

Coal Market Update

July 2023



INTERNATIONAL ENERGY AGENCY

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Abstract

Coal markets, like those for oil and natural gas, have experienced a turbulent three years as a result of the pandemic and Russia's invasion of Ukraine, which triggered the first truly global energy crisis. In 2023, coal markets have so far been less volatile, though more turmoil could lie ahead. This Coal Market Update – which provides the latest analysis of coal demand, production, trade and prices – finds that coal demand and supply reached an all-time high in 2022, confirming previous forecasts. It also provides preliminary estimates for the first half of 2023 and outlooks for full-year 2023 and 2024, based on recent trends and forecasts for economic growth across regions, as well as fuel and forward curves. Given that coal is the single largest source of carbon dioxide (CO₂) emissions and that global coal consumption has more or less plateaued for a decade, the key question is when a structural decline in coal demand will begin. The analyses and data in this Coal Market Update inform those looking to answer this question, which has major implications for efforts to reach international energy and climate goals.

Demand

Global coal demand reached a new all-time high in 2022

As projected in the [Coal 2022 report](#) last December, global coal demand reached a new all-time high in 2022, rising above 8.3 billion tonnes (bt). It rose despite a weaker global economy, mainly driven by being more readily available and relatively cheaper than gas in many parts of the world. The turn to coal-fired generation was further supported by overall weak nuclear power and hydropower production, contributing to a new record global high of 10 440 TWh being generated from coal, representing 36% of the world's electricity generation, up one percentage point compared to 2021. In addition, final 2021 demand numbers for coal were revised upward, particularly in China, meaning that 2022's increased demand was coming off an even higher base.

In China, coal demand grew by 4.6% in 2022 to a new all-time high of 4 519 Mt. Demand was higher than expected in last year's Coal Report for two reasons. First, the calorific value (CV) of coal produced in China was lower, resulting in higher-than-expected volumes. Second, more coal than expected was gasified to produce synthetic liquid fuels, plastics and fertilizers. As a result, we estimate that coal demand for non-power uses grew by 7%, despite economic growth of only 3% and a sluggish real-estate sector.

India's economy performed very well in 2022 with growth of 6.9%, resulting in coal demand increasing by more than 8% to a total 1 155 Mt, become the only country besides China to cross the 1.1 bt mark.

Due to an ongoing decline in coal-fired power generation, US coal demand continued its downward trajectory in 2022, dropping by about 7% to 457 Mt.

European Union coal demand increased by 0.9% to 448 Mt, driven by power generation, which offset declines in non-power uses. Coal-fired power generation was pushed up by high gas prices, and the urge to reduce gas use amid reduced Russian gas flows and low hydro output and temporary shutdowns in the French nuclear fleet. This was the second consecutive year of growth, but as anticipated, the uptick was short-lived and a steep decline is forecast for subsequent years.

Developments varied across Asia. Coal demand in Indonesia soared by about 36% to 201 Mt, surpassing 200 Mt for the first time ever and making Indonesia the fifth largest coal consumer after China, India, the United States, and Russia. The growth was driven by strong economic expansion in a country that relies heavily on coal for power generation. The steel and metallurgy sector was a source of particularly strong demand due both to direct coal use and captive power plants

fuelled by coal. Nickel pig iron production witnessed especially rapid growth. The non-power sector grew by 96% to a total of about 69 Mt. Meanwhile, coal demand in Viet Nam decreased to 81 Mt (-4.2%), driven by the electricity sector, in particular higher renewable generation. Coal demand in Japan remained stable, while demand in Korea (-5.3%) and Taiwan (-6.4%) decreased despite high gas prices.

Global coal demand is set to remain at all-time highs in 2023

We expect coal demand grew by about 1.5% in the first half of 2023 to a total of about 4 665 Mt, backed by both an increase of 1% in power generation and 2% in non-power. We observed continued increases in China, India and Indonesia, which more than offset declines in the United States, the European Union and Japan.

In the second half of 2023, we expect a decrease in global coal-fired power generation to more than reverse the first-half gains. For the whole year, we expect demand from the power sector to be 0.4% lower at about 5 597 Mt. In the non-power sector, we expect growth to continue, reaching 2 791 Mt for the full year 2023. As a result, overall global coal demand is expected to remain flat at around 8 388 Mt (+0.4%) in 2023. Whether coal demand in 2023 grows or declines, will depend on weather conditions and on the economies of large coal consuming nations.

After three very particular years, with the Covid-19-induced shock in 2020, the strong post-pandemic recovery in 2021, and the first truly global energy crisis after Russia's invasion of Ukraine in 2022, markets returned to more recognisable patterns in 2023: Declines in the United States and the European Union, and continued growth in Asia. The US and EU declines are driven by the power sector, with a combination of weak electricity demand and renewable energy expansion. In the case of the United States, cheap gas is also weighing on coal demand.

