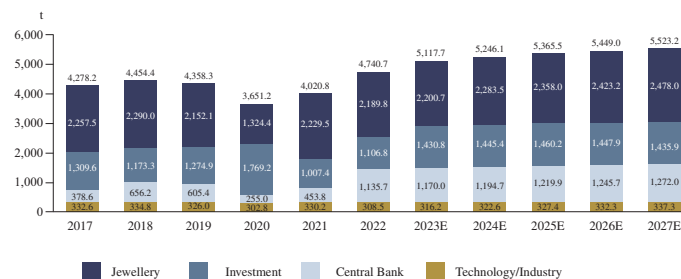
Investments include purchase of gold bars and coins as well as exchange traded fund (“ETF”) which is linked to gold price. Historically gold investment exhibits a growing trend during 2017 to 2020, which was mainly attributed to ETF as a result of increase in gold price and consumers’ purchase of bars and coins for value preservation. In 2021, gold investment decreased by more than 40% compared with 2020 level, which was mainly caused by decrease in gold investment by ETF as the world is stepping into recovery phase from the pandemic, ETF gold investment cooled down and funds were flowing into other investment products such as equity. In 2022, gold investment increased, especially for investment in gold coin and bar, which is due to geopolitical concerns and hedging against inflation. In the foreseeable future, considering the uncertainties of global economy recession under the context of the Federal Reserve’s aggressiveness in raising interest rate and Russia-Ukraine tensions, gold investment is expected to exhibit a growth of CAGR of approximately 5.3% during 2022 to 2027.

The development of new/emerging commodity asset class (e.g. cryptocurrency, gold-backed NTFs and other virtual commodities) provides investors with more available options on top of to gold and typical financial products such as stocks and bond, for them to build up their investment portfolios. However, such impact is believed to be limited considering gold as an investment product, due to 1) gold is widely accepted by and traded in global market, indicating higher liquidity; 2) gold with long history is traded under a pretty much comprehensive regulatory environment and 3) gold is typically invested and held for risk hedging against the inflation and other risks while new commodity asset such as cryptocurrency is more attracted for its expected high return associated with high risk.

Besides, gold is demanded for many other usages besides investment purpose. Gold is demanded for jewellery, for central bank reserves and for technology and industry production use which are taking more than 70% of total gold demand in 2021, and such demands are quite different from the emerging commodity class which are mainly for investment purpose. Therefore, it is believed that the emerging commodity asset class has a limited impact on gold demand.

Gold Demand, Global, 2017–2027E

	Jewellery	Investment	Central Bank	Technology/ Industry	Total
CAGR 17-22	-0.6%	-3.3%	24.6%	-1.5%	2.1%
CAGR 22-27E	2.5%	5.3%	2.3%	1.8%	3.1%



Source: World Gold Council and Frost & Sullivan

GOLD INDUSTRY IN CHINA AND SHANDONG

Gold demand in China

China’s gold demand has increased to approximately 1,127.9 t in 2021, representing an increase of a more than 30% compared with 2020, which was mainly attributed to the growth in gold demand for jewellery and investment. Driven by improved economic environment due to the rollout of vaccine, and improved consumer sentiment, jewellery demand showed a rebound from 2020. Moreover, investors are putting more emphasis on gold investment, resulting in the increase in gold investment such as gold bar and coins.

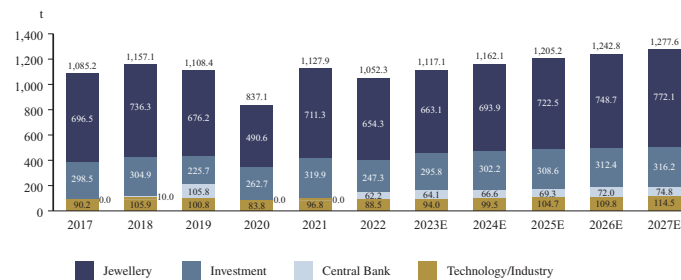
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In 2022, China’s gold demand decreased a bit due to China’s lockdown to prevent pandemic spread, demand for gold jewellery decreased. Furthermore, gold investment in gold bar and coin, as well as gold ETF decreased due to the high gold price level in China. Gold used for technology/industry purpose decreased in 2022, due to the pandemic lockdown and shrink in demand. Going forward, consumption of gold jewellery is expected to have a continuous growth, considering the effective control of pandemic in China and resumption of gold jewellery retailing activities, as well as the continuous rise of people’s income level and consumption upgrade.

In upward trend in gold investment in China is anticipated, driven by increasing demand on gold to hedge future uncertainties of global economy recession under the context of the Federal Reserve’s aggressiveness in raising interest rate and Russia-Ukraine tensions.

Gold Demand, China, 2017–2027E

	Jewellery	Investment	Central Bank	Technology/ Industry	Total
CAGR 17-22	-1.2%	-3.7%	N.A.	-0.4%	-0.6%
CAGR 22-27E	3.4%	5.0%	3.7%	5.3%	4.0%



Note: Gold Demand in China does not include gold needed by gold smelting companies, banks or others for portfolio allocation, trade turnover, leasing and inter-bank lending.

