Coal

2021

Analysis and forecast to 2024

INTERNATIONAL ENERGY AGENCY

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Abstract

Coal 2021 is the world's most comprehensive forecast of coal demand, supply and trade, based on detailed analysis of the most recent data at country and sectoral level, broken down by coal grade (thermal coal, coking coal, pulverised coal injection and lignite). *Coal 2021* presents real data for 2019 and 2020, the most up-to-date estimates for 2021, and forecast for 2022, 2023 and 2024. Leveraging the IEA's inter-fuel and inter-regional expertise, *Coal 2021* report is consistent with the assumptions and forecasts for oil, gas, electricity, renewables and energy efficiency in other agency reports.

Coal 2021 places a special focus on China, whose dominance of coal markets – it is the largest consumer, producer and importer – has no parallel with any other country or any other fuel. India, the second-largest producer, consumer and importer, also receives a special attention. Whereas the current speed of policy and market changes is unprecedented, *Coal 2021* looks for the underlying indicators which will determine coal markets realities through 2024.

Given that coal is the largest source of electricity generation, the second-largest source of primary energy and the largest source of energy-related CO_2 emissions, *Coal 2021* is a must-read for anyone with an interest in energy or climate.

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Executive summary

The 2020 collapse in coal demand turned out to be smaller than anticipated

Even before the pandemic, coal faced a difficult outlook for 2020. Demand was being squeezed by a mild winter in the Northern Hemisphere, low natural gas prices and strong renewables growth. When electricity demand and natural gas prices plummeted as the Covid-19 crisis escalated, coal-fired power generation bore the brunt of the impacts. Reduced industrial activity also hit coal demand, although in a more limited way. In the early months of the crisis, a double-digit annual decline in global coal demand looked plausible. But economic recovery in China came sooner and stronger than initially expected, with year-on-year growth resuming as early as in April. With economic recovery following elsewhere and a cold snap in December in Northeast Asia, global coal demand fell by 4.4% in 2020 – the largest decline in many decades but less than initially expected. The regional disparities were large. Coal demand grew by 1% in China in 2020 but dropped by nearly 20% in the United States and the European Union – and by 8% in India and South Africa.

Coal-fired power generation is set to reach an all-time high in 2021

The declines in global coal-fired power generation in 2019 and 2020 led to expectations that it might have peaked in 2018. But 2021 dashed those hopes. With electricity demand outpacing low-carbon supply, and with steeply rising natural gas prices, global coal power generation is on course to increase by 9% in 2021 to 10 350 terawatt-hours (TWh) – a new all-time high. However, coal's share of the global power mix in 2021 is expected to be 36% – 5 percentage points below its 2007 peak. In the United States and the European Union, coal power generation is forecast to increase by almost 20% in 2021 but will not reach 2019 levels. By contrast, estimated growth of 12% in India and 9% in China will push coal power generation to record levels in both countries. Taking into account the rebound in global industrial output, overall coal demand worldwide is expected to grow by 6% in 2021, bringing it close to the record levels it reached in 2013 and 2014.

China continues to dominate global coal trends

China's influence on coal markets is difficult to overstate. China's power generation, including district heating, accounts for one-third of global coal consumption. China's overall coal use is more than half of the global total. Coal demand in China is underpinned by fast growing electricity demand and the resilience of heavy industry.

This is despite a decade of strong and sustained efforts to diversify the country's power mix – during which China has expanded hydro, wind, solar and nuclear power capacity by more than any other country in the world – and intensive switching from coal to natural gas in the residential heating and light industrial sectors. China is also the world's largest coal producer and importer, with domestic price swings from supply-demand imbalances immediately impacting international markets.

