

China's Coal Conundrum

**EXAMINING COAL MINE PRODUCTION,
PROPOSALS, AND METHANE EMISSIONS**



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ABOUT THE COVER

An excavator loads a truck with coal at an open pit.
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FURTHER RESOURCES

For additional data on global proposed and operating coal mines, see the [Summary Tables](#) on the GEM website. For links to more reports based on coal mine data, visit the [Reports & Briefings](#) section. To obtain primary data from the Global Coal Mine Tracker, see the [GCMT Download Data](#) page.

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EXECUTIVE SUMMARY

Global coal production has been on the rise following a brief [decline](#) in 2020, with China remaining the major driving force behind this growth. In 2023, global coal production reached an [all-time high](#), with China alone contributing over 50% of the total with a record-breaking output of [4,700](#) million tonnes (Mt). China's dependency on coal shows no sign of abating soon. Data from the Global Coal Mine Tracker on a pipeline of proposed mines paint a concerning picture for the future: China's proposed capacity of 1,155 million tonnes per annum (Mtpa), primarily from projects with a designed capacity at least 1 Mtpa, represents nearly double Australia's total coal production from similarly sized mines.

This heavy reliance on coal poses a significant threat to China's dual-carbon goals: peaking emissions before 2030 and achieving carbon neutrality before 2060, as committed under the Paris Agreement to tackle climate change. China is a major global greenhouse gas emitter, with its coal mining sector a large culprit, accounting for over [80%](#) of methane emissions from the country's energy sector and a staggering [70%](#) of global coal mining emissions. Phasing out unabated coal is crucial to reaching net-zero targets, making continued investment in coal expansion particularly problematic.

Key findings

- Operating large-scale coal mines with a capacity of 1 Mtpa or more are the greater driving force behind China's coal production, contributing approximately 3,881 Mt annually. This equates to nearly half the [global total](#) from similar large-scale mines, surpassing the combined output of India, Indonesia, and Australia—the world's next three biggest coal producers—by nearly twofold.

- Expanding the scope to include mines with a capacity of at least 0.6 Mtpa reveals a total of 1,800 active mines with a combined capacity of nearly 4,390 million tonnes. Shanxi (1,226 Mtpa) and Inner Mongolia (1,201 Mtpa) together account for nearly one-third of global coal capacity.
- Approximately 1,280 Mtpa of coal capacity is under development across fourteen provinces, representing nearly half of the global proposed capacity and more than double India's planned capacity for million tonne scale coal mines (approximately 530 Mtpa). Four hundred and fifty Mtpa are already under construction, meaning an estimated 4,819 million cubic meters (MCM)/yr (3 Mt/yr) of new methane emissions may be already locked in and are likely to commence emissions within the next 3–5 years.
- Nearly 80% (1,022 Mtpa) of mine proposals are greenfield developments, indicating a strong industry push to establish new operations. These new mines are likely to commit to long-term production and higher emissions compared to expanding existing mines. The remainder of proposals (257 Mtpa) are brownfield developments that expand the capacity of existing operations.
- China's operating coal mines emit a staggering 52,726 MCM of methane annually, equivalent to approximately 35 Mt of methane released each year and accounting for roughly 70% of the global total for coal mine methane emissions from operating mines of similar size. If smaller mines with a capacity of 0.6 Mtpa and above are factored in, the total methane emissions could be as high as 60,036 MCM/yr (40 Mt/yr).
- Shanxi province is the primary source of China's coal mine methane emissions, with 17,325 MCM/yr (12 Mt/yr) in estimated emissions, contributing 32% of the country's total. These emissions are mainly attributed to the prevalence of deep underground mines extracting the most bituminous and anthracite coal in China.
- The top ten state-owned enterprise (SOE) producers and developers collectively control approximately 40% of the nation's coal production capacity — roughly 1,500 Mtpa. Companies like China Energy, Jinneng Holding Group, and Shandong Energy lead this sector. These same SOEs are the primary contributors to methane emissions, with the top ten emitters accounting for a staggering 20,984 MCM/yr (14 Mt/yr).

BACKGROUND

Coal has long been the backbone of China's energy sector, serving as the primary fuel source and a significant contributor to greenhouse gas emissions. As the nation embarks on a new era characterized by the pursuit of carbon neutrality and green, low-carbon development, the energy landscape is undergoing a transformative shift. Driven by the ambitious “dual carbon” goals — reaching peak carbon emissions before 2030 and carbon neutrality by 2060, as well as the imperatives of sustainable development, renewable energy sources are poised for [rapid growth](#).

Despite the transformation of the country's energy landscape, coal remains the primary energy source in China, powering thousands of coal plants and underpinning industries such as iron and steel and cement production.

After reaching a 2013 coal production high, China experienced a brief decline. Although production rose again starting in 2016, it took until 2021 to reach the record highs seen in 2013. After a short-term [reduction](#) in coal production due to strict government regulations and weak economic performance, the country experienced a major power shortage that affected two-thirds of the provinces, forcing many factories to shut down and leaving some households without power. While multiple factors contributed to the power shortage, a broad [consensus](#) has emerged that a widespread coal supply shortage was a primary cause. In response, China has been ramping up domestic coal production.

Favorable policies in China have led to a significant boost in renewables over the last two decades, propelling the country to the status of a [global leader](#), particularly in wind and solar power. China accounts for 64% of the global utility-scale solar and wind power currently under construction, more than eight times that of the United States, the second-largest producer.

However, China is simultaneously expanding its fossil fuel infrastructure, primarily due to rigid and outdated

[grid management](#) that prioritizes the continued use of coal over inter-provincial grid coordination and demand management. In 2023, over 100 gigawatts (GW) of coal capacity was approved, and over 70 GW started construction, according to [GEM's analysis on coal power](#). While 2024 is showing signs of a [permitting slowdown](#), the country still has over 420 GW of coal power under development, more than double the U.S.'s operating coal fleet. Unless significant efforts are made to retire older plants, this increase in capacity will lead to more coal being produced and imported.

GEM's data show that during the first three years of the 14th Five-Year Plan (2021–2025), approximately 614 million tonnes of coal were in different stages of development, more than the annual output of Australia.¹ When combined with previously proposed projects, China is now developing a total of 1,278 Mtpa of coal capacity across fourteen provinces, more than half the global [pipeline](#). If materialized, and without robust mitigation measures, this massive expansion will significantly increase methane emissions.

The surge in new production starkly contrasts with China's dual carbon neutrality targets. The potential for increased methane emissions from these new mines, coupled with the challenge of [abandoned coal mine methane](#) as China accelerates the closure of small-scale and inefficient operations, poses significant risks to China's climate goals.

This report uses GEM's Global Coal Mine Tracker to provide a comprehensive understanding of China's coal mining landscape. GEM has been tracking granular data of individual coal mines of various statuses since 2021. This tracker now includes 5,226 active and proposed coal mines and projects responsible for 90% or more of global coal production. As of April 2024, the dataset includes more than 2,335 Chinese coal mines with a designed or approved capacity exceeding 0.6 Mtpa. Given the limited availability of actual output data, this report utilizes production capacity as a proxy for operating coal mine performance.

1. This figure only accounts for coal mines with a designed capacity of at least 1 million tonnes per annum, excluding many smaller proposals.