Source: China Gold Association and Frost & Sullivan

Gold price

Average gold spot price in China is closely associated with global average gold spot price so as to prevent the arbitrage profits. The difference in between the two prices is primarily coming from the foreign exchange rate fluctuation of RMB/USD as well as the gold import and export control imposed by Chinese government. The gold price is predominantly impacted by global political and economic situations, and when there exists instabilities in political or economic environment or turbulence in stock market, gold is usually treated as one of the risk-hedging tools, and its price will typically exhibit upward trend. Moreover, monetary policies by central banks (e.g. fluctuation in currency exchange rate) and macroeconomic factors (e.g. interest rate and inflation expectation) are also important influential factors of gold price. Shanghai Gold Exchange (“SGE”) was established by the People’s Bank of China upon approval by the State Council. SGE provides trading, clearing, delivery and vaulting services of gold, silver and platinum. In terms of gold traded in SGE, there are different categories and respective gold prices according to types of standard gold (e.g. Au99.99, Au99.95, Au 99.5).

Gold spot price in China increased from approximately RMB 341.6 per gram on 2 Jan 2020 to RMB 392.4 per gram on 31 Dec 2020, and further back to RMB 373.8 per gram on 31 Dec 2021, and return to RMB 409.9 per gram on 30 Dec 2022, which is generally in line with global gold price change. Average gold spot price in China increased by approximately 1.3% from RMB 387.1 per gram in 2020 to RMB 392.1 per gram in 2022.

Average global gold spot price in January 2022 is USD1,816.8 per ounce; average gold spot price in the PRC in January 2022 is RMB372.6 per gram. The global gold spot price at 22 March 2022 is USD1,915.25 per ounce, and PRC gold spot price at 22 March 2022 is RMB395.48 per gram. Between 2020 and 2022, the minimum and maximum monthly average gold spot price was RMB347.0 per gram in January 2020 and RMB422.6 per gram in August 2020.

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During 2017 to 2022, gold spot price in China grew at CAGR of 7.3%, from RMB275.4 per gram in 2017 to RMB392.1 per gram in 2022, which was mainly due to the increasing demand globally on gold to diversify investment as gold-linked financial instrument develops, as well as to hedge risks due to the concerns on global economic and political environment uncertainties and economic slowdown as caused by pandemic lockdowns, rising in U.S. interest rate and central banks’ increase in gold reserve, and in future, it is expected to climb steadily at CAGR of 2.6%, to RMB445.1 per gram. Going forward, China gold spot price is expected to go up steadily during 2022 to 2027 at CAGR of 2.6%, from RMB392.1 per gram in 2022 to RMB445.1 per gram in 2027, considering the robust demand of gold. Furthermore, worries of economic downturn under the context of high inflation and high fuel cost is to last in the forecast time period, plus the existing geopolitical uncertainties (e.g. Russia-Ukraine tensions). Additionally, markets are also concerning on the over-aggressiveness of the Fed on rising interest rate, which may cause possible economic recession soon afterwards. Therefore, gold is needed for investment portfolio diversification to hedge risks and value preservation.

The average global gold spot price and the average gold spot price in the PRC in January 2022 was approximately US\$1,816.8 per ounce and RMB372.6 per gram, respectively. Upon the occurrence of the recent Russia-Ukraine tensions, the global spot price and the gold spot price in the PRC further increased by approximately 6.6% and 5.3%, respectively to US\$1,936.3 per ounce and RMB392.5 per gram, respectively on 24 February 2022 when Russian President Vladimir Putin announced the launch of a special military operation in eastern Ukraine, as compared to January 2022. Such global gold spot price and the gold spot price in the PRC further increased by approximately 6.1% to RMB416.5 per gram and 2.7% to US\$1,988.9 per ounce, respectively, on 9 March 2022, being the day before the foreign ministers of Ukraine and Russia met in Turkey, as compared to that of 24 February 2022.

Average global gold spot price increased from approximately US\$1,527.1 per ounce on 2 January 2020 to approximately US\$1,887.6 per ounce on 30 December 2020, and further back to US\$1,820.1 per ounce on 31 December 2021 and US\$1812.4 per ounce on 30 December 2022.

The gold spot price in China is generally in line with the global gold spot price, except for the fact that the average global spot price in 2018 was higher than that in 2017, the average gold spot price in China decreased in 2018 as compared with that in 2017, mainly due to depreciation of USD against RMB. The increasing trend of average global spot price during the period between 2017 to 2022 was due to the similar reasons leading to the increase of average gold spot price in China, as depicted in above.

Gold was one of the star performers throughout much of 2020, and countries have introduced fiscal and monetary policies stimuli to fight against highly-likely economy recession. Coming to 2021, the world is slowly and steadily recovering from COVID-19 pandemic influence, investment in gold gradually cooled down with market sentiment back towards normal. Overall, a slight increase of 1.9% was noted for USD gold price of 2021, compared with 2020.