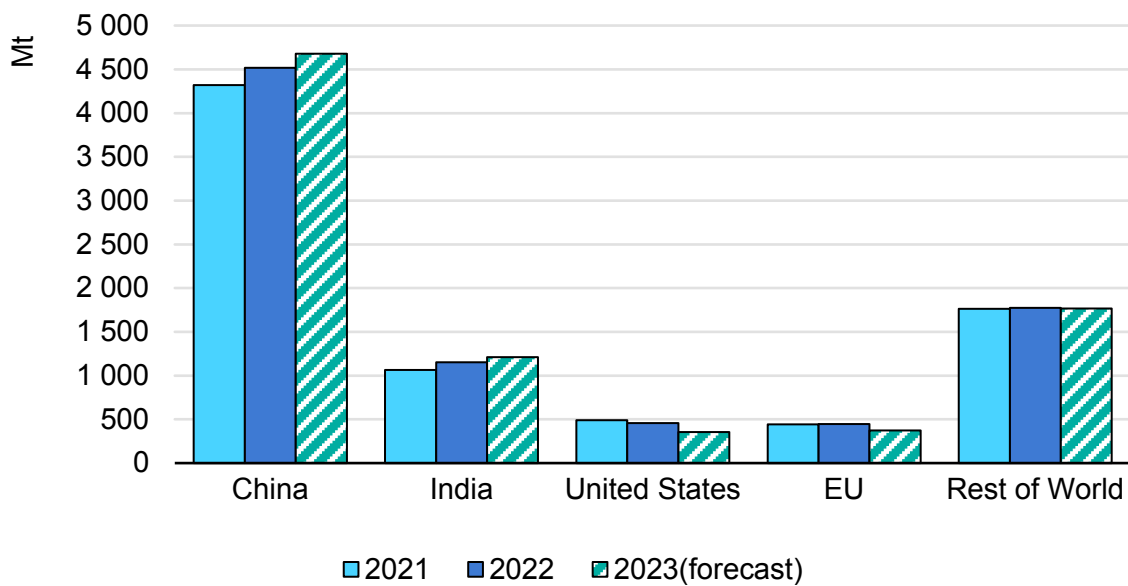
We estimate that China's coal demand increased by about 5.5% in the first half of 2023, driven by a comparison effect with H1 2022 when Covid-related lockdowns weighed on the economy, and very low hydro output in H1 2023 which pushed up reliance on coal-fired power generation. In the second half, growth is expected to slow slightly, mainly due to recovering hydropower availability after last year's drought. In total, we expect China's coal demand in 2023 to grow by about 3.5% to 4 679 Mt, with demand from the power sector up 4.5% and demand from non-power uses growing by 2%.

Due to strong economic growth and coal reliance, India's coal demand grew by about 5.5% in the first half of 2023. With growth in the power sector slowing down a bit in the second half, we expect a total increase of 5% for the year, totalling 1 212 Mt.

Indonesia is set to remain the fifth largest coal consumer in 2023, as economic perspectives are positive, and the power sector, the smelting sector and other industries are all expected to demand more coal.

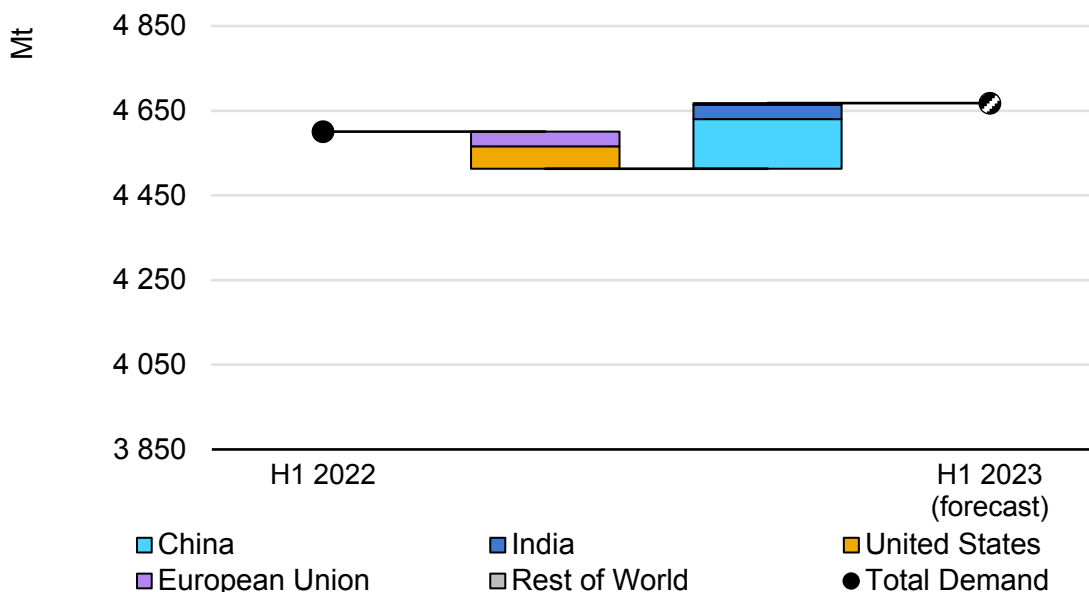
In the United States, coal demand is continuing to decline, driven by the power sector. After contracting by about 24% in the first half, a slower decrease in coal demand is expected in the second half. Total coal demand in 2023 is expected to drop to 357 Mt. Coal demand is also again on a downward trajectory in the European Union and Japan, as well as Korea. In the first half of 2023, coal demand dropped by about 16% in the European Union and for the full year it is expected to decline by about 17% to about 372 Mt. The decrease is driven by weaker economic prospects, lower gas prices, nuclear recovery and ample power production by renewable resources. In Japan and Korea, these effects are limited, resulting in an expected demand of 179 Mt (-1.9%) in Japan and 117 Mt (-2.8%) in Korea.