Global coal demand may well hit a new all-time high in the next two years

Beyond 2021, global coal consumption is set to revert to the pattern seen over the previous decade: declines in advanced economies offset by growth in some emerging and developing economies. After its brief rebound in the United States and the European Union in 2021, coal demand will resume its decline through 2024. This is mostly driven by the power sector where slow electricity demand growth and rapid expansion of wind and solar PV are eating into coal power generation. In addition, a big part of the recent switching from natural gas to coal will reverse as gas prices retreat from their highs. At the same time, countries such as Viet Nam, the Philippines and Bangladesh, where very strong growth in coal demand had been expected a few years ago, are now set to show more modest increases as they shift more towards sources of electricity that are less carbon intensive. However, global coal trends will be shaped largely by China and India, who account for two-thirds of global coal consumption, despite their efforts to increase renewables and other low-carbon energy sources. In China, coal demand growth is expected to average less than 1% per year between 2022 and 2024. In India, stronger economic growth and increasing electrification are forecast to drive coal demand growth of 4% per year. India's growing appetite for coal is set to add 130 million tonnes (Mt) to coal demand between 2021 and 2024. For most industrial purposes where coal is used, such as iron and steel production, there are not many technologies that can replace it in the short term. Based on current trends, global coal demand is set to rise to 8 025 Mt in 2022, the highest level ever seen, and to remain there through 2024.

Coal production is set to rise to its highest ever levels in 2022

Coal production failed to keep pace with rebounding coal demand in 2021, especially during the first half of the year, cutting into stock levels and pushing up prices. In China and India, where coal shortages led to power outages and idled factories, domestic policies to ramp up production and reduce coal shortages were soon implemented, facilitated by the large presence of state-owned companies in production. The main coal exporting countries were prevented from fully taking advantage of high prices by supply chain disruptions, such as flooding in Indonesian mines. Years of lower investment due to financing and bureaucratic restrictions also played a role. Outside China, most of the additional production in

2021 came from existing mines or reopened mines that had been idled during periods of low prices. Futures contracts for coal are trading well below spot prices, which is not conducive to investment. Coal production is forecast to reach an all-time high in 2022 and then plateau as demand flattens.

Coal prices reached record highs in 2021

Under pressure from low demand and low natural gas prices, spot-traded thermal coal prices had fallen to USD 50 per tonne in the second quarter of 2020, down by around 50% over an 18-month period. They stayed around the same level through the third quarter. Supply cutbacks then balanced the market before rebounds in economic activity and coal demand in China started pushing prices up. In 2021, the price of coal was further lifted by demand outstripping supply in China – the global coal price setter – as well as by supply disruptions and higher natural gas prices globally. Chinese coal demand rebounded by more than 10% in the first half of 2021, but production did not keep pace in part because many mines had closed in previous years amid government fears of oversupply. Coal prices reached all-time highs in early October 2021, with imported thermal coal in Europe, for example, hitting USD 298 per tonne. Quick policy intervention by the Chinese government to balance the market had a rapid effect on prices. As of mid-November, European prices were in the range of USD150 per tonne.

Momentum behind net zero has grown, but the era of declining emissions is moving further away

The pledges to reach net zero emissions made by many countries, including China and India, should have very strong implications for coal – but these are not yet visible in our near-term forecast, reflecting the major gap between ambitions and action. Japan, Korea and China have also committed to stop public funding for building new coal power projects abroad, severely limiting the possibilities for expanding coal-fired generation in many countries. New commitments during COP26, such as the Global Coal to Clean Power Transition Statement to accelerate the transition from unabated coal power generation, put additional pressure on coal. The coal power generation rebound in the United States and Europe in 2021 is a blip, and coal demand will resume its decline in both regions. However, Asia dominates the global coal market, with China accounting for more than half of global demand, or two-thirds if India is added. These two economies – dependent on coal and with a combined population of almost 3 billion people – hold the key to future coal demand. The fate of coal depends on how quickly and effectively countries move to implement their net zero commitments. And the level of coal demand in a net zero carbon economy will depend on how successful efforts are to deploy carbon capture, utilisation and storage (CCUS) technologies.

Demand

A strong rebound in 2021 and slow growth thereafter lead to highest ever global coal demand by 2024

The importance of China in the world coal market cannot be overstated. In 2020, its share of global coal consumption rose further to 53%. As China and India (12%) together account for roughly two-thirds of world coal use, global trends (and hence our forecast) depend heavily on developments in China and, to a lesser extent, India.

With the impact of the Covid-19 pandemic, total coal consumption declined 4.4% in 2020, to 7 456 Mt. Coal use for power production dropped 4.2% due to lower electricity consumption (-0.5%) as well as growth in renewable generation and low gas prices. Industrial production was also depressed because of confinements and the economic slowdown, resulting in lower coal consumption in non-power sectors (-5.4%).