In 2022, the occurrence of Russia-Ukraine tensions led to the increase in global gold price. At the same time, the hike of interest rate in the U.S. is noted, due to U.S. Federal Reserve is raising interest rate to resolve the high inflation issue. Gold investment in coin and bars increased in 2022, due to geopolitical concerns and hedging against inflation. Furthermore central banks are increasing gold reserves to hedge potential economy recession. Global gold spot price increased slightly from USD1,798.9 per ounce in 2021 to USD1,801.3 per ounce in 2022.

In the first half of 2023, the global gold spot price continued to rise, reaching US\$1,975.9 per ounce in the second quarter and the average global gold spot price was US\$1,931.5 per ounce in the first half of 2023. The rise in gold spot price was primarily driven by increasing market risk aversion, particularly against the backdrop of weak US economic data and unresolved banking crises in Europe and America. As a traditional safe-haven asset, the gold spot price has further increased. With the gradual receding of the impact of the epidemic and a series of policies to promote consumption to take effect, as well as the increase in demand for safe-haven assets, China’s gold spot price continued to rise in the first half of 2023, reaching RMB447.0 per gram in the second quarter and the average gold spot price in the PRC was RMB433.8 per gram in the first half of 2023.

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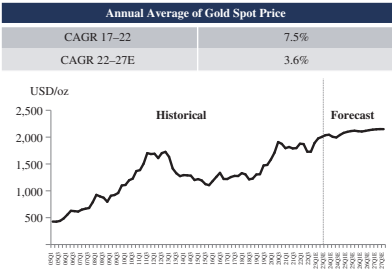
Going forward, global gold spot price is expected to go up steadily during 2022 to 2027 at CAGR of 3.6%, from USD1,801.3 per ounce in 2022 to USD2,148.4 per ounce in 2027, considering the robust demand of gold. Furthermore, worries of economic downturn under the context of high inflation and high fuel cost is to last in the forecast time period, plus the existing geopolitical uncertainties (e.g. Russia-Ukraine tensions). Additionally, markets are also concerned on the over-aggressiveness of the Fed on rising interest rate, which may cause possible economic recession soon afterwards. Therefore, gold is needed for investment portfolio diversification to hedge risks and value preservation.

The gold price is predominantly impacted by factors such as real rate, U.S. Dollar value, global geographical uncertainties and inflation expectation. Typically, when there exists instabilities in political or economic environment or turbulence in stock market, gold is usually treated as one of the risk-hedging tools, and its price will typically exhibit upward trend. Moreover, monetary policies by central banks (e.g. fluctuation in currency exchange rate) and macroeconomic factors (e.g. interest rate and inflation expectation) are also important influential factors of gold price.

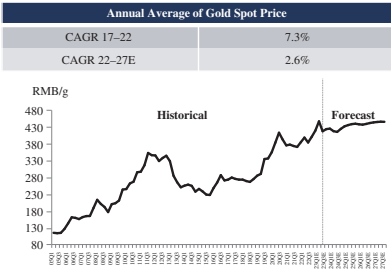
During 2018 to 2022, global gold spot price grew at CAGR of 9.2%, from USD1,268.5 per ounce in 2018 to USD1,801.3 per ounce in 2022. The increasing trend of global gold spot price and the gold spot price in China during the period between 2018 to 2022 was mainly due to the increasing demand on gold to diversify investment as gold-linked financial instrument develops, as well as to hedge risks due to the worries on global economic and political environment uncertainties and economic slowdown as caused by pandemic lockdowns and rising in U.S. interest rate.

In 2019 and 2020, financial and monetary stimuli (e.g. quantitative easing) and policies of cutting interest rate are introduced by U.S. Federal Reserve and other major economies’ central banks, to pump liquidities to rescue U.S. stock market and fight against economic downturn during pandemic year. USD depreciated and major asset classes including equity, sovereign debt and crude oil commodities have shown bearish performances, driving up gold price during 2020 as global market chases for gold for value preservation and risk hedging. In 2021, the gradual economic recovery from the COVID-19 pandemic and cooling down of investment sentiment in gold lead to a slowdown of global gold spot price growth.

Gold Spot Price (Quarterly Averages), Global, 2005–2027E



Gold Spot Price (Quarterly Averages) China, 2005–2027E



Note: Global gold spot price is set as quarterly averaged gold spot price of London Bullion Market, and is set in USD per fine troy ounce, which is a troy ounce (equals approximately 31.1 grams) of 99.5% pure gold.