Global coal consumption, 2021-2023



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Changes in global coal consumption, H1 2022-H1 2023



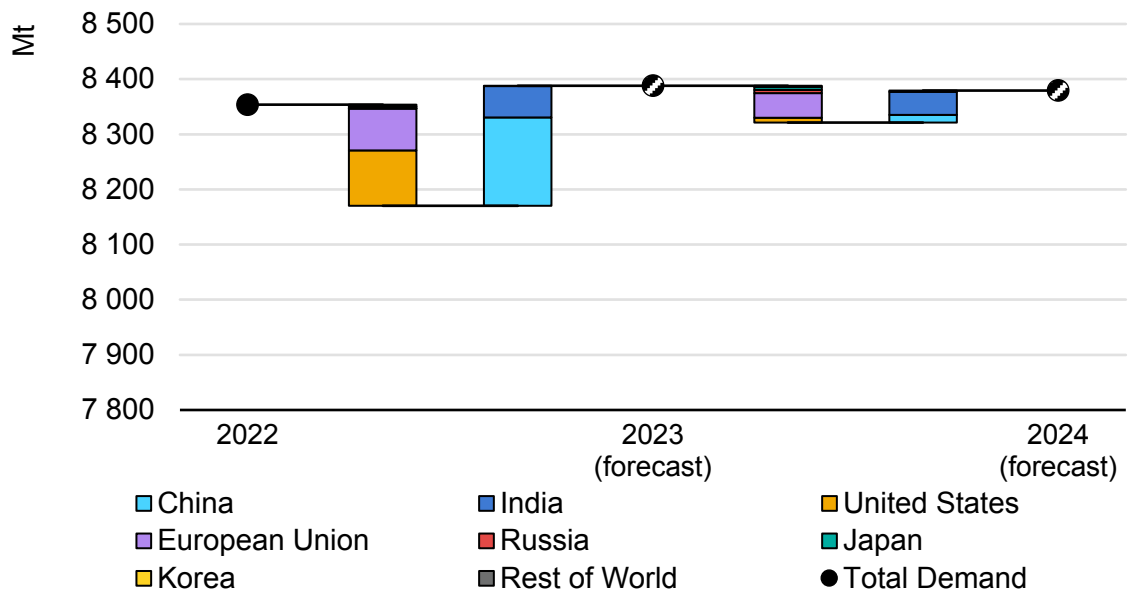
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Global coal demand is forecast to remain flat in 2024

In 2024, we expect global coal demand to remain stable (-0.1%) at about 8.38 bt, which remains a level never reached before 2022. In the electricity sector, we expect a decline of about 1%, due to the continued strong expansion of renewable power generation amid moderate electricity demand growth. However, we expect a small increase of around 1.5% in the industrial sector, as economic conditions improve. Those trends are very much in line with the Coal 2022 report expectations, although at a higher level given the already mentioned upward revisions for 2021. By region, Asia will grow, in particular India and Southeast Asia, offset by declines in the United States and the European Union. Demand is also declining in other mature economies such as Japan, Korea, Australia, and Canada, where coal demand peaked some years ago.

China will continue to account for more than half of the world's coal use, with the power sector alone consuming one-third. If we add India, the global share rises to about 70%, meaning that China and India together consume double the amount of coal as the rest of the world combined. Along with recent growth in Southeast Asia, the dominance of the Asia continent is further increasing. In 2024, the share of China, India and the ASEAN region is expected to reach 76%. At the same time, the United States' and the European Union's share of coal consumption, which amounted to 40% three decades ago, will fall to 8% by 2024.

Changes in coal consumption by country, 2022-2024



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Supply

Global coal production reached a new all-time high in 2022

Despite lukewarm economic prospects, global supplies grew by 8% in 2022 to a record 8 634 Mt. The three largest producers – China, India and Indonesia – each reached all-time highs in 2022. Coal production was mainly boosted by China and India, which rapidly increased domestic production to mitigate exposure to high market prices after a first price spike in October 2021.

According to the [National Bureau of Statistics](#) (NBS), China in December 2022 passed 400 Mt¹ of production in a single month for the first time. This is more than any other country, except for Australia, Russia, Indonesia, India and the US, produces in a whole year. With rapid growth of 11% in 2022, China is ahead of its 14th Five-Year Plan.

India boosted its domestic production by about 12% to 924 Mt to avoid shortages and reduce import dependency amid rising demand. Coal India Ltd (CIL), the state-owned company accounting for 80% of India's domestic coal production, increased output by about 12%. Other public companies – SCCL and NLC – also contributed, although the increase in captive blocks – those players allowed to produce coal for their own consumption – was more significant (+30%).

Coal production in the European Union grew for the second year in a row to a total of 349 Mt, up 5% from the previous year, owing to an increase of lignite production to feed nearby power plants, mostly in Germany, Czech Republic and Bulgaria.

Indonesia increased coal production to about 641 Mt in 2022, up 12% from the previous year. Indonesia was partially filling in for other suppliers which did not manage to ramp-up production to benefit from tight markets and surging coal prices. Australia's coal production suffered from adverse weather conditions caused by La Niña but also from the aftermath of the Covid-19 pandemic. In total, coal production in Australia contracted by about 3% to 451 Mt. In the United States, weak domestic demand limited the increase to just over 3% to 542 Mt despite high coal prices. Severely impacted by adverse weather and protests, Colombia's coal production increased by only slightly more than 2% to 57 Mt, despite high export prices. In South Africa, rail disruptions and a decline in domestic consumption affected coal production, resulting in an increase of only 0.5%. Russia's coal production remained stable at 442 Mt (-0.2%), as sanctions

¹ China NBS reports raw coal, which is not directly comparable with marketable coal in IEA statistics.

imposed in response to its invasion of Ukraine and eastbound railway bottlenecks prevented the otherwise expected growth.

Global coal supply is expected to reach new record in 2023

Global coal production is expected to grow further in 2023, driven by an expected strong ramp-up of production in China, India, and Indonesia in the first six months, offsetting declines in the United States and the European Union. Russian coal production is estimated to have recovered somewhat in the first half of 2023.