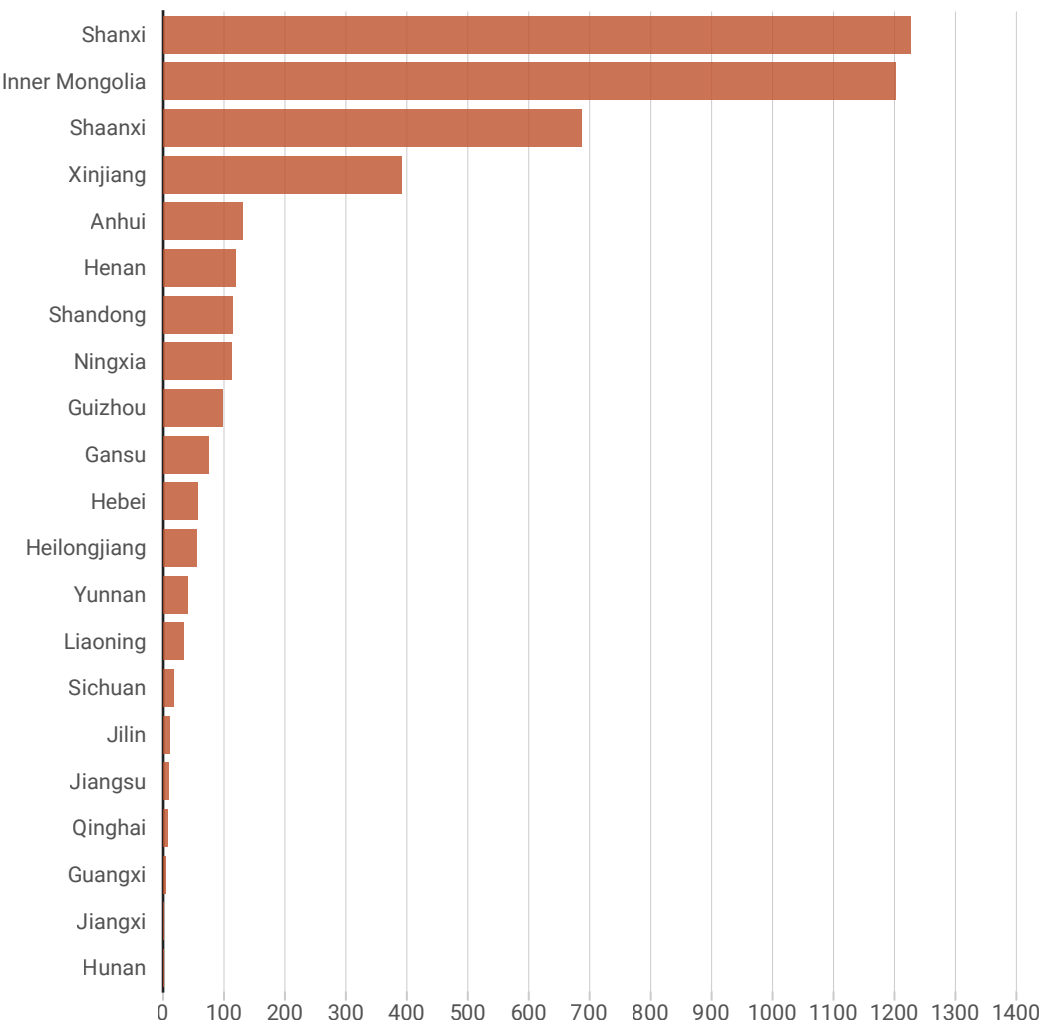
OPERATING CAPACITY OVERVIEW

As of April 2024, GEM’s Global Coal Mine Tracker identified approximately 1,800 active coal mines with a minimum approved annual capacity of 0.6 Mt. These mines collectively possess the capacity to produce nearly 4,390 million tonnes of coal annually. Large-scale operations exceeding 1 Mtpa annual production capacity are the primary drivers of China’s coal

output, contributing roughly 3,881 million tonnes per year. This performance represents nearly half of the [global total](#) from similarly sized mines, eclipsing the combined production of India, Indonesia, and Australia — the world’s next three largest coal producers — by almost twofold.

Shanxi and Inner Mongolia together produce more coal than the rest of China combined

Provincial breakdown in active coal capacity, in million tonnes per annum (Mtpa)



Note: This chart presents data on operating coal mines with a minimum approved annual production capacity of 0.6 Mtpa.

Source: Global Coal Mine Tracker, April 2024, Global Energy Monitor



Figure 1

A geographic dive into coal production reveals that China's coal production is heavily concentrated in specific regions. While coal mining occurs across 22 provinces, the industry is dominated by the northern and northwestern regions. Shanxi and Inner Mongolia stand out as the leading coal producers, collectively accounting for over 50% of the nation's total output. Shanxi boasts a substantial capacity of 1,226 Mtpa, closely followed by Inner Mongolia at 1,201 Mtpa. Combined, these two provinces possess over half

of the country's production and nearly one-third of [global coal production](#) in 2023.

Shaanxi province in the north and Xinjiang in the northwest follow as the third and fourth largest coal producers, contributing 686 Mtpa and 392 Mtpa, respectively. Anhui, the sole southern representative among the top five, produces 130 Mtpa. Collectively, these five powerhouse provinces account for over 80% of the country's production and more than 40% of global output.

Large mines and regional concentration

China's coal production isn't just about leading the pack in volume, it's also about the size of the mines themselves. Over the past two decades, China's coal mining landscape has undergone a significant transformation towards large-scale production. This trend is driven by a government strategy to significantly increase the contribution of large-scale mines (exceeding 1.2 Mtpa) to national production. Furthermore, coal production has become increasingly concentrated in specific regions, with Shanxi, Shaanxi, and Inner Mongolia being the production hubs due to their superior resource endowments and favorable mining conditions compared to other coal-producing provinces. This trend is further amplified by the government's initiative to establish [fourteen large coal bases](#)² in these areas, aiming to optimize production efficiency and guarantee a stable national coal supply.

Delving deeper into production by mine scale in different provinces reveals a distinct geographical pattern that aligns closely with the locations of the large coal bases. Data from the GEM's April 2024 coal mine tracker reveal that China has 82 active mega-scale mines,³ each exceeding a production capacity of 10 Mtpa, contributing approximately 30% of the

nation's entire coal output. Nearly all such scale mines operationalized in the past two decades are concentrated within these designated coal bases, particularly in Inner Mongolia, Shanxi, Shaanxi, and Xinjiang. However, the true workhorses of China's coal industry are the large-scale mines, with capacities exceeding 1.2 Mtpa but below 10 Mtpa, contributing approximately 53% of the national total.

A clear geographical pattern emerges when examining coal production by both scale and mining method. Underground mining is the predominant method nationwide, contributing nearly 80% of total output. The remaining output comes from surface mines, concentrated mainly in Inner Mongolia and Xinjiang.

Shanxi and Shaanxi provinces epitomize this trend towards underground mining. An overwhelming majority of their coal production, 92% and 98% respectively, originates from underground operations. Shanxi, China's coal capital, boasts the highest number of coal mines and a significant concentration of large-scale producers. Mines with capacities exceeding 1.2 Mtpa contribute over 80% to the province's total output. However, Shanxi's mega-scale mines

2. In 2006, the government approved the establishment of [thirteen large-scale coal bases](#), strategically located near rich coal reserves. These bases include Shendong, Eastern Inner Mongolia, Eastern Ningxia, Northern Shanxi, Middle Shanxi, Eastern Shanxi, Northern Shaanxi, Huanglong, Middle Hebei, Henan, Lianghuai, Western Shandong, and Yunnan & Guizhou. During the 13th Five-Year Plan (2016–2020), the government added [Xinjiang](#) to the list, bringing the total number of coal bases to fourteen.

3. [The Annual Report of Coal Industry Development](#), released by the China Coal Industry Association in 2023, stated that by the end of 2023, China had built 81 mega-scale coal mines, with an approved production capacity of 1,330 Mtpa. GEM has identified 82 mega-scale mines, including one in the test operation phase. Since GEM categorizes coal mines in the test operation phase as “operating,” excluding this mine brings GEM's data on mega-scale mines in line with the government's statement.

constitute a relatively small portion of its overall production (16%). Shaanxi has a higher concentration of mega-scale operations, with 45% of its total output coming from these mega mines.

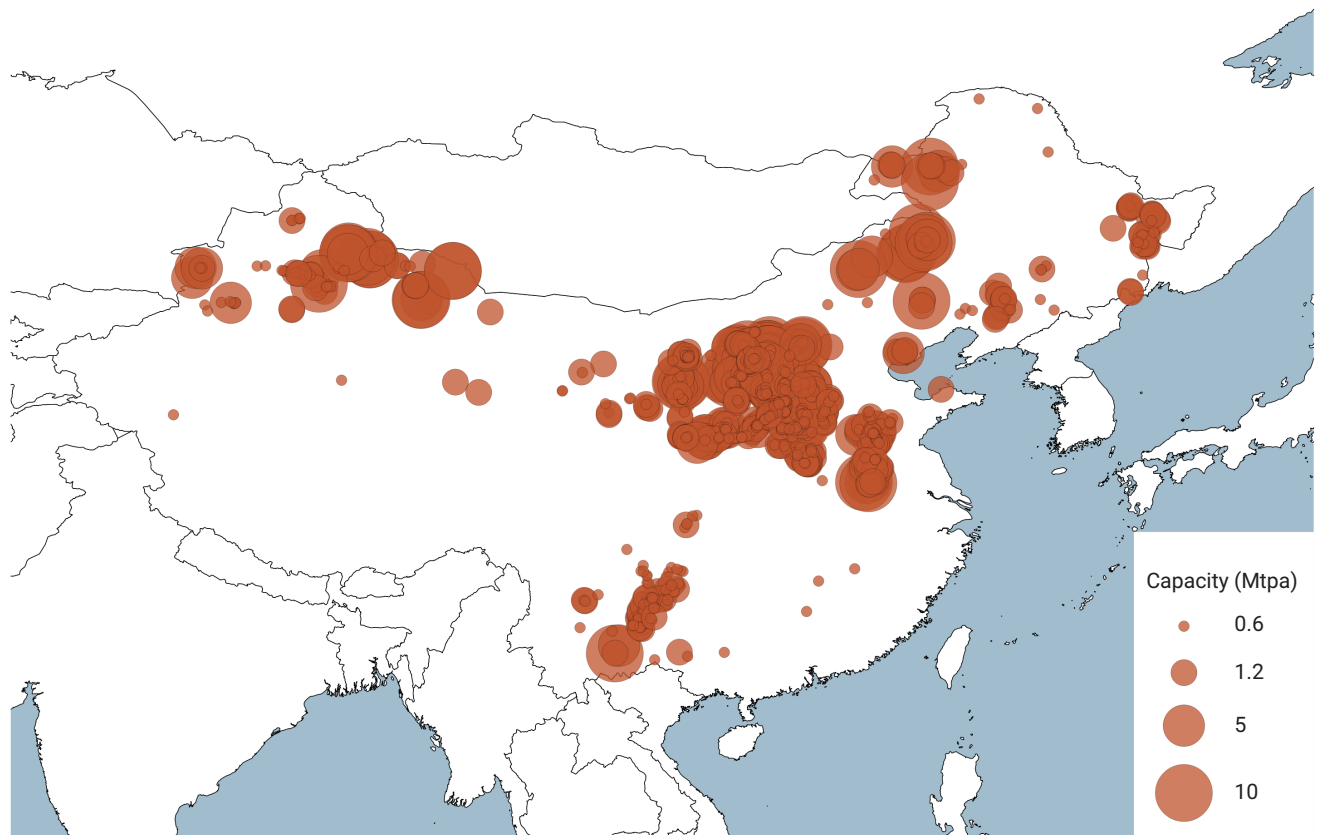
In stark contrast, Inner Mongolia and Xinjiang are characterized by surface mining, with over 86% of the nation's surface mines located within their borders. These regions also host a significant portion of China's mega-scale mines, particularly in the surface mining segment. The geological attributes of these provinces,

high-quality coal seams situated at shallower depths within simpler geological structures, create ideal conditions for large-scale, open-pit operations.