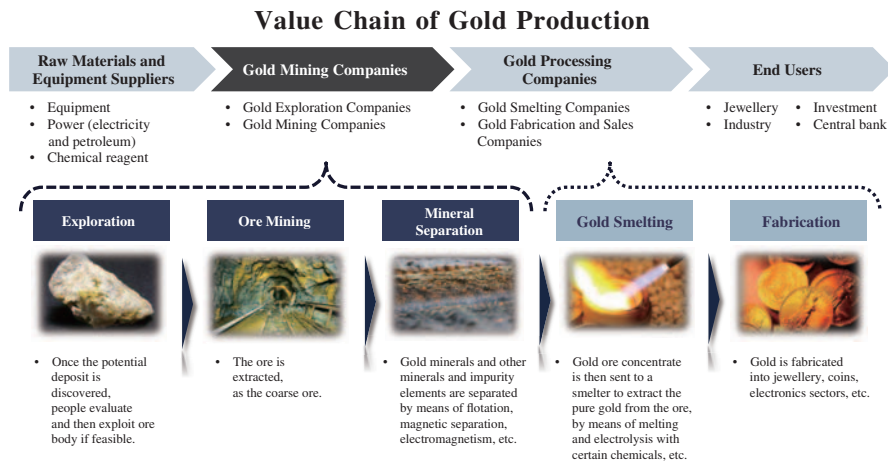
China gold spot price refers to the closing price of Au99.95 traded in Shanghai Gold Exchange.

Source: London Bullion Market Association, Shanghai Gold Exchange, Frost & Sullivan

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GOLD MINING INDUSTRY IN CHINA AND SHANDONG

Value chain



Source: Frost & Sullivan

In China, it is a common industry practice for gold mining and processing companies to outsource the refining process to gold smelting companies and sell the finished gold bullion to the same gold smelting companies. Since the cost of obtaining the operating licence as a smelting company is high, the number of smelting companies in China is limited. The gold smelting industry is of a high concentration. In 2022, there were about 27 smelting companies in Shandong province and the top five gold smelting companies in Shandong accounted for approximately 93.2% of Shandong’s total gold smelting volume in 2022. There were about 30 gold producers engaged in gold mining in Shandong Province in 2022. The top five gold producers by gold mine production volume accounted for approximately 84.7% of total gold mine production volume in Shandong Province. Some large gold mining enterprises extend their business to gold smelting to pursue higher profits and stronger competitiveness. Further, only mining and/or smelting companies with registered membership in the Shanghai Gold Exchange are qualified to sell gold bullion in the Shanghai Gold Exchange, the only one exchange platform of gold bullion in China. For mining and/or smelting companies without membership in the Shanghai Gold Exchange mainly due to the limit on the total number of membership, they can only sell the refined gold to registered members of the Shanghai Gold Exchange to sell their refined gold.

Gold Mineral Resources

The total gold resources of China has experienced a continuously growth for more than a decade and for the first time the number has surpassed 10,000 t in 2015. At the end of 2022, China’s total gold resources was approximately 16,463.1 t, representing a CAGR of approximately 4.5% from 2017.

Shandong is the province with the largest amount of gold identified resources in China. The gold identified resources in Shandong increased from approximately 3,756.6 t in 2017 to approximately 4,703.6 t in 2022, representing a CAGR of approximately 4.6%. Shandong has abundant gold resource and well-established supply chain in gold mining industry in China.

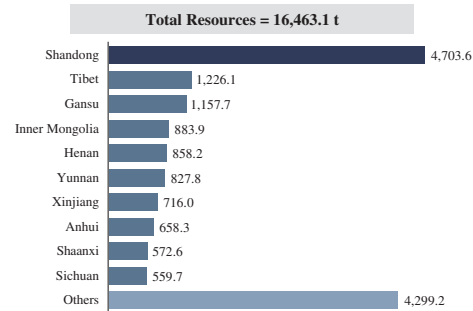
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Most of Shandong’s gold reserves are concentrated in Zhaoyuan and Laizhou.

Gold Identified Resources, China & Shandong, 2017–2022



Gold Identified Resources by Provinces, China, 2022



Source: China Gold Association and Frost & Sullivan

Gold production

China has been the largest gold mine producer in the world since 2007. China gold market experienced a gloomy market consumption for gold (e.g. gold jewellery) and a tightened regulatory control in 2017 which has affected its gold supply since then. Central government issued a series of policies including Acceleration of Constructing Green Mines 《關於加快建設綠色礦山的實施意見》 and Guidance on Promoting Gold Industry Upgrade and Transformation 《關於推進黃金行業轉型升級的指導意見》, emphasising the importance of environmental protection and requiring the new mines to meet the environmental protection standards.

In July 2017, the Ministry of Nature Resources issued the Work Plan for the Clearance of Mining Rights in Natural Reserves 《自然保護區內礦業權清理工作方案》, which requires comprehensive investigation and gradual cancellation of existing mining rights in nature reserves, resulting in the shutdown of gold mines in several provinces. China’s gold production declined since 2017.

The impact of the COVID-19 pandemic on gold mining industry in 2020 was mainly on the reduced working days and the supply of raw materials and products, such as the explosives, support materials and filling materials. Further, the production of most gold mining companies were delayed for weeks. On the other hand, the transportation of raw materials and products was affected due to the traffic control caused by the COVID-19 pandemic. However, the COVID-19 pandemic also contributed to the rise in gold prices. The gold mining companies accelerated their production after the resumption of production to capture the high price and profit. Besides, the increase in production capacity of gold mining companies due to technology improvement and equipment upgrading also drove the increase of the gold production after the first quarter of the year. Therefore, China’s gold production in 2020 only slightly declined by 3.9%, from 380.2 t in 2019 to 365.3 t in 2020.