The most substantial relative declines in coal use were in the United States (-18%/-96 Mt) and the European Union (-19%/‑93 Mt). Other major coal-consuming countries experienced smaller but significant decreases, for instance India (-8%/‑83 Mt), the Russian Federation (hereafter “Russia”) (-6%/-15 Mt) and South Africa (-8%/-15 Mt). In contrast, coal use in China, the world’s primary coal consumer, increased slightly by 0.5% (+21 Mt).

A 6% rebound is expected to raise coal consumption to 7 906 Mt in 2021, similar to the 2010 increase that followed the global financial crisis. While *Coal 2020* did forecast that coal demand would bounce back robustly in 2021, the rebound is turning out to be much stronger for three reasons: first, the global economy recovered more quickly than expected, with global GDP growth of ~5.8%, the highest in almost half a century. Second, a cold winter and hot summer boosted power demand while low rainfall and weak winds in some regions decreased electricity supplies. Third, weather conditions and some supply issues pushed gas prices to all-time highs, raising demand for coal for power generation.

The bulk of the increase in 2021 is from three countries: China, India and the United States. In all three, coal use in power generation increased significantly. China’s coal consumption is expected to increase by 159 Mt (+4%), while demand rises 125 Mt (+13%) in India and 74 Mt (+17%) in the United States. Coal consumption is also expected to recover in other regions, including the European Union (+45 Mt) and Southeast Asia (+14 Mt).

Although coal demand is anticipated to grow slower after the strong recovery of 2021, it surpasses the record of 2013 in 2022 and rises to an all-time high of 8 031 Mt in 2024. The increase is driven by

China (+135 Mt), India (+129 Mt) and the countries of Southeast Asia (+50 Mt). In all these regions, economic growth spurs higher power demand, with coal as the central pillar of power generation. However, increases in Asia will be offset by declines in the United States (-77 Mt) and the European Union (-102 Mt) by 2024.

The overall continued increase assumes that global GDP rises at a compound average annual growth rate (CAAGR) of 4% from 2022 to 2024. If the economy does not perform as expected, especially in China, it will clearly affect coal consumption. Another critical forecast assumption is gas price development, as coal and gas are the main competitors in the electricity market to fill what is known as the ''thermal gap''[1] (the difference between electricity demand and nuclear and renewable electricity generation).

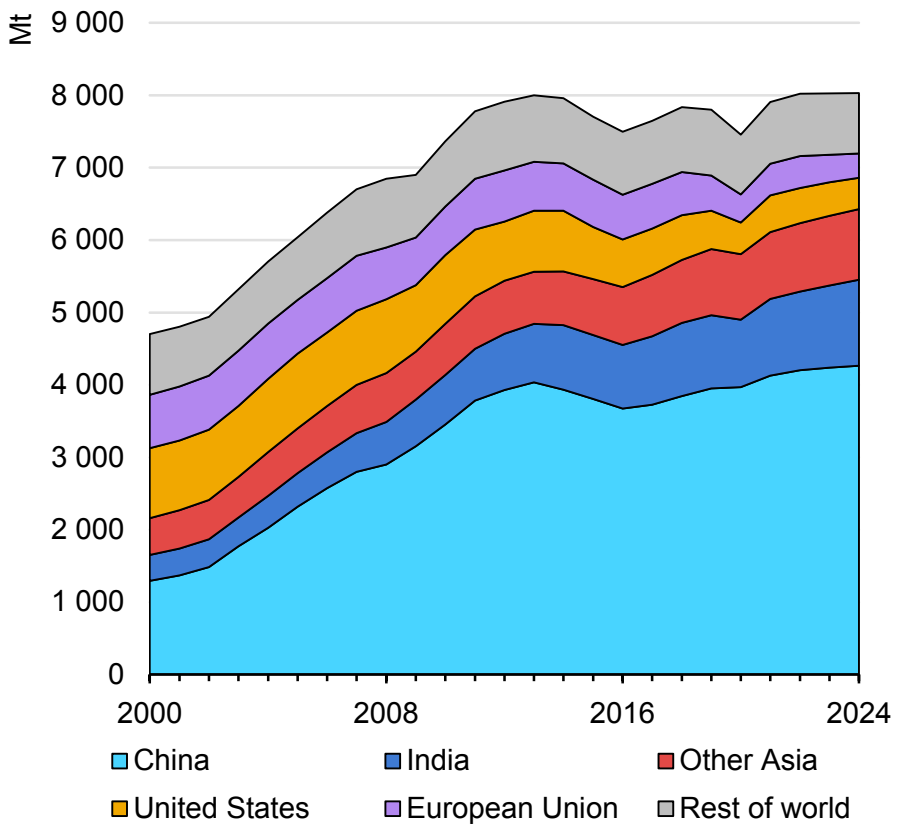
This forecast is therefore based on market expectations expressed through forward prices. As price futures for gas are relatively high until 2024, coal's share in the energy supply mix will be more significant than what we expected in last year's report. The level of coal-fired generation will also depend heavily on the size of the thermal gap, which is largely determined by the rate of renewable electricity generation growth. This report reflects the results of the latest *Renewable Energy Market Report*'s main case scenario.