In March 2023, China reached another monthly record of 417 Mt², surpassing the previous record set in December 2022. In total, we expect China's production to increase by 3.3% to 4 631 Mt for the full year 2023.

In the first half, India's supply rose by about 10%, reaching a new single-month production record of 107 Mt in March, according to the [Coal Ministry](#), surpassing 100 Mt in a single month for the first time. For the entire year, we expect an increase in coal production to about 989 Mt (+7%), close to the government's 1 bt target.

Indonesia's coal production grew by an estimated 16% to 353 Mt in the first six months of 2023. Growth is expected to slow down in the second half and we expect an increase of about 8% to about 695 Mt for the full year.

Due to ongoing demand destruction owing to wide unavailability of coal power plants after years of poor maintenance and severe infrastructure issues, South Africa's coal production is expected to decline by about 4.2% to 220 Mt in 2023. In the first half, production is estimated to have decreased by an even faster 10%.

In the US, coal production turns downward again. Although production is expected to have increased by about 0.8% in the first half of the year, for the full year we forecast a 4.2% drop to 519 Mt, compared to a 22% decline in demand. Higher exports and stock building at power plants explain the gap.

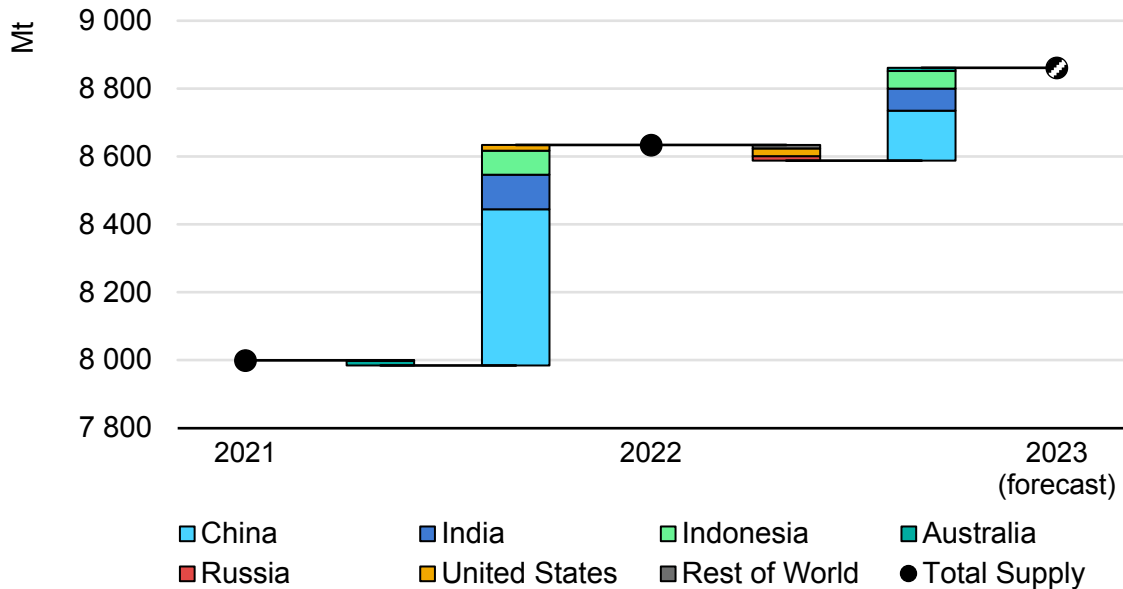
In the first six months, coal production in the European Union plummeted by an estimated 17%, driven by falling demand from the power sector. In total, we forecast EU production to fall by about 8% to 321 Mt.

² See Footnote 1.

Russia’s coal production is expected to slightly decrease by 2.9% to 429 Mt in 2023, after an estimated 1.4% increase in the first six months. But any forecasts for Russia are difficult under the current wartime circumstances.

Australia’s coal production is set to increase by 2%, as weather conditions enable producers to significantly expand production, after they had been severely hit by La Niña last year. Coal production is anticipated to rise to 460 Mt.

Changes in coal production by country, 2021-2023



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Trade

A major reshuffling of trade flows in 2022

Global coal flows experienced significant shifts in 2022, driven by sanctions imposed on Russia after it invaded Ukraine. Russian supplies could not all be redirected due to railway constraints, contributing to a tightening of global supplies. Other producers, in particular Australia, faced severe production disruptions due to adverse weather conditions (La Niña). Infrastructure issues hindered South Africa from fully capitalizing on higher prices. In response to elevated prices, China and India limited imports and significantly pushed domestic production. Despite this, India's imports increased due to strong demand. International trade of thermal coal grew by 2% to 1 045 Mt. Trade of metallurgical coal experienced a slight decline, driven by weaker economic performance, amounting to 307 Mt (-0.4%).

Thermal coal exports from Russia dipped approximately 10% to 157 Mt, while metallurgical coal exports fell by 14% to 35 Mt. Australian thermal coal exports fell by about 7% to 184 Mt, whilst exports of metallurgical coal decreased by 3% to 166 Mt. The United States, which had previously served as a swing supplier, witnessed a 2.8% decrease in thermal coal exports to 35 Mt despite high prices, due to shortages of rail slots and to the poor perspectives for the sector dissuading financing and investment. Metallurgical coal exports remained stable. Colombian exports of thermal coal decreased by 4% to 52 Mt, in part due to unfavourable weather conditions.