The COVID-19 pandemic is increasing the downward pressure on the China’s economy. In addition, the gradual spread of the pandemic in the world caused panic in international markets and raised concerns about the international economy, which drove the gold price going upward. And gold mining companies were incentivized to increase production in order to capture the high price and profit after the resumption of production.

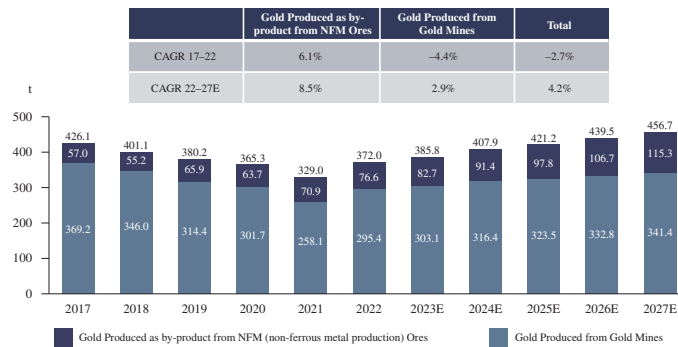
Shandong is the largest source of gold produced from gold mines in China. However, from February to September 2021, non-coal mines in Shandong Province, including gold mines, stopped production for safety inspection. This had a huge negative impact on the gold production in the province. As a result, total gold production in China decreased a lot, from approximately 365.3 t in 2020 to approximately 329.0 t in 2021.

As the safety inspection towards gold mines in Shandong Province ended in September 2021, the gold produced from gold mines in Shandong largely increased in 2022. Also, as the negative impact of the COVID-19 pandemic largely alleviated, the consumption of gold jewellery experienced a strong recovery in 2022. As a result, gold production in China bounced back to 372.0 t in 2022. Driven by numerous factors including the recovery from the pandemic, the increasing demand for gold as well as the rising gold price, the accelerated automation and mechanisation in gold mining industry under the

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context of “Made in China 2025”, and the gold recycling activity from the electronics manufacturing sector, China’s gold production is expected to grow steadily to approximately 456.7t in 2027, representing a CAGR of approximately 4.2% from 2022 to 2027.

Gold Production, China, 2017–2027E

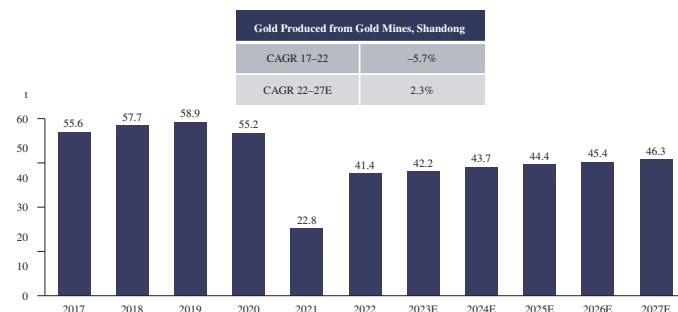


Source: China Gold Association and Frost & Sullivan

The gold produced from gold mines in Shandong declined from approximately 55.6 t in 2017 to approximately 22.8 t in 2021. Besides the negative impact of the COVID-19 pandemic on the production, another main reason for the decline is the strict safety and environmental policies. From February to September 2021, non-coal mines in Shandong Province, including gold mines, stopped production for safety inspection. This had a huge negative impact on the gold production in the province.

As the safety inspection towards gold mines in Shandong Province ended in September 2021, the gold produced from gold mines in Shandong increased to approximately 41.4 t in 2022, and is expected to eventually reach approximately 46.3 t in 2027, representing a CAGR of approximately 2.3% from 2022 to 2027. Other main growth drivers are expected to be the increasing gold demand, rising gold price, and technology advances.

Gold Produced from Gold Mines, Shandong, 2017–2027E



Source: China Gold Association and Frost & Sullivan

Market drivers

Increasing Demand

The increasing demand for gold will stimulate gold mining companies to intensify efforts to exploit gold mine and expand production scale. With the improvement of people’s living standard and stronger purchasing power, consumers’ demands for luxury products like jewellery rise sharply as well. Meanwhile, the world’s economy has been in a grim situation amid the COVID-19 pandemic, and the increasing frequent regional conflicts, such as the Russia Ukraine conflict and Israel-Palestine conflict, causing the financial character of gold becoming increasingly evident. Thus, the increasing demand from the gold application fields will largely drive this industry.

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Increasing Gold Reserve

Internationalisation of RMB is an inevitable result of national economy development, cross-border trade and investment progress. As RMB has been included in the International Monetary Fund’s unit of account, the Special Drawing Right (SDR) in October 2016, RMB has finished a significant part of being an international reserve currency. As an important means of reserve and settlement, gold is still occupying a definite proportion in each central bank. Gold reserves are effective ways to hedge the risk of international financial markets. However, China’s gold reserve’s share of total reserve is still below the world’s average. Raising the gold reserves is an inexorable trend to meet the demand of RMB’s internationalisation.