The regional specialization in mine scale and mining method has significant implications for the environmental impact of China's coal industry, particularly in terms of methane emissions, as these factors partially explain why China emits the greatest amount globally of methane gas from the coal mining sector.

Operating coal mines in China

Locations of operating coal mines, circles sized by capacity in million tonnes per annum (Mtpa)



Note: Data include operating mines with a minimum annual production capacity of 0.6 Mtpa

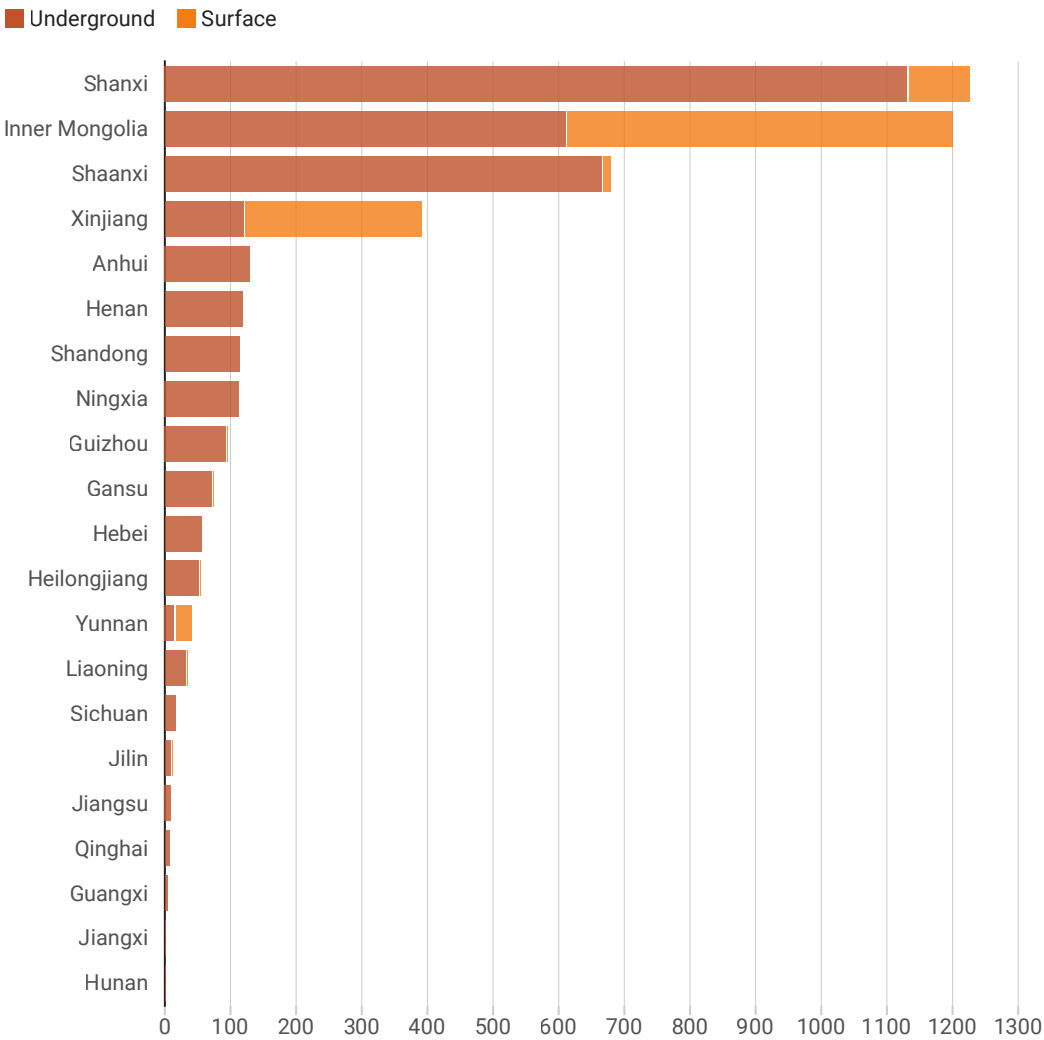
Source: Global Coal Mine Tracker, April 2024, Global Energy Monitor

Map 1



Underground mines are responsible for 77% of the coal production in China

Provincial breakdown in coal production, by mine type, in million tonnes per annum (Mtpa)



Note: This chart presents data on operating coal mines with a minimum annual production capacity of 0.6 Mtpa.

Source: Global Coal Mine Tracker, April 2024, Global Energy Monitor



Figure 2

China is also a coal import giant

China is not only the biggest coal producer, but also the biggest coal importer. Prior to 2009, China leveraged its vast domestic coal reserves to be a net exporter of coal. However, a confluence of factors triggered a significant shift, including increased domestic energy demand fueled by rapid economic growth, outpaced production capabilities. Additionally, depletion of resources in central and eastern China led to longer transportation distances from north and west to coastal areas, straining railway capacity and driving up costs. In some cases, imported coal, particularly for coastal regions, offered a price advantage compared to transporting domestic coal long distances. The price competitiveness of imported coal, especially for coastal regions, coupled with the implementation of zero tariffs on coal imports, significantly boosted imported volumes. China's coal imports reached a record-breaking [474 Mt](#) in 2023, nearly four times the amount imported in 2009, which is the year the country became a net importer for the first time.

While this import figure pales in comparison to China's massive domestic production of 4,771 Mt in 2023, it solidifies China's position as the world's leading coal importer, surpassing Japan since 2011. In fact, China [accounted](#) for over a third of the 1,466 Mt of total global coal imports in 2023.

[Data](#) from China's General Administration of Customs paints a clear picture of the country's top coal suppliers in 2023. Indonesia emerged as the leader, exporting a staggering 220 Mt of coal to China and representing a significant 46% share of China's total imports. Indonesia's thermal coal is the primary supplement to the surging demand for electricity

generation in the eastern and southern coastal cities of China. Russia followed closely behind, supplying China with 102 Mt of coal, which accounted for 22% of the total imports.

Mongolia secured the third position, exporting approximately 70 Mt of coal to China, with a notable 77% being metallurgical coal primarily used in steel production. Australia resumed exports with approximately 52 Mt in 2023 after China lifted restrictions on Australian coal imports in early 2023. Despite historically being a major exporter of coking coal to China, Australia supplied less than 3% of this crucial steelmaking ingredient in 2023. Russia and Mongolia filled the gap mainly due to lower transportation costs or [price discounts](#).

While domestic production has hit record highs, imports remain crucial for specific regions and industries. This apparent paradox stems from the urgency of meeting China's ever-growing energy demands, particularly in coal-dependent areas and for heavy industries like steel. Expanding domestic production is a long-term solution, often hindered by high costs and lengthy development times. Imports, on the other hand, offer a more immediate way to bridge this gap and ensure the [coal quality](#), especially during periods of surging demand.

While imported coal only accounts for [less than](#) 10% of China's total coal consumption, the reliance on imports still exposes China to vulnerabilities in the global coal market, as evidenced by the impacts of the [Indonesian export ban](#) and the Australia trade dispute in recent years.

CAPACITY UNDER DEVELOPMENT

New coal capacity development in China continues despite increased domestic production and imports. As of April 2024, China is developing approximately 1,280 Mtpa of coal capacity across fourteen provinces, nearly half of the [global proposed capacity](#). Inner Mongolia, Xinjiang, Shaanxi, Guizhou, and Shanxi account for 90% of this capacity. With 35% (447 Mt) under construction and 289 Mtpa permitted for construction soon, a surge in production is expected within 3–5 years. Inner Mongolia leads in large-scale

projects, followed by Xinjiang and Shaanxi, while Guizhou focuses on smaller mines due to geological constraints. Shanxi, though emphasizing large-scale mines, lacks mega-scale proposals. This development marks a shift from the 13th Five-Year Plan's coal reduction efforts to the 14th FYP's increased production due to a 2021 power crisis. China has been a frontrunner in renewable energy, but it is also rapidly expanding its coal capacity at a pace surpassing the rest of the world.

Provincial breakdown of proposed capacity

Examining the data of coal mines with capacity of at least 0.6 Mtpa, as of April 2024, shows approximately 1,280 Mtpa of coal capacity under development in fourteen provinces in China. This is more than [half](#) of the global proposed capacity, and more than twice as much as the proposed capacity of million-capacity scale coal mines in India (approximately 530 Mt). The new additions in production capacity continue to be concentrated in a few major coal-producing provinces: Inner Mongolia (482 Mtpa), Xinjiang (232 Mtpa), Shaanxi (176 Mtpa), Guizhou (147 Mtpa), and Shanxi (100 Mtpa). Together, these five provinces comprise nearly 90% (1,137 Mtpa) of all proposed capacity in China.