The missing supplies were only partially offset by other producers. Indonesia, the largest exporter of thermal coal, proved to be also the most flexible with exports of thermal coal growing by 9% to 469 Mt. Mongolia ramped up exports of metallurgical coal by 54% to 17 Mt, despite Covid-related restrictions. Attracted by high prices, smaller suppliers such as Mozambique, Botswana and Tanzania increased exports, although volumes were marginal. Collectively, thermal coal exports from countries other than Indonesia, Australia, South Africa, Colombia, Russia and the United States grew by 16% to 79 Mt in 2022. However, this increase is expected to be short-lived, as prices need to remain high to overcome their poor logistics and high break-even points.

Coal trade in 2023 is heading back to 2019 volumes

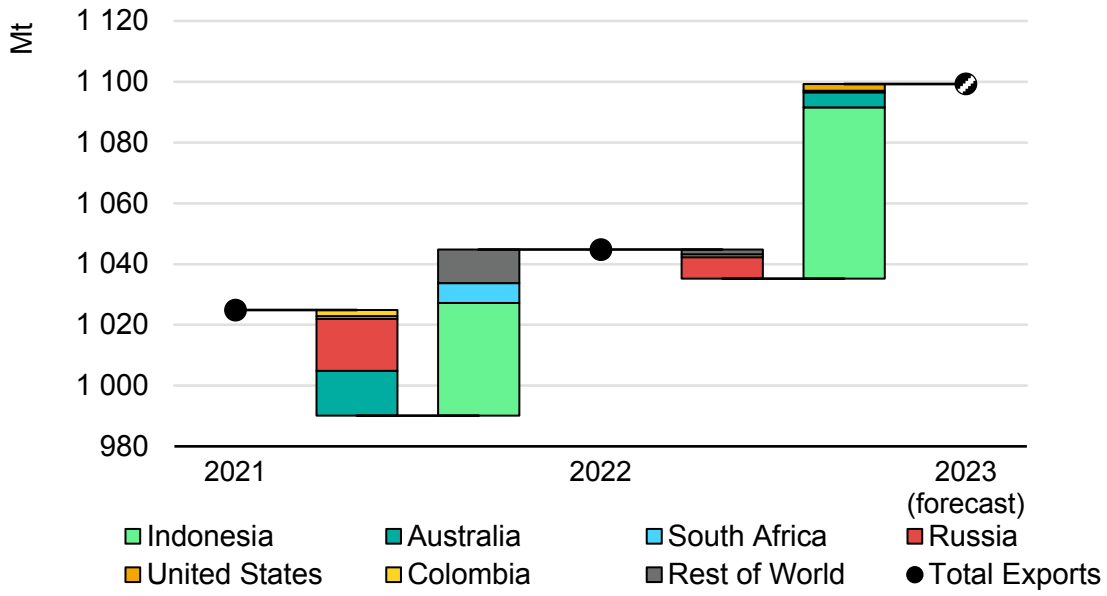
Despite no new large-scale projects coming online, high prices in 2022 have left coal mining companies with stronger balance sheets, providing them with an opportunity to invest in sustaining as well as some expansionary capex. This, together with the end of La Niña, which hampered production in Australia, has strengthened the coal supply outlook for 2023 despite coal prices retreating from their highs.

Stronger coal supply and lower gas prices sent coal prices steeply downward towards the end of 2022. The drops attracted price-sensitive buyers such as China and India, although the price declines were partially offset by the depreciation of the Chinese yuan renminbi and the Indian rupee against the US dollar. China and India ramped up imports at the beginning of 2023, with China even ending its unofficial ban on coal from Australia. Until April, imports from China and India amounted to approximately 50% of global coal imports, as the two largest coal producers and consumers are also the largest importers.

During the first half of 2023, the European Union temporarily turned into an exporter of thermal coal due to ample inventories accumulated during the previous year and reduced coal-fired power generation. In April, EU countries exported close to 1 Mt. Export destinations included, among others, Morocco, India, and China.

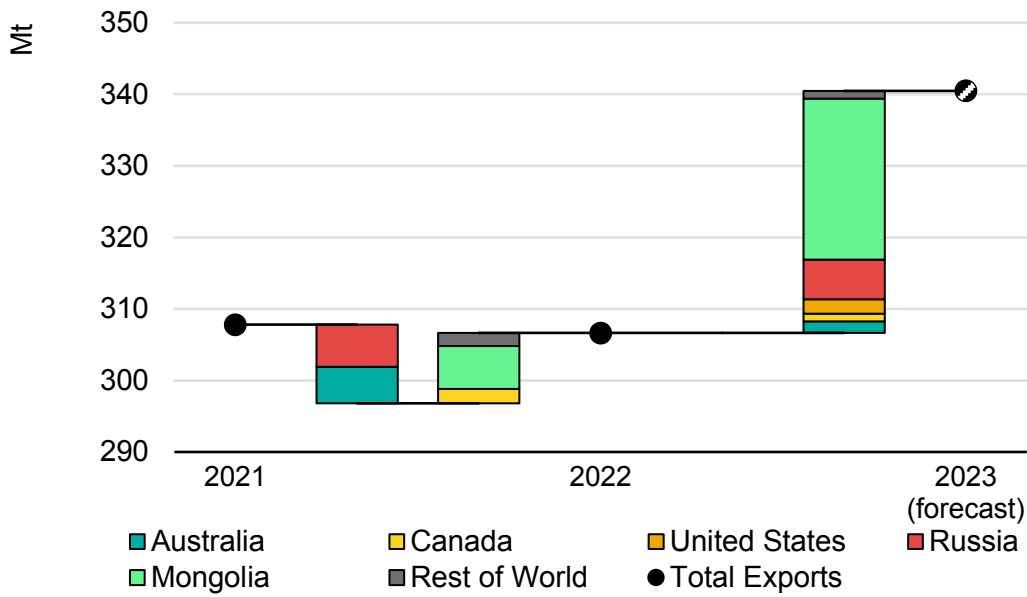
However, elevated global demand for thermal coal imports is projected to be predominantly covered by Indonesian exports, expected to rise by 12% to about 525 Mt for the full year. Similarly, the elevated demand for metallurgical coal is anticipated to be mainly covered by additional exports from Mongolia, more than doubling to well over 40 Mt. Total exports of thermal coal are expected to increase to 1 099 Mt (+5.2%), while metallurgical coal exports are forecast to reach 340 Mt (+11%) in 2023, with total coal trade expected to approach the record volumes seen in 2019. For seaborne coal trade, we project around 1 335 Mt (about 93% of total coal trade) which would surpass the 1 331 Mt record reached in 2019.