In the longer-term perspective, very low global coal demand growth through 2024 – after the 2020 drop and 2021 rebound – sustains the past decade's general trend towards plateauing consumption, apart from annual fluctuations created by economic, market or weather conditions.

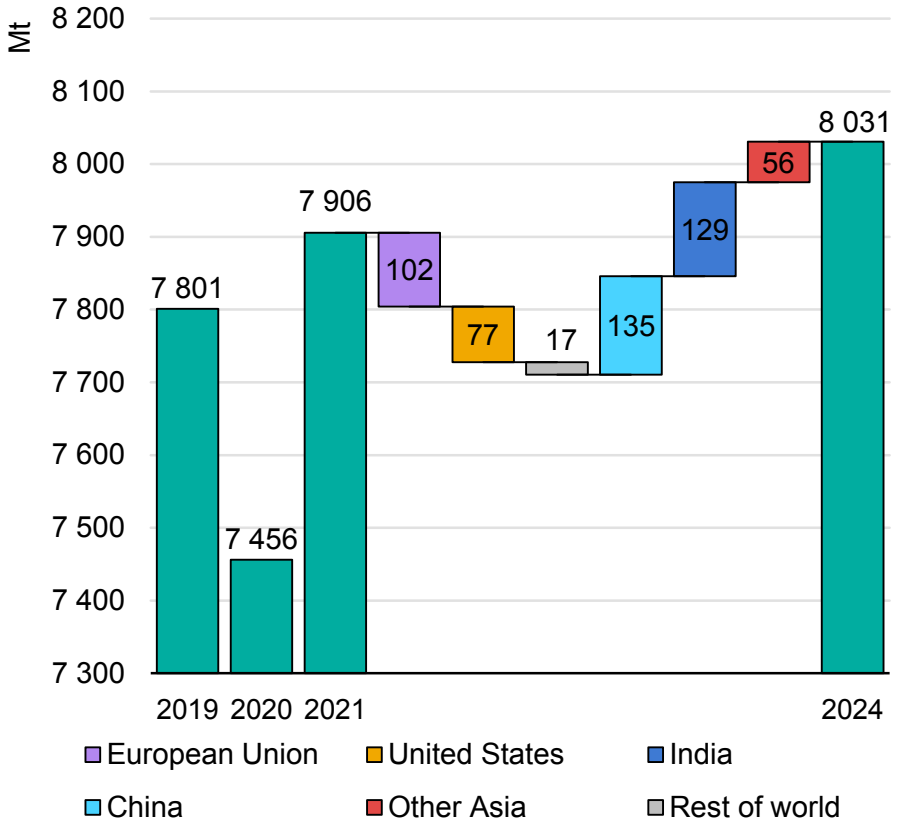
[1] Strictly speaking, nuclear, oil, biomass, waste and geothermal energy sources are also used for thermal power generation.

Plateauing of coal consumption resumes

Global coal consumption by region, 2000-2024



Changes in coal consumption by region, 2021-2024



Coal-fired power generation reaches all-time high in 2021

In 2020, the decline in worldwide electricity consumption (-0.5%) and low natural gas prices caused coal-fired generation to drop 3.8% (-380 TWh), which reduced consumption of both steam coal (-3.6% to 5 735 Mt) and lignite (-13% to 621 Mt).