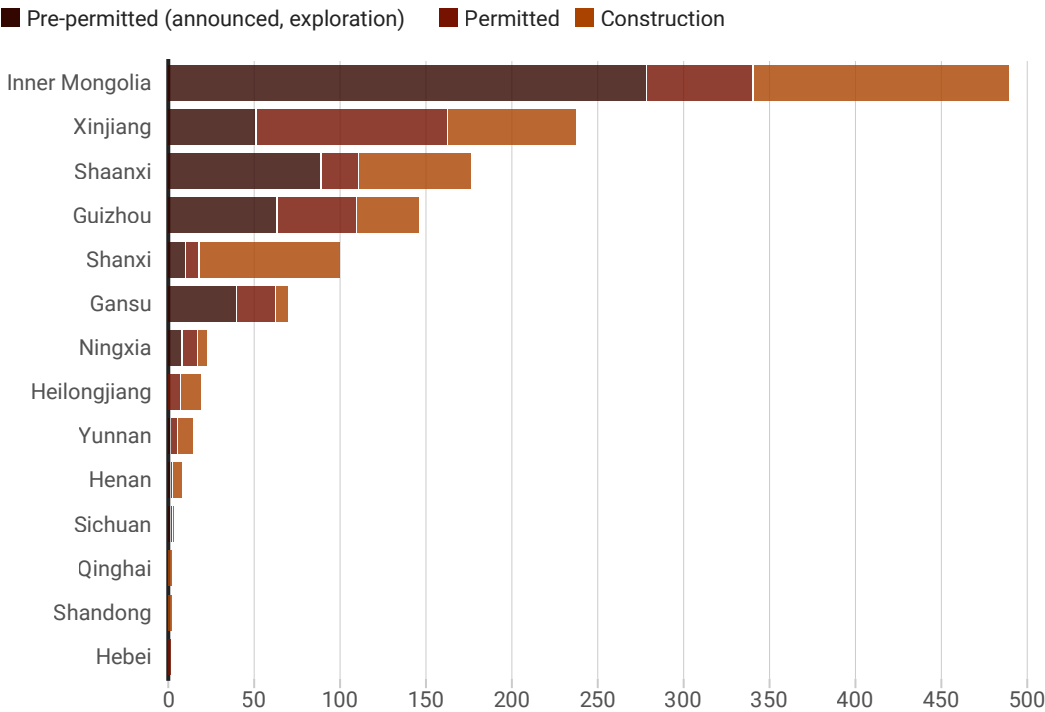
At present, nearly 35% (450 Mtpa) of these projects are already under construction, surpassing the combined construction activity of the rest of the world. With a typical construction period of [3–5 years](#), this suggests a potential surge in production capacity within that time frame, assuming slower mine closures. It also signifies that ensuing methane emissions may be already locked in, requiring widespread adoption of mitigation schemes to curb further emissions or the outright cancellation of new mines.

An additional 289 Mtpa of proposed capacity has already received permits and is expected to move into the construction stage within [two years](#). Projects entered into these two phases have a higher likelihood of becoming operational mines by the next Five-Year Plan period (2026–2030) if completed as planned. The remaining 544 Mtpa of proposed capacity remains in the early stages of development. These projects typically require several years to reach the permitting stage and are more susceptible to cancellation if future coal demand shrinks.

Among China's provinces, Inner Mongolia leads China's coal expansion, particularly in both active construction and proposed projects in the early stage of development. Xinjiang follows behind with the highest share of permitted proposed capacity. Shaanxi holds the third position in overall proposed capacity, while also boasting the second-largest share of early-stage developments. Surprisingly, Guizhou outpaces the traditional coal hub, Shanxi, in terms of current coal capacity under development, although Shanxi maintains a strong position in active construction, with more than 80% of its proposals having entered into construction phase.

Major capacity additions continue to be concentrated in the same coal-producing provinces

Proposed capacity in Chinese provinces by status, in million tonnes per annum (Mtpa)



Note: This chart presents data on proposed coal mines with a minimum designed annual production capacity of 0.6 Mtpa.

Source: Global Coal Mine Tracker, April 2024, Global Energy Monitor

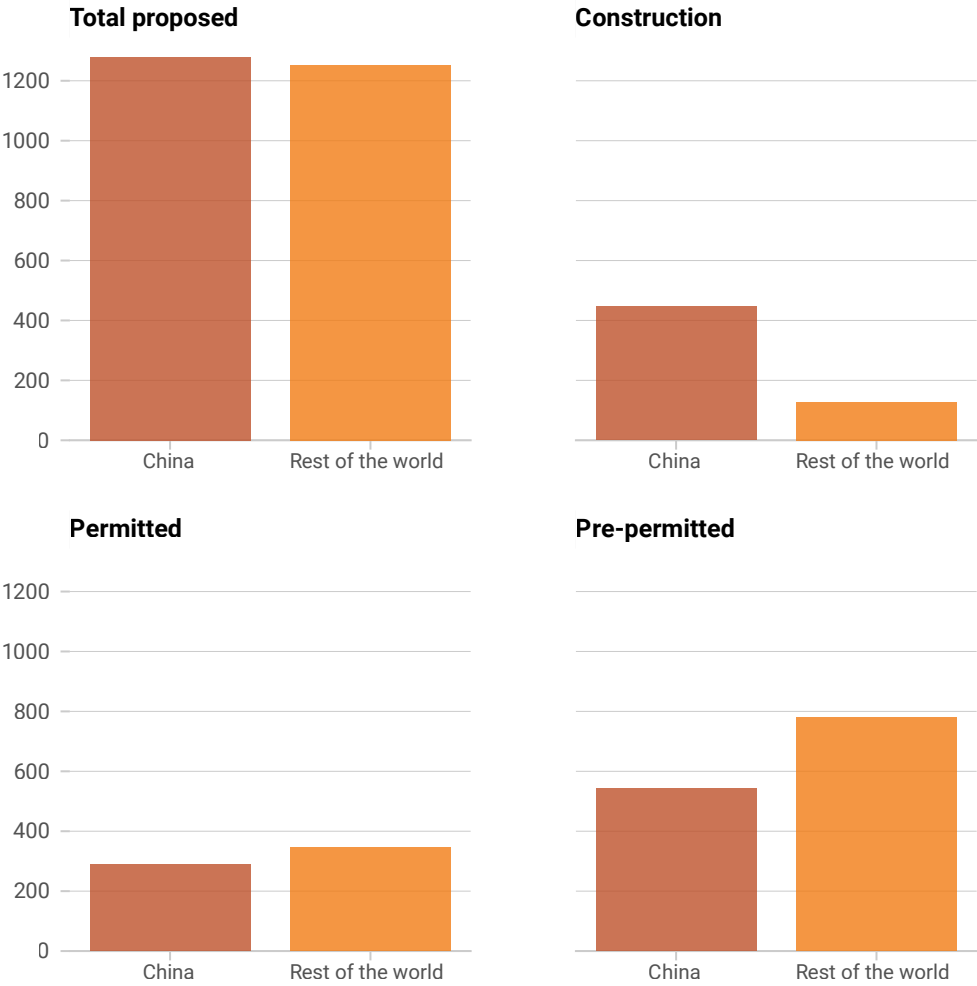


Figure 3

China’s proposed coal mine capacity outstrips the rest of the world, with three times more under construction

Global proposed capacity by mine status, in million tonnes per annum (Mtpa)
Proposed status include pre-permitted, permitted and construction

China Rest of the world



Note: This chart compares proposed coal mines in China (with a minimum capacity of 0.6 Mtpa) to those in the rest of the world.

Source: Global Coal Mine Tracker, April 2024, Global Energy Monitor

Figure 4



Focus on large-scale mine development

As China's coal industry is undergoing a significant transformation, characterized by a pronounced shift towards large-scale mining operations, the nation's coal expansion strategy is heavily concentrated on mines with capacities exceeding 1.2 Mtpa, accounting for nearly 90% (1,141 Mtpa) of the proposed capacity.

Inner Mongolia has emerged as the leader in this trend. With approximately 482 Mtpa of proposed capacity, over 98% of which is dedicated to large-scale mines, the region's dominance is unparalleled. This concentration surpasses the combined [proposals](#) for million-scale mines in both Russia and Australia. Xinjiang and Shaanxi follow a similar trajectory, with