Changes in thermal coal exports, 2021-2023



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Changes in metallurgical coal exports, 2021-2023



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Prices

After 18 months of high prices and volatility, thermal coal prices return to more normal levels

In 2022, a convergence of soaring global coal demand and supply shortages led to exceptionally tight coal markets and unprecedented price levels. There was an overall rise in energy prices after Russia's invasion of Ukraine, while high gas prices in particular drove many countries to switch to coal-fired generation. Supply-side factors included adverse weather conditions associated with La Niña, triggering heavy rainfalls and flooding, severely impacting coal production mostly in Australia. Additionally, a temporary export ban imposed by the Indonesian government in January 2022 to address domestic shortages lowered the availability of thermal coal in the market. Furthermore, the European Union banned Russian coal and a portion of these supplies could not be diverted to other markets due to eastbound rail bottlenecks. As a result of all these factors, high-CV Newcastle free on board (FOB)³ and ARA (Amsterdam Rotterdam Antwerp)⁴ thermal coal prices surpassed USD 400/t several times in 2022.

Newcastle and ARA prices first peaked just below USD 400/t at the beginning of March 2022, when Russia's invasion of Ukraine unsettled the markets. Following a brief decline below USD 300/t in April, prices ramped up ahead of announced western sanctions. Newcastle prices, also boosted by supply shortages, first surpassed USD 400/t in May and maintained these levels until declining steeply at the beginning of 2023. Prices reached an all-time high of USD 443/t in September 2023. ARA prices peaked three times above USD 400/t between the end of June and the end of July, before embarking on a downward trajectory after reaching the all-time high of USD 408/t.

In the last quarter of 2022, ARA prices began to decline due to mild weather conditions and ample stockpiles at European coal-fired power plants. ARA prices converged with prices in South China at around USD 146/t at the beginning of 2023. Throughout 2022, prices for high-CV coal in South China deviated substantially from the trends for Newcastle and ARA, and remained comparably stable at an average price of about USD 169/t. Abundant domestic supply limited the exposure to high import prices.

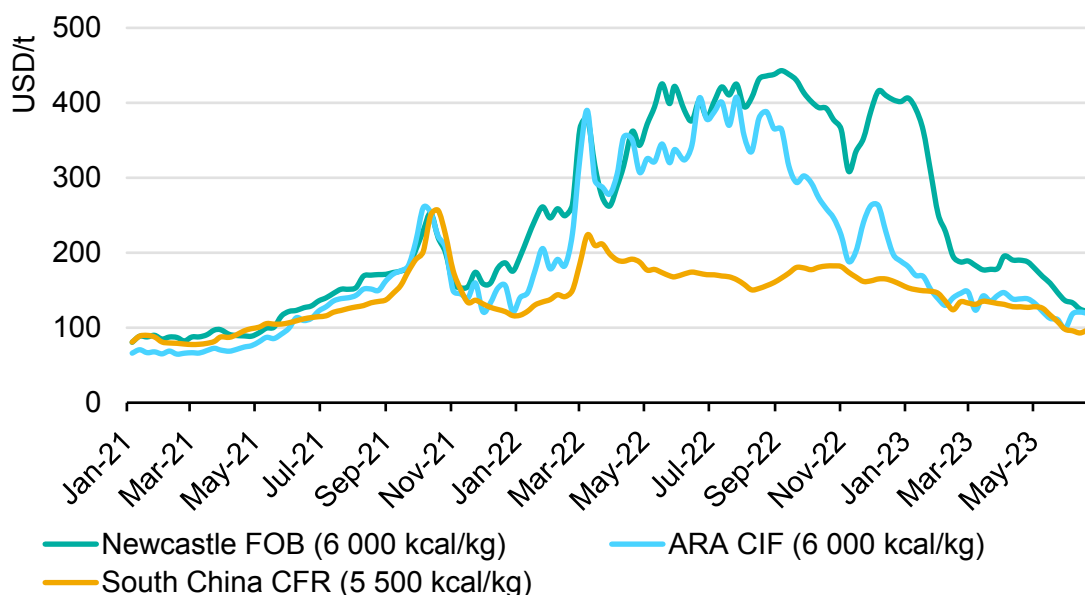
³ Price for 6 000 kcal/kg (net-as-received) coal free on board in the port of Newcastle, Australia.

⁴ Price for 6 000 kcal/kg (net-as-received) coal in the ports of Amsterdam, Rotterdam and Antwerp including cost, insurance and freight (CIF).

Whilst ARA prices plunged towards the end of 2022, coal prices in Newcastle commanded a premium of up to USD 225/t over ARA in January 2023. The price disparity arose from robust demand for Australian coal coupled with persistent supply shortages due to La Niña. Towards the end of the second half of 2023, prices gradually converged. Newcastle and ARA prices for high-CV thermal coal reached levels around USD 119/t, last seen at the beginning of 2022. Prices in South China ranged just below USD 100/t, last observed in mid-2021.