New Downstream Applications of Gold

Through the development of new techniques, gold can be applied in more fields efficiently and technology application may grow into new markets for gold. Gold can be used in medical field such as gold nanoparticles for Rapid Diagnostic Tests, gold-based drugs used to treat illness. Moreover, in the technology field, gold can be utilized in touch sensitive screens for visual display and advanced flash memory devices for data storage. Therefore, the expanding downstream applications of gold will further drive the demand of the gold.

Advanced Technology

The Industry Structure Adjustment Catalogue (2019 edition) 《產業結構調整指導目錄（2019年本）》 calls for encouraging deep gold exploration and mining (1000 meters and below), which will contribute the research of deep mining technology and accelerate the solution of deep mining technology problems, promoting the improvement of gold production capacity in China. In addition, the policy also encourages the recovery of gold from tailings and waste rock, which will improve the utilisation of gold resources in tailings, and contribute to the increase in production capacity of gold mining industry.

Development trends

- **Intelligent Mining** Leveraging the development of science and technology, a new concept has been introduced in mining industry that is to build a new unmanned mining model, to achieve digitalised mining environment by intelligent technology and equipment, visualised control of production process and networked information transmission. This approach could address the problem of unsafe production and meanwhile enhance productivity. During the 13th five-year plan period, the project of “key technology research and development of scaled unmanned mining underground” was established under the special project “deep resources survey and mining”.
- **Green Mining** The state government has successively issued a series of policy documents such as Requirements for Green Mine Construction in Gold Industry 《黃金行業綠色礦山建設要求》, Technical Specification for the Control of Cyanide Residue Contamination in the Gold Industry 《黃金行業氰渣污染控制技術規範》 and Policy on Pollution Prevention and Control Technology in the Gold Industry (Draft for Comments) 《黃金行業污染防治技術政策(徵求意見)》, calling for the construction of green mines and the development of environmentally friendly gold mining technologies. In this case, gold mining companies are bound to go on the way of green mining. Specifically, the cut-and-fill stoping, which has less impact on the environment, will be applied further widely. The traditional gold flotation method such as mixed mercury method, chlorination method and cyanidation method will be replaced by low-toxicity agents and bio-flotation method, which have the advantage of energy-saving and eco-friendliness.
- **Deep Mining** With the consumption of shallow gold resources, China’s gold mining industry is gradually turning to deep mining. At present, the depth of gold mines in China is mostly between 500 and 1000 meters, less than that in South Africa, Canada and other mining developed countries where the depth is more than 2000 meters. China has great development space in the field of deep mining. Meanwhile, the NDRC issued Guide Catalogue for Industrial Restructuring (2019 edition) 《產業結構調整指導目錄(2019年本)》, encouraging the development of deep gold exploration and mining, which will accelerate the deep gold mining technology in China.
- **Overseas Acquisitions and Cooperation** The proportion of low-grade ore and refractory gold resources in China is large, resulting in high cost of gold mining. Gold mining enterprises are facing huge pressure from environmental policies. In addition, the current domestic gold demand is rising rapidly, while the domestic supply is unable to meet the demand. So it is an inevitable trend

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for gold mining industry to ‘go abroad’ and seek for overseas gold resources, capital and technology. Overseas acquisition and cooperation will be a new trend for China’s gold mining industry.

Entry barriers

- **Licence barrier.** China implements an admittance system for the exploitation of gold resources. The application for gold mining and smelting shall comply with the requirements of the national gold industry planning, industrial policies and the state regulations on the approval of investment projects, environmental protection and land administration, etc. Gold mining companies shall be qualified for the exploitation of gold resources in order to obtain the ‘mining licence’ and ‘safety production licence’ issued by the national government. In addition, gold mining enterprises can only conduct mining within the area stipulated by the state, and comply with increasingly strict safety production and environmental protection regulations. It is difficult for new market entrants to obtain relevant qualifications in a short period of time.
- **Resources barrier.** Gold reserves or resources is the key factor to the sustainable development of the gold mining companies. At present, a majority of domestic gold mine is possessed by large or medium sized gold mining companies, which also enjoy considerable right of mineral exploration, thus ensuring the increasing potential of the gold reserve to some extent. As for new entrants, it is difficult for them to obtain substantial gold mine resources. Companies that do not have self-owned mines have to rely on the gold ore suppliers, which give rise to uncertainty surrounding the stability of the supply of raw materials and therefore affecting the operating performance. Since gold belongs to natural resource, the imbalanced distribution of gold raises the threshold to the entrants in some region from the global perspective.
- **Land Settlement and Villagers Relocation.** During the mining process, gold mining companies must comply with laws and local government regulations, and communicate with local villagers on resettlement issues timely. Gold mining companies usually have to settle the villagers by compensation, relocation or other ways in order to maintain good relationship with them and ensure the smooth mining operation. In addition, many gold mining companies would also help local villagers build agricultural product processing plants to increase their income, and build new schools etc. to improve corporate image. These actions could increase the operating costs for mining companies and raise the threshold for new entrants.
- **Capital barrier.** The initial investment is high as a large number of equipment and land resources are required in the gold extraction and smelting stage, exerting large pressure on companies’ capital. With the increasingly stringent requirement for safety production and environmental protection during gold processing stage, the investments in these two aspects will also increase, which will incur additional expenditures. Moreover, for the purpose of ensuring sustainable and enough mine reserves, it is necessary to adopt resource exploration, recycle procedure, and merger and acquisition activities which impose higher requirements on companies’ financial viability.
- **Technology barrier.** With the decrease of the grade of gold mine and increase of mining depth, the difficulty and complexity of gold mining procedure rise accordingly, which builds up a high technical barrier to new entrants. The exploration and mining of existing, newly-built, reconstructive and expanded mines require up-to-date technical skills, complete equipment and ancillary facilities. Besides, only companies equipped with advanced technology and sufficient experience could satisfy the increasingly strict requirements proposed by government for safety production and environmental protection, increasing the difficulty for new entrants.