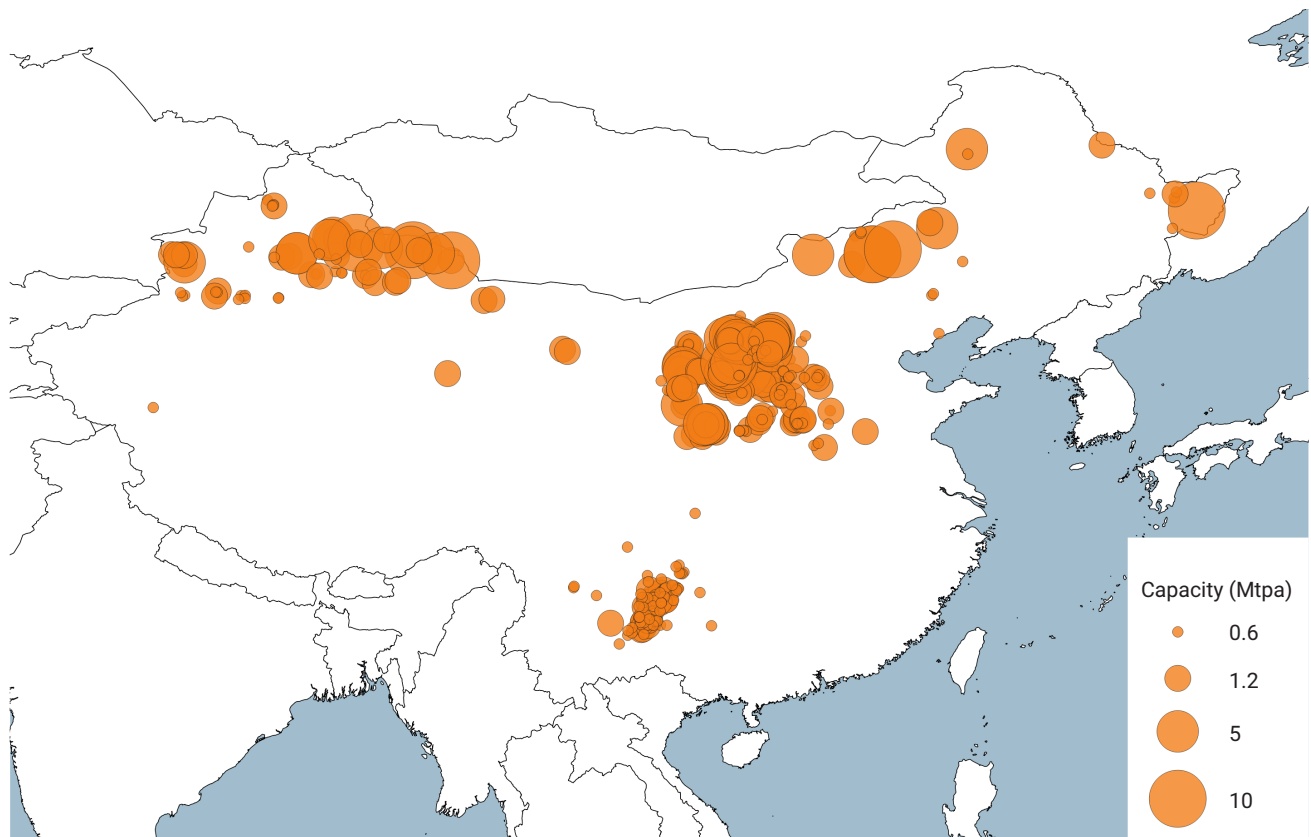
substantial portions of their proposed capacities allocated to large-scale mines. They will see 97% and 94%, respectively, of their planned capacity emerging from coal mines of 1.2 Mtpa or more.

These three provinces are also home to the bulk of proposed mega-scale coal mines with a designed capacity reaching 10 Mtpa or more. A combined 359 Mtpa of such scale projects are currently in the pipeline, and about 35% of them have entered into construction stage.

Guizhou Province is the sole southern representative among China's top five provinces in terms of proposed

Distribution of proposed mine projects

Locations of proposed coal mines, circles sized by capacity in million tonnes per annum (Mtpa)



Note: Data include proposed mines with a minimum annual production capacity of 0.6 Mtpa
Source: Global Coal Mine Tracker, April 2024, Global Energy Monitor

Map 2

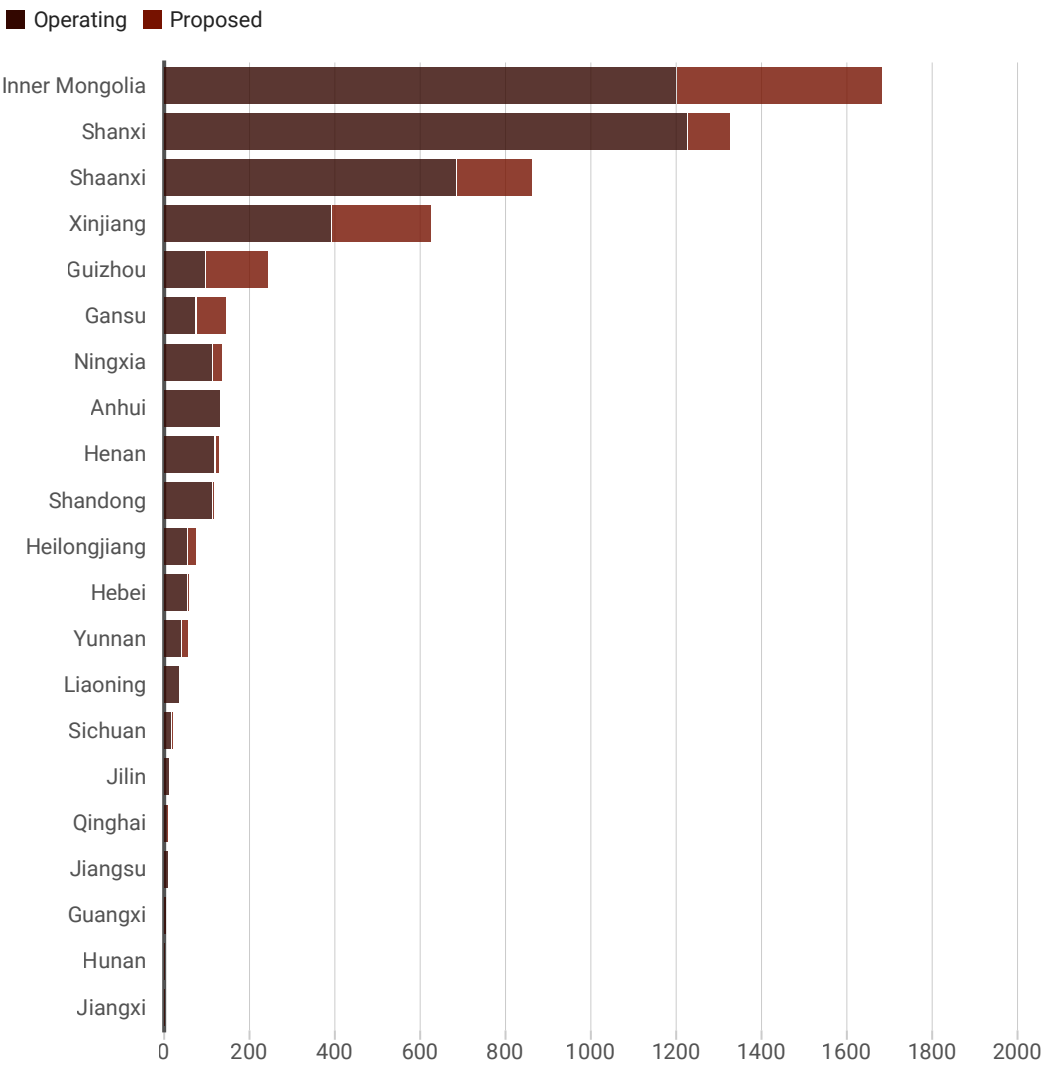


capacity. As one of the key hubs in the West-to-East Power Transmission Program⁴ for over two decades, the coal mines in Guizhou primarily fuel local power plants supplying electricity to neighboring provinces and Guangdong. After being designated the [coal supply center](#) for Southwest China in the province's 14th Five-Year Plan for the coal industry issued in

2022, the province has seen a surge in new coal mine proposals in 2023. However, unlike the emphasis on large-scale mines in other regions, Guizhou's proposals are characterized by smaller-scale projects. Over half of its planned 147 Mtpa capacity is concentrated in mines with capacities below 1.2 Mtpa.

Inner Mongolia is on track to surpass Shanxi as China's largest coal producer

Coal mine production capacity of 0.6 Mt and above in Chinese provinces, by status, in million tonnes per annum (Mtpa)



Source: Global Coal Mine Tracker, April 2024, Global Energy Monitor
Figure 5



4. The West-to-East Power Transmission Program (西电东送) is a major infrastructure initiative in China designed to address the country's regional disparities in energy resources and demand. Launched in the early 2000s, this program involves the construction of power plants and extensive transmission lines to transport electricity from resource-rich western regions to the more industrialized and densely populated eastern regions.

Shanxi still emphasizes large-scale mines with 85% of its 100 Mtpa capacity dedicated to projects above 1.2 Mtpa but differs from the mega-mine focus of its northern counterparts. Unlike Inner Mongolia, Xinjiang, and Shaanxi, Shanxi has yet to propose any mega-scale coal mines with capacities reaching 10 Mtpa or more.

The fluctuations of coal mine approvals

The trajectory of coal mine capacity approvals in China saw significant fluctuations between the 13th Five-Year Plan (FYP) and the first three years of the 14th FYP. During the 13th FYP (2016–2020), the coal industry was shaped by a government-mandated **"decapacity" policy** aimed at reducing the nation's reliance on coal. Initiated in 2015, this policy involved mine closures, consolidation, and a three-year moratorium on new capacity additions. However, a surge in approvals occurred in 2017 due to a backlog of previously unapproved mines that were already under construction. Approvals then peaked in 2019, with many of the newly approved projects likely intended to **replace** small or depleted mines.

Entering the 14th Five-Year Plan (FYP) period (2021–2025), following a nadir in coal mine project approvals in 2021, a severe power crisis occurred, largely caused by coal supply shortages. In response, the Chinese

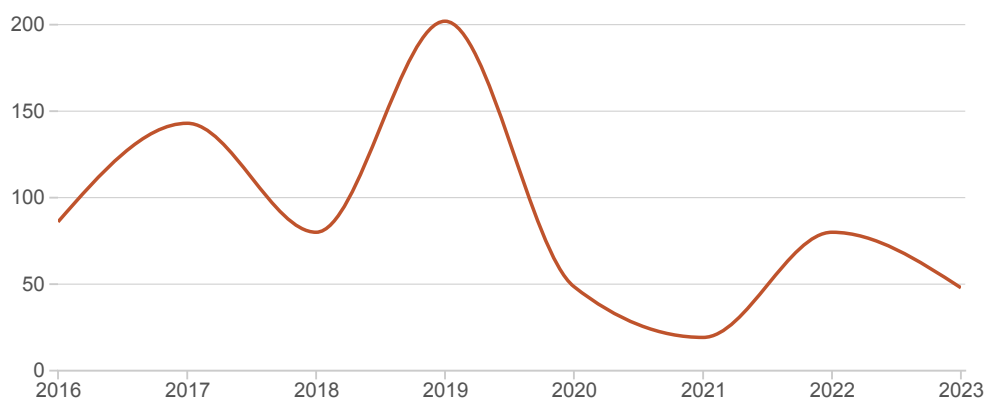
If all current proposals materialize, the coal mining landscape will see a shuffling of rankings in terms of coal production capacity. Inner Mongolia will surpass Shanxi to become the top coal producer not only in China but also the world. Guizhou is poised to enter the top five, replacing Anhui province.

government shifted its focus towards increasing coal production to ensure energy security. This led to a rebound in coal mine capacity approvals in 2022, with around 80 Mtpa approved, followed by a decline in 2023. However, this decline does not necessarily suggest that the approved capacity in 2023 is lower than in the previous year. In fact, many operating mines may have expanded their production capacity this year, though tracking these expansions is difficult due to fragmented data.