The premium of international benchmarks to Chinese closed down

Thermal coal price markers, 2021-2023



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Note: ARA = Amsterdam Rotterdam Antwerp. FOB = free on board. CIF = cost, insurance and freight. CFR = cost and freight.

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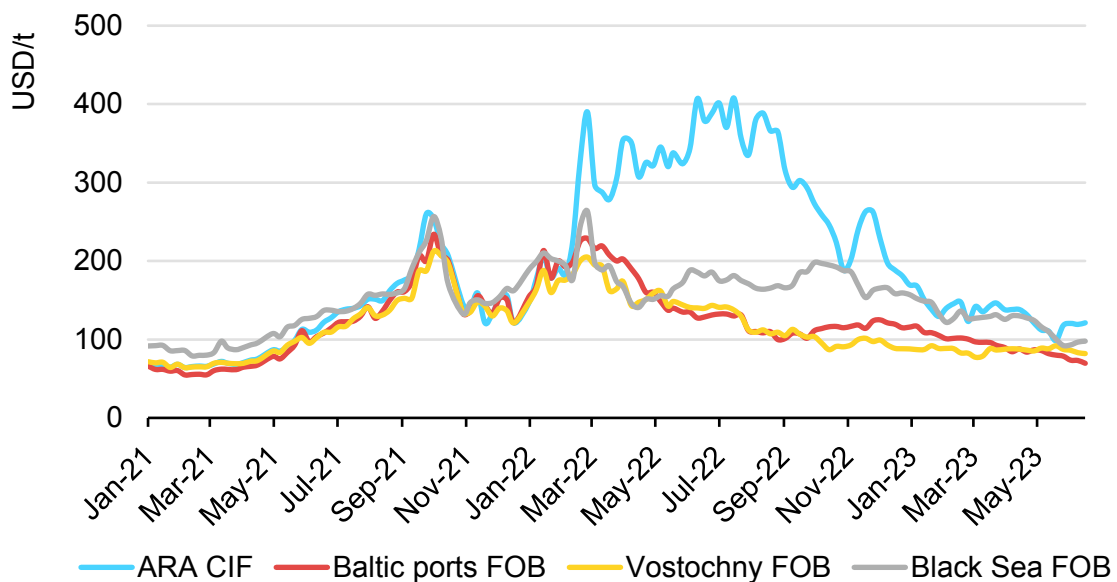
Russian discount almost vanished

In response to Russia's invasion of Ukraine, several western countries and institutions imposed sanctions on Russia, including exclusion from the international payment system SWIFT, severely impeding the settlement of Russian coal trades in dollars. Furthermore, the European Union implemented a ban on Russian coal effective from August 2022, and some Japanese and Korean utilities announced their intention to cease buying Russian coal. In 2021, the European Union, Japan and Korea collectively accounted for about 40% of Russian coal exports. Due to sanctions, cargo insurance was more difficult to procure.

Despite the European ban not coming into full effect until early August, the spot market reacted swiftly and Russian coal faced persistent discounts starting from March and lasting through the year. In the third quarter of 2022, when ARA prices surged, coal at Baltic ports and in Vostochny was traded at a discount of up to 73%. Coal prices in the Black Sea region, geographically close to alternative buyers who did not impose sanctions on Russia, such as Türkiye and India, experienced discounts of up to 58%.

With plummeting ARA prices in the last quarter of 2022, the Russian discount began to dissolve. Coal prices at Black Sea ports converged with ARA towards the end of 2022, while coal at Baltic ports and at the port of Vostochny continued to be traded at a discount of around 30% to 40%. In first half of 2023, ARA and Russian prices showed a parallel trajectory, with prices at Russian ports approaching the nominal price levels observed at the beginning of 2021.

European and Russian thermal coal (6 000 kcal/kg) price markers, 2021-2023



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Note: ARA = Amsterdam Rotterdam Antwerp. FOB = free on board. CIF = cost, insurance and freight.
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Thermal coal prices below coking coal prices again

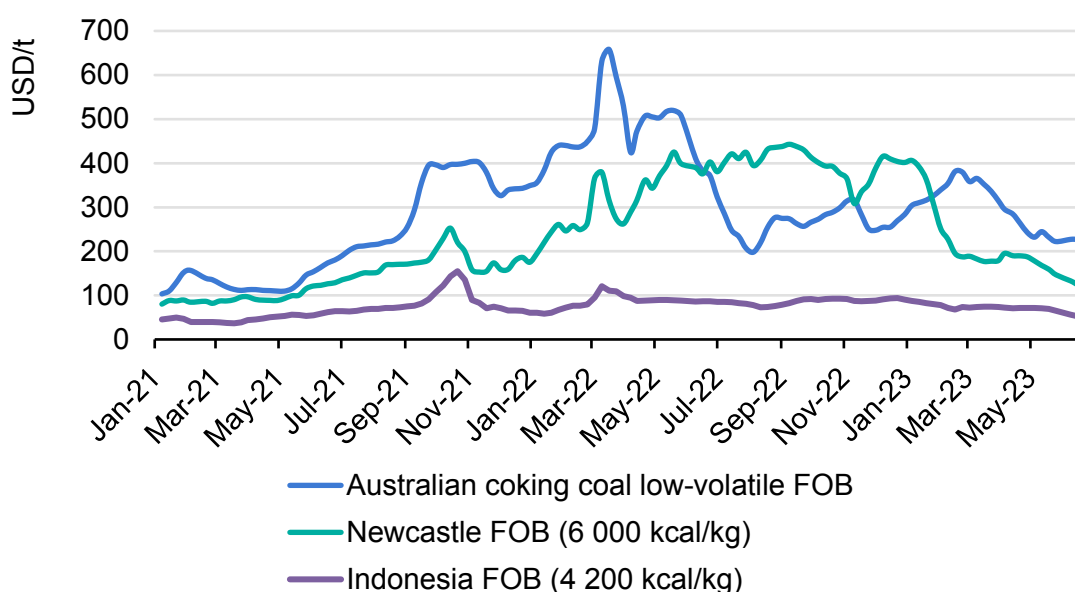
Prices for high-CV FOB coal in Newcastle were supported by limited substitutability. In the Pacific Basin, coal is traded across a wide range of calorific values, representing individual market segments rather than direct substitutes. This characteristic was evident in the price trajectories observed in 2022.