COMPETITIVE LANDSCAPE OF GOLD MINING INDUSTRY IN CHINA AND SHANDONG PROVINCE

In 2022, China’s gold mine production volume reached at 295.4 t. The top five and top three gold producers by domestic gold mine production volume accounted for 40.6% and 32.7% of total gold mine production volume in China in 2022, respectively. The second and fourth largest gold producers in China were also the top and second largest gold producers in Shandong Province in 2022, respectively.

With the continuous asset reorganisation and resource integration of gold enterprises, the gold mining industry in Shandong Province is concentrated. There are about 30 gold producers engaged in gold mining in Shandong Province in 2022. The gold mine production volume of Shandong Province reached approximately 41.4 t in 2022, and the top five gold producers by gold mine production volume accounted for approximately 84.7% of total gold mine production volume in Shandong Province. The rest of gold mining producers occupied approximately 15.3% market share, the average gold mine production volume of each producer is around 0.2 t annually.

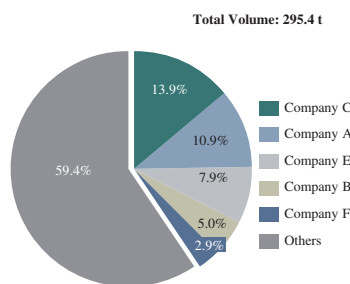
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Among the 30 gold producers in Shandong, only the top two producers have their own smelting business. In addition, these two gold producers in Shandong Province have the membership of Shanghai Gold Exchange due to scale and cost advantages.

In terms of the price sold to gold smelters, there is no competitive relationship between gold producers, mainly because the gold bullion will be sold through the Shanghai Gold Exchange at the same spot price of the day. In addition, the difference in the difficulty of gold concentrate processing is the main feature between gold producers, because the processing fees for the smelting process will be different.

In the Shandong Province, Company A ranked first with its gold mine production arriving 23.6 t, followed by Company B of which gold mine production was 8.8 t in 2022. In terms of gold mine production volume in Shandong Province, Company A and Company B have an aggregated market share of 78.3% in 2022. The Company ranked third with mine production volume of 1.1 t in 2022.

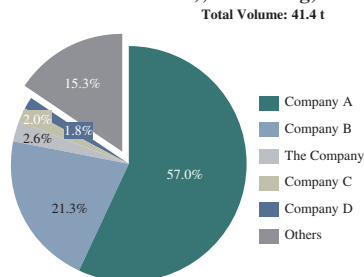
Top 10 Gold Producers (by Mine Production Volume), China, 2022



Rank	Company	Mine Production Volume (t)	Market Share
1	Company C	41.0	13.9%
2	Company A	32.3	10.9%
3	Company E	23.5	7.9%
4	Company B	14.7	5.0%
5	Company F	8.5	2.9%
	Others	175.4	59.4%
	Total	295.4	100.0%

Source: China Gold Association, Public information of Listed Company, Frost & Sullivan

Top 5 Gold Producers (by Mine Production Volume), Shandong, 2022



Rank	Company	Mine Production Volume (t)	Market Share
1	Company A	23.6	57.0%
2	Company B	8.8	21.3%
3	The Company	1.1	2.6%
4	Company C	0.8	2.0%
5	Company D	0.7	1.8%
	Others	6.3	15.3%
	Total	41.4	100.0%

Source: China Gold Association, Public information of listed companies, Frost & Sullivan

Background information of the top gold producers in China:

1. Company A, established in 1996, a state-owned gold mining group directly under Shandong Provincial Government. Company A is a group company which includes a public listed company, which is listed on the Shanghai Stock Exchange and Hong Kong Stock Exchange. Company A mainly engaged in the gold mining, beneficiation and smelting of ores and deep processing and sales of gold products. The major gold mines of Company A are located in Laizhou City and Zhaoyuan City of Shandong Province as well as Fujian, Inner Mongolia, Gansu, Xinjiang and other provinces in the PRC.
2. Company B, established in 1992, a state-owned gold mining group and is a group company which includes a public listed company, which is listed on the Hong Kong Stock Exchange. Company B mainly engaged in exploration, mining, processing and smelting operations of gold and other metallic products, focusing on gold production business. The major gold mines of Company B are located in Zhaoyuan City of Shandong Province. Company B principally produces two kinds of gold products, which are Au 99.99 and Au99.95 gold bullions under its own brand.
3. Company C, established in 2003, is a central state-controlled enterprise which is mainly engaged in the business of prospection designing, resource development, gold production, trade, engineering procurement construction in the PRC. Company C is a group company which includes two public listed company, one of which is listed on the Shanghai Stock Exchange, and the other one is dually listed on the Toronto Stock Exchange and Hong Kong Stock Exchange, respectively. The key gold mines of Company C are in Henan, Hubei, Shaanxi, Liaoning, Inner Mongolia and other provinces in the PRC.
4. Company D, established in 1992, a state-owned gold mining company. Company D is located in Qixia City which is under the administration of Yantai City and mainly engaged in the gold mining.

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- 5. Company E, established in 2000, a state-owned large multinational mining group which is mainly engaged in the business of exploration and development of copper, gold, zinc and battery metals worldwide, as well as the research of engineering technology. Company E is a public listed company, which is listed on the Shanghai Stock Exchange and Hong Kong Stock Exchange.
- 6. Company F, established in 2001, a state-owned non-listed gold mining group which is mainly engaged in gold exploration, gold mining, gold smelting and gold sales. The major gold mines of Company F are located in Yunnan Province. It is the largest gold mining enterprise in Yunnan province.

Besides the Company, other companies included in the above two rankings include (listed not in particular order): Shandong Gold Group Co., Ltd., Shandong Zhaojin Group Co., Ltd., China National Gold Group Co., Ltd., Qixia Gold Group Corporation, Zijin Mining Group Company Limited, Yunan Gold & Mining Group Co., Ltd..

GOLD PRODUCTION COST

The total production cost of gold mining in China has increased continuously from approximately RMB200.4 per gram in 2017 to approximately RMB298.0 per gram in 2022, representing a CAGR of approximately 8.3%.

In 2022, raw material cost is the largest component of gold mining costs, the share of which reached 37% in China. Due to numerous factors including the negative impact of the COVID-19 pandemic on transportation and other aspects, the cost of raw materials, including explosives, support materials and filling materials, has increased in recent years.

Depreciation and amortisation accounted for 28% of the total gold mining costs in China in 2022. Gold producers in China have increased their exploration activities in recent years, including conducting topographical and geological surveys, exploratory drilling, and sampling and trenching. Since the assets consumed during these exploration activities are calculated as depreciation and amortization costs, the average depreciation and amortization costs have increased.

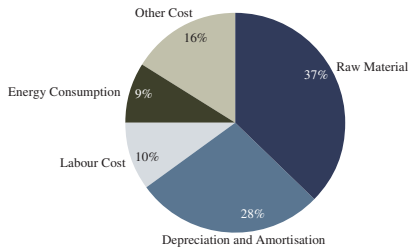
Labour cost accounted for 10% of the total gold mining costs in China in 2022. It has also increased in recent years, as a result of inflation in China.

Furthermore, energy consumption cost, which accounted for 9% of the total gold mining costs in China in 2022, also experienced an increase in recent years, largely due to stricter requirements from the government on energy protection which leads to higher electricity prices. Such policies include the Notice on Further Deepening the Market-oriented Reform of Electricity Pricing for Coal-fired Power Generation, which was published and took effect in October 2021.

Total Production Cost of Gold Mining, China, 2017–2022



Gold Production Cost Structure*, China, 2022

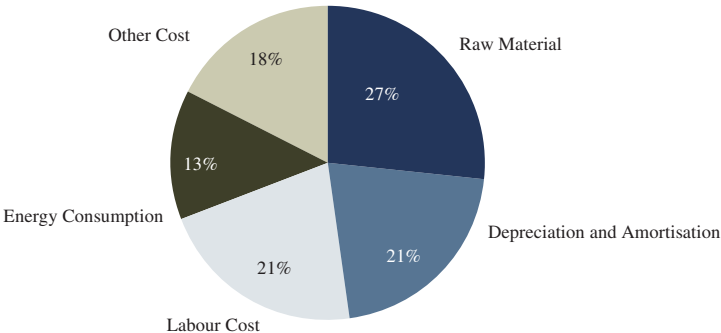


Source: China Gold Association and Frost & Sullivan

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Approximately 95% of gold mining in China involves underground mining. Compared with underground mining, open-pit mining methods are less used in the gold mining industry in China. It has a different gold production cost structure compared with underground mining. Compared with the industry average cost structure, the raw material costs of open-pit mining are 10% lower, the depreciation and amortisation costs are 75% lower, the labour costs are 11% higher, and the energy consumption costs are 4% higher.

**Gold Production Cost Structure of Open-Pit Mining,
China, 2022**



Source: Frost & Sullivan