Notably, nearly 80% of all currently proposed capacity is from greenfield or brand new mine proposals (275 mines, 1,022 Mtpa), indicating a strong industry push to establish new operations. These new mines are likely to commit to longer-term production compared to expanding existing mines. The remaining 20% of capacity (178 mines, 257 Mtpa) is from brown-field developments involving expansions through

A rebound in new capacity approvals in 2022, following a short-term decline

Comparison of approved capacity from 2016 to 2023, in million tonnes per annum (Mtpa)



Source: Global Coal Mine Tracker, NEA, NRDC, Caixin, Cinda Securities

Figure 6



technological upgrades and the consolidation of smaller mines, with Inner Mongolia and Guizhou being particularly prominent in this respect.

In theory, the capacity expansion of existing operating mines must also go through a series of [procedures](#), including the approval of forest and grassland use, adjustments to the mining area master plan, environmental impact assessments, the acquisition of mining rights, etc. However, the urgent need to address coal shortages in 2021 prompted a relaxation of these regulations.

Expanding production capacity became an immediate solution to ensuring supply, particularly in response to the “increase production to ensure supply” mandate. Coal mines designated as emergency supply sources are allowed to produce at the expanded capacity while simultaneously initiating the approval procedures that are processed at a more expedited pace than usual. This activity is particularly evident in the case of [72](#) coal mines in Inner Mongolia and [98](#) coal mines in Shanxi. The approach consequently contributed to the increase in approved capacity and subsequent production in 2021 and the following years.

COAL MINE METHANE EMISSIONS

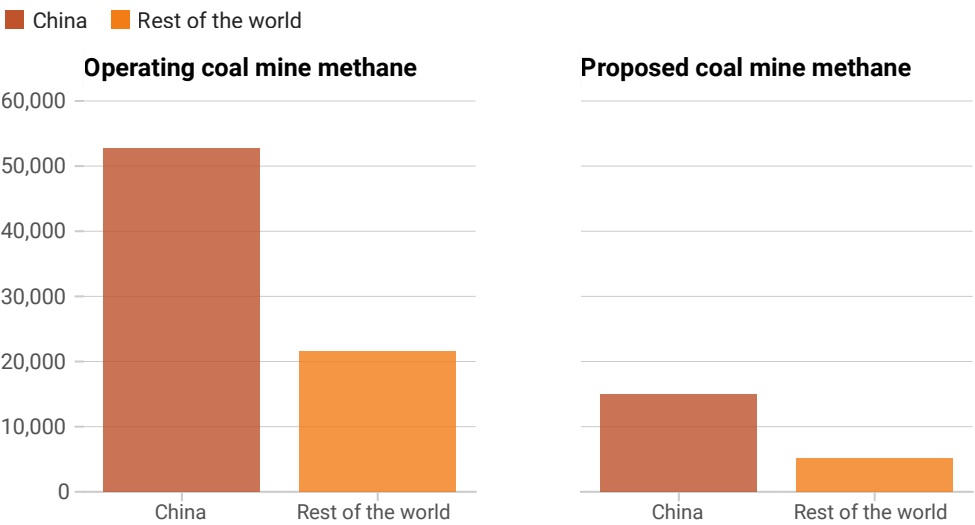
Coal significantly contributes to global warming through the CO₂ produced when it is burned and the methane emitted during coal mining. During mining, fractured coal seams and surrounding strata emit methane into the atmosphere through vent holes, ground fissures, storage piles, and open-pits. China is by far the [highest](#) methane emitter in the coal sector, and China’s coal mining sector is the largest source of methane emissions within the country’s energy

sector. However, there is a substantial lack of accurate and reported data on methane emissions from this sector in China.

To address this gap, GEM conducted a pioneering analysis using nationwide coal mine-level activity data to assess China’s coal methane emissions. By analyzing all operating and proposed coal mines or mine expansions with a capacity of 1 Mtpa or greater

China’s coal mines are responsible for more coal mine methane emissions than the rest of the world combined

Coal mine methane (CMM) emissions from coal mines with a capacity of at least 1 Mtpa, in million cubic meters per year (MCM/yr)



Source: Global Coal Mine Tracker, April 2024, Global Energy Monitor

Figure 7



as of April 2024, GEM revealed that China's operating coal mines emit a staggering 52,726 MCM of methane annually, equivalent to approximately 35 Mt of methane released each year. This figure is nearly twice the emissions estimated by the International Energy Agency (IEA) in their [Global Methane Tracker](#), which reported that China's coal mining sector was responsible for about 20 Mt of methane emissions in 2023.

The significance of China's coal mine emissions becomes even more apparent when compared to emissions from coal mines of similar size in other

coal-producing countries. China's operating coal mine methane emissions account for roughly 70% of the global total for coal mine methane emissions from [operating mines](#) of similar size.

With substantial coal mine expansion planned, China is poised to become an even larger emitter of global methane emissions. If all proposed projects materialize, another 14,956 MCM (10 Mt) of methane will be emitted, potentially accounting for nearly 75% of projected methane releases from proposed mines worldwide.

Provincial coal mine methane emissions from operating mines

China's coal mine methane emissions (CMM) are concentrated in traditional mining regions, with Shanxi, Inner Mongolia, and Shaanxi as the top emitters. These three provinces collectively account for 70% of China's total CMM emissions and roughly half of global CMM emissions from operating mines.

Shanxi's coal mines, in particular, emerge as the absolute leading source of China's CMM emissions, with 17,325 MCM/yr (12 Mt/yr) estimate emissions, contributing 32% of the country's total, mainly attributed to the prevalence of deep underground mines in the region, which extract high volumes of bituminous and anthracite coal. These coal types, formed under immense pressure, naturally contain higher methane concentrations.⁵

Inner Mongolia and Shaanxi, which are [home](#) to some of the world's worst individual coal mine methane emitters, are the second- and third-largest emitters, contributing approximately 10,926 MCM (7 Mt) and 8,911 MCM (6 Mt) of methane per year, respectively. Collectively, these three provinces generate 1.5 times more coal mine methane than the rest of the world combined (15 Mt/yr).

The amount of methane released during coal mining depends on [a number of factors](#), the most important of which are coal rank, coal seam depth, and method of mining. Generally speaking, underground coal mining releases more methane than surface or open-pit mining because of the higher gas content of deeper seams. China relies primarily on underground mining to produce over 75% of total production capacity.

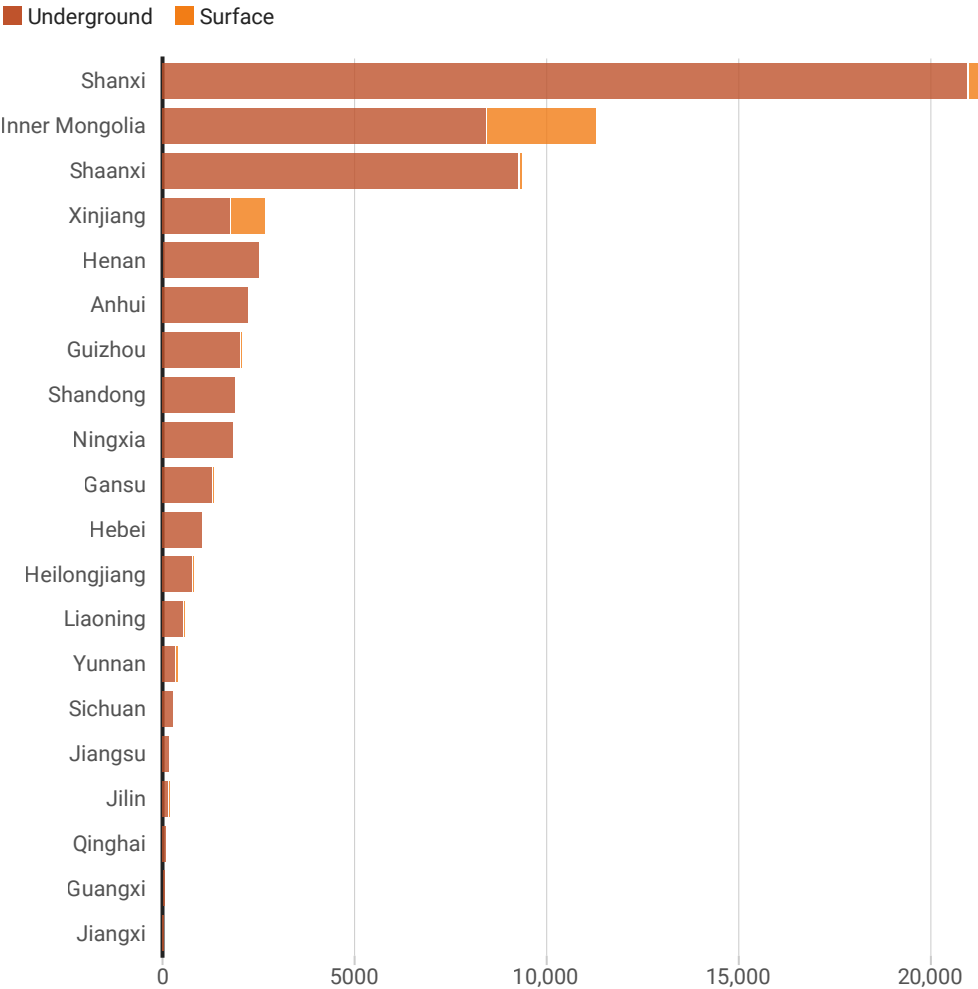
Consequently, the significant number of underground mines is the primary culprit behind methane emissions, contributing roughly 93% of the country's total coal mine methane emissions. Shanxi and Shaanxi are particularly responsible for these emissions. The remaining 7% of CMM emissions originate from surface mines, mainly located in Inner Mongolia and Xinjiang.