While high-grade Newcastle FOB thermal coal (6 000 kcal/kg) soared to unprecedented levels in 2022, prices for Indonesian low-grade thermal coal

remained relatively stable. The high-grade thermal coal market was so tight that, for almost the entire second half of 2022, high-grade thermal coal in Newcastle traded above metallurgical coal, which was unprecedented. This anomaly was resolved at the beginning of 2023. Prices for metallurgical coal were supported by Chinese buyers resuming imports from Australia in February 2023.

The exceptionally high prices were also evident when comparing high-grade thermal coal to other commodities. In September and December 2022, high-grade thermal coal was temporarily trading at higher prices than Brent Crude Oil in energy terms.

Marker prices for different types of Australian coal, 2021-2023



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Note: FOB = free on board.

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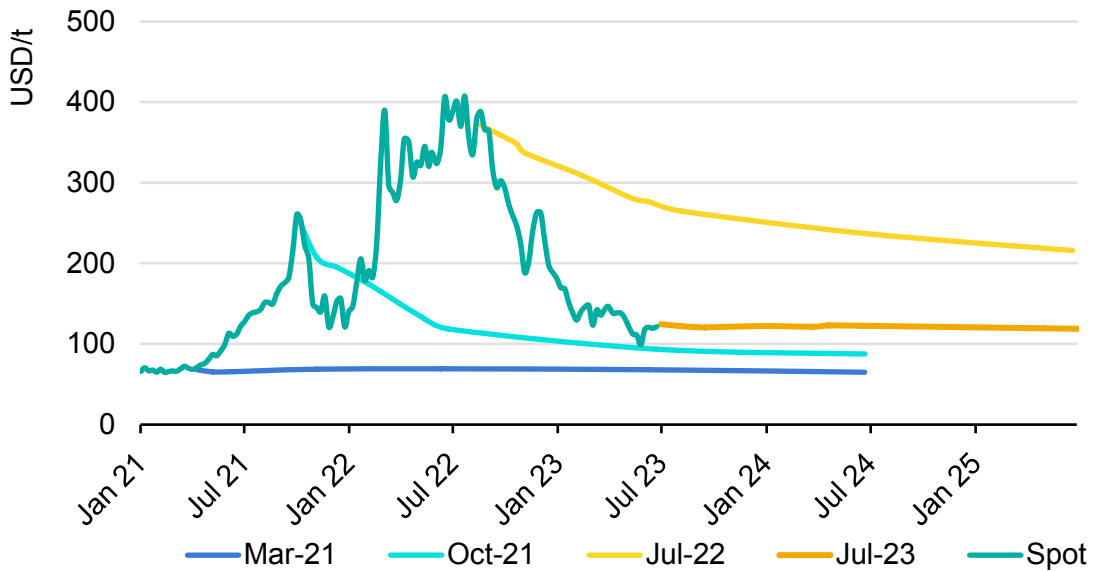
Backwardation disappeared from forward curves

The tumultuous conditions in the coal spot market during 2021 and 2022 also influenced forward prices. Whilst exhibiting strong backwardation (when spot prices are higher than futures) from mid-2021 to the end of 2022, market expectations on futures markets varied broadly.

During the peak price of USD 254/t in October 2022, the market initially expected long-term prices to return to just below USD 100/t by 2024. However, the sanctions imposed on Russia following its invasion of Ukraine fundamentally altered market expectations. By mid-2022, forward prices anticipated coal prices to remain above USD 200/t until mid-2025.

Following the sharp decline in spot prices at the end of 2022 and their stabilisation in the first half of 2023, the forward price curve for API2 (a price index for coal deliveries to Europe, CIF) adopted a flat trend. It is worth noticing that the current flat forward curve is about USD 65/t higher than the last flat curve in March 2021. Among other factors, the inflation of supply costs play an important role in this.

API2 spot prices and forward curves, 2021-2025



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Note: API = Argus/McCloskey's Coal Price Index.
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General annex

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For questions and comments, please contact Carlos Fernández Alvarez (Carlos.Fernandez@iea.org).

Abbreviations and acronyms

API	Argus/McCloskey's Coal Price Index
ARA	Amsterdam, Rotterdam, and Antwerp
ASEAN	Association of Southeast Asian Nations
CFR	cost and freight
CIF	cost, insurance and freight
CV	calorific value
EIA	Energy Information Administration (United States)
EU	European Union
FOB	free on board
GDP	gross domestic product
IEA	International Energy Agency
met	metallurgical
OECD	Organisation for Economic Co-operation and Development
TTF	Title Transfer Facility (Netherlands)
US	United States
USD	United States dollar
y-o-y	year-on-year

Glossary

bt	billion tonnes
GW	gigawatt
kcal	kilocalorie
kg	kilogramme
km	kilometre
kt	kilotonnes
MBtu	million British thermal units
Mt	million tonnes
Mtpa	million tonnes per annum
MW	megawatt
t	tonne
TWh	terawatt hours

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