Notably, the current estimated methane emissions only include coal mines with a capacity of 1 Mtpa or more, representing over 80% of China's coal mines. However, if smaller mines with a capacity of 0.6 Mtpa and above are factored in, based on GEM's data, they could increase total methane emissions by 14%, reaching as high as 60,036 MCM/yr (40 Mt/yr).

5. See GEM's [methodology](#) on estimating coal mine methane emissions

Underground mines are the primary coal mine methane sources, contributing more than 90% of the total

Methane emissions from operating coal mines in different provinces, in million cubic meters (MCM) per year



Note: This chart presents data on operating coal mines with a minimum annual production capacity of 0.6 Mtpa.

Source: Global Coal Mine Tracker, April 2024, Global Energy Monitor

Figure 8



Lock-in emissions from proposed coal mines

China currently has 453 new mines or mine expansions of various capacity scales currently under development. Of these, 282 have a capacity of 1 Mtpa or more. Based on these larger projects, GEM estimates an additional 14,956 MCM/yr (10 Mt/yr) of methane emissions annually once operational. This represents a potential 28% increase in China’s total coal mine methane emissions.

With 34% of the proposed projects already under construction, an estimated 4,819 MCM (3 Mt/yr) of new methane emissions may be already locked in and are likely to commence emission within the next few years, considering the 3–5 year construction timeline in China.

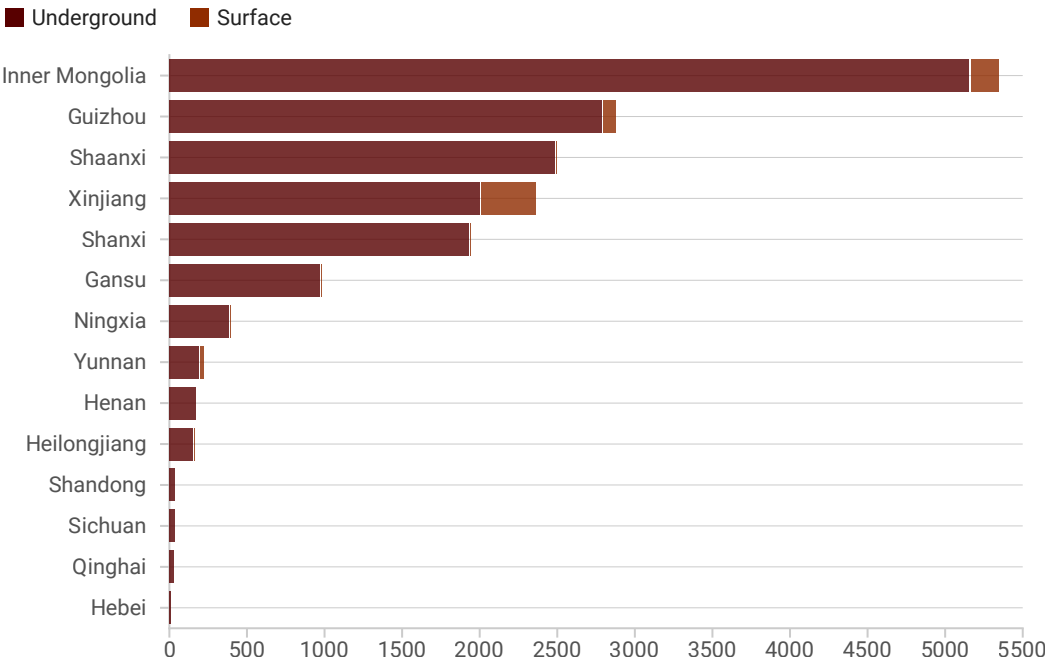
Approximately 95% of the projected emissions will originate from million-scale underground mine

projects, with Inner Mongolia (5,335 MCM/yr, or 4 Mt/yr), Shaanxi (2,389 MCM/yr, or 2 Mt/yr), and Xinjiang (2,328 MCM/yr, or 2 Mt/yr) ranking as the top three potential emitters due to their massive planned underground mine capacities. Together, these three provinces comprise nearly 70% of potential emissions from all new million-scale coal projects in China.

However, if smaller mines with a capacity of 0.6 Mtpa and above are factored in, the total methane emissions from proposed mines are expected to reach 17,460 MCM/yr (12 Mt/yr). Inner Mongolia will likely become the leading source, and Guizhou will likely surpass Shaanxi, Xinjiang, and Shanxi to become the second-largest emitter.

95% of projected coal mine methane emissions will come from proposed underground mines, with Inner Mongolia as the leading source

Potential methane emissions from proposed coal mines in different provinces, in million cubic meters (MCM) per year



Note: This chart presents data on proposed coal mines with a minimum annual production capacity of 0.6 Mtpa.

Source: Global Coal Mine Tracker, April 2024, Global Energy Monitor

Figure 9



CORPORATE COAL PRODUCERS AND EMITTERS

China’s strategic industries, including those vital to national security and the economy, are predominantly controlled by state-owned enterprises (SOEs) under central or provincial government oversight. This pattern is particularly pronounced in the coal sector, where SOEs hold a commanding position. Subject to government direction, these SOEs facilitate rapid adjustments in coal production and capacity.

GEM data reveal that the top 10 SOE entities collectively possess approximately 40% of the nation’s coal production capacity, equating to roughly 1,500 Mtpa. Moreover, a significant proportion of new mine development and expansion is being undertaken by these leading producers, with an estimated 360 Mtpa of capacity currently under various development stages.

What are the top ten corporations in coal production and proposals

Among the top ten coal-producing corporations, China Energy Investment Corporation (China Energy) stands out. This company holds the title of the world’s largest power producer, but it also reigns supreme in coal production within China and throughout the globe. It extracts a staggering 473 Mt of coal annually from its million-scale mines, primarily located in northwestern China. This amount surpasses the combined output of all similar-sized mines in the United States. Furthermore, China Energy maintains its leadership position with an estimated 71 Mtpa of new coal proposals under development, the majority centered in Inner Mongolia and Xinjiang.

coal annually. Ninety-five percent of these mines are underground operations. Jinneng Group’s dominance extends to future production as well, with an estimated 42 Mtpa of new coal capacity under development, solidifying its position as the third-largest company in terms of planned coal capacity.

Shandong Energy secures the third spot among the top ten coal producers in China. Its million-scale mines produce a substantial 165 Mt of coal annually. Additionally, the company boasts a significant development pipeline with approximately 41 Mtpa of new coal capacity underway.

Jinneng Holding Group is another major force in China’s coal sector. Owned by the Shanxi provincial government, it ranks as the country’s second-largest coal producer. The group’s mines, primarily located in Shanxi province, extract a significant 202 Mt of

China Datang, though not ranking among the top ten current producers, holds the title of the second-largest company in terms of new capacity planning, with several mega-scale coal mines under development primarily in Inner Mongolia.

Top ten largest state-owned coal producers

Company	Operating capacity (Mtpa)
China Energy	473
Jinneng Holding Group	202
Shandong Energy	165
Shaanxi Coal and Chemical Industry Group	127
Shanxi Coking Coal Group	126
China Huaneng	118
China Coal	97
Lu'an Chemical Group	69
Tebian Electric Apparatus	70
Jizhong Energy Group	44

Source: Global Coal Mine Tracker, April 2024, Global Energy Monitor

Table 1

Top ten companies in new capacity development

Company	Proposed capacity (Mtpa)
China Energy	71
China Datang	46
Jinneng Holding Group	42
Shandong Energy	41
China Coal	39
Shaanxi Yulin Energy Group	34
Xinjiang Energy Group	30
Yongmei Group	20
Beijing Enterprises Group CO LTD	18
China Huaneng	17

Source: Global Coal Mine Tracker, April 2024, Global Energy Monitor

Table 2

What about emissions from companies?

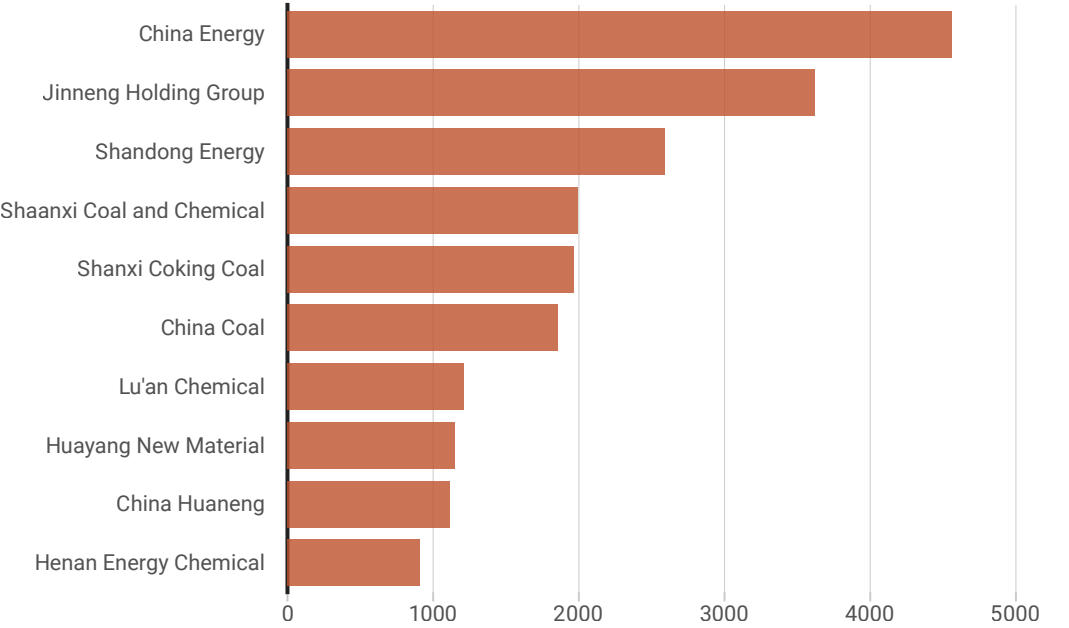
Overlapping almost entirely with the nation’s top coal producers, these SOEs collectively account for a staggering 20,984 MCM/yr, or 14 Mt/yr, of methane emissions annually. This represents nearly 40% of China’s total coal mine methane emissions and is roughly equivalent to the **combined** methane emissions from all other global coal mines (15 Mt/yr).

China Energy, the leading emitter among SOEs, releases a substantial 4,564 MCM/yr, or 3 Mt/yr of methane annually from its million-capacity mines. This amount surpasses Australia’s total CMM emissions (3,972 MCM/yr) from similar-size mines.

Following suit are Jinneng Holding Group and Shandong Energy, the second- and third-largest coal producers in China, respectively. These companies also contribute significantly to China’s CMM burden, releasing 3,618 MCM/yr (2 Mt/yr) and 2,589 MCM/yr (2 Mt/yr) of methane annually, a combined emission level nearly equivalent to the total **emissions** from three major coal producing countries: United States (3,438 MCM/yr), India (1,820 MCM/yr), and Indonesia (1,241MCM/yr), as estimated by GEM.

The listed corporate emitters are responsible for almost 40% of China’s total coal mine methane emissions

Active coal mine methane emissions by top ten companies, in million cubic meters (MCM) per year



Source: Global Coal Mine Tracker, April 2024, Global Energy Monitor
Figure 10



BALANCING SUPPLY AND DEMAND REMAINS THE CONUNDRUM

China implemented a policy of reducing coal production capacity as part of its supply-side reforms during the 13th Five-Year Plan (FYP) from 2016 to 2020. This policy aimed to address overcapacity in the coal sector. Following a peak production of 3,974 Mtpa in 2013, coal output steadily declined over the next four years, reaching 3,411 million tonnes in 2016. While there was a slight increase in subsequent years, production never returned to 2013 levels, leading some to believe China may have **reached** peak coal production. However, the 2021 power crisis prompted a government-led push to increase coal supply.

During this time, the Chinese government intensively issued more than **70** coal industry and market regulation policies with a focus on increasing production and ensuring stable supply. For instance, in October 2021, the central government announced that it would

release **370 Mtpa** of additional mine capacity, accelerate the commissioning and full production of open-pit coal mines that had been approved and were nearly completed, and promote the resumption of coal mines that had stopped production for rectification. These measures contributed a significant increase in new coal mine operations in 2021.

As supply became a rigid demand, the government promoted medium- and long-term coal supply contracts to ensure a steady flow of thermal coal and stabilize prices. Leading coal-producing provinces like Shanxi **signed** contracts with fourteen provinces, and state-owned coal enterprises were **mandated** to operate at full capacity to meet these commitments. The efforts resulted in a substantial increase in coal production starting in 2021 that broke records for a consecutive three years.

Coal peak depends on the consumption sector

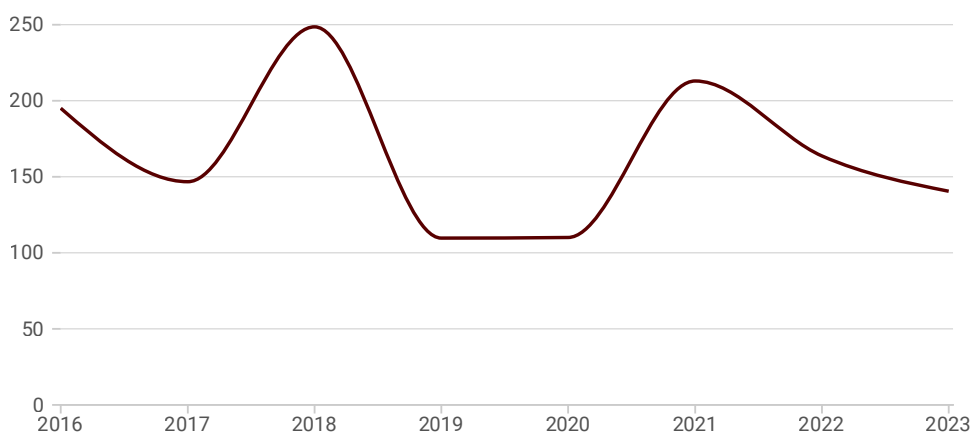
China's record-breaking coal production in recent years has raised concerns about its climate goals. The peak in coal production is closely tied to consumption patterns, and a closer look at the sectoral trends suggests a peak in coal production may be imminent, while the trajectory of coal consumption suggests

continued high demand. The transition away from coal is poised to be a bumpy ride.

The power sector, which is the **largest** coal consumer and CO₂ **emitter** in China (accounting for over 54% and 40% of the national totals, respectively), holds the

Uptick in new coal operations in 2021 to meet increased coal demand

Comparison of new operations from 2016 to 2023, in million tonnes per annum (Mtpa)



Source: Global Coal Mine Tracker, April 2024, Global Energy Monitor

Figure 11



key to achieving a coal peak. Despite a recent increase in new coal power plant construction permits, China's CO₂ emissions [may have](#) peaked in 2023. This development can be attributed to the rapid rise of renewable energy, especially wind and solar power. Renewables have driven a significant portion of China's recent electricity demand growth, reducing the fossil fuel share in electricity generation to 62.7% in the first half of 2024 from 65.7% a year prior.

While power consumption [grew](#) by 8.1% in the first half 2024, power generation from the coal power sector decreased by 7.4% year-on-year, suggesting that renewables filled the gap. Coal production also showed a downward trend in the [first half](#) of 2024, falling by almost 1.7% compared to the same period of 2023. However, coal imports increased significantly (12.5%), indicating that this year's imports may reach another record high, potentially boosting production in major supplier countries like Indonesia.

Looking ahead: Coal dilemma will continue

China's coal industry is at a pivotal juncture. While the government prioritizes energy security, heavily reliant on coal, the nation is also committed to expanding renewable energy sources. Recent surges in coal production, prompted by supply concerns, may be curtailed by the nation's ongoing efforts to optimize the energy mix and reduce coal demand through a structural shift towards renewable energy sources.

New coal mine proposals, though likely to diminish, are unlikely to cease entirely in the near term. To safeguard coal supply stability, the Chinese government has [finalized](#) the plan to establish a coal production reserve system, scheduled for completion by 2027. This system involves creating a pool of idle yet operational mines capable of rapid production increases during supply disruptions. By 2030, an additional 300 million tonnes per year of production capacity is earmarked for this reserve.

Although intended for standby purposes, this capacity expansion signals persistent investment in the coal

The steel industry [accounts for](#) 17% of China's coal consumption, making it the second-largest coal-consuming sector. Strict production control measures implemented in recent years have already led to a peak in coal consumption in 2020, as [evidenced](#) by declining production capacity and output since 2021. Another major coal-consuming sector is the cement sector, accounting for [less than](#) 10% of China's coal consumption. A dramatic 22% year-on-year [decline](#) in cement production since 2021, primarily due to a shrinking real estate market and lower demand for construction materials, suggests a similar path towards reduced coal consumption. However, the coal-to-chemical industry, though also [accounting](#) for less than 10% of overall coal consumption, has become a key driver of recent energy consumption growth. Coal consumption in the chemical industry [grew](#) by 21% in the first half of 2024.

sector and will likely contribute to future production growth. The primary focus of this expansion will be mainly the five major coal supply bases⁶ which are located in Shanxi, Inner Mongolia, Shaanxi, and Xinjiang, further consolidating large-scale mine development in these regions.

China's emphasis on the development of large-scale coal mines, particularly mega-scale coal mines, with capacities exceeding 10 Mtpa, carries significant long-term implications. These mines typically boast lifespans of at least five decades, and some may operate for over [two centuries](#). It is predictable that the coal mine methane emission will continue to rise, necessitating substantial efforts and billions of dollars in investments to mitigate and reduce these emissions. The potential for premature closure of these mines due to market fluctuations, policy changes, or other external factors raises the risk of [stranded assets](#) and loan defaults.

6. Five major coal supply bases include Shanxi, Western Inner Mongolia, Eastern Inner Mongolia, Northern Shaanxi, and Xinjiang