Global electricity consumption is expected to rebound 6% in 2021, exceeding the 2019 level, as economic recovery around the globe and adverse weather conditions boost demand at the same time as renewable power generation is lower than expected due to meagre rainfall and weak wind in some regions. China's electricity demand growth for 2021 is estimated at 10%, reflecting the country's strong economic recovery as well as a cold snap in the north and a warmer-than-average summer.

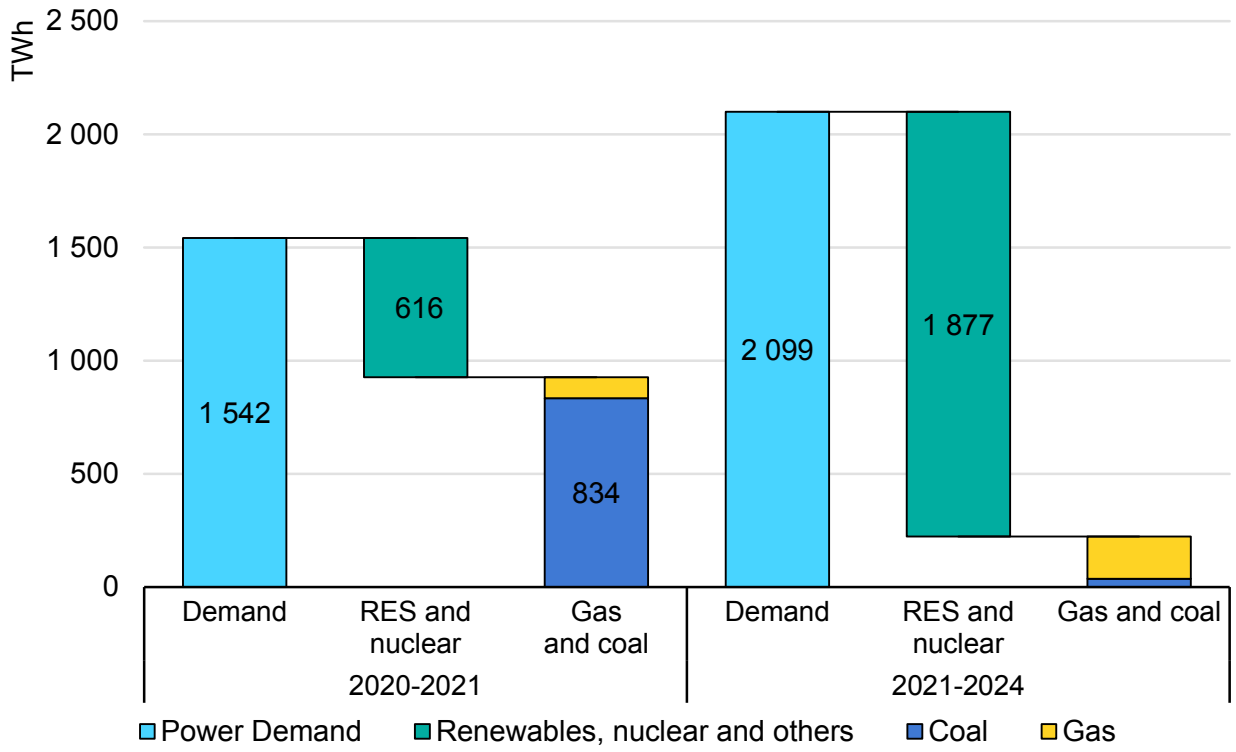
Renewable energy and nuclear power generation are expected to meet ~39% of the increase in electricity demand in 2021, while residual growth of more than 800 TWh will be covered by coal and gas. A gas supply shortage and resulting record-high gas prices support a rebound in coal-based power generation, especially in the United States and the European Union, where shares of coal in power generation have been declining for years. Consequently, global coal-fired power generation is expected to increase 9% in 2021, recovering to above 2019 levels.

For 2022-2024, global power demand is expected to increase ~2 099 TWh (annual average growth of 2.4%), of which a large share (91%) will be covered by additional renewable electricity generation. We expect a gap of more than 220 TWh to be filled by coal- and gas-fired power generation. With forward prices pointing to a gas price drop, we expect gas to meet most of the remaining demand while coal-fired power generation stays stable over the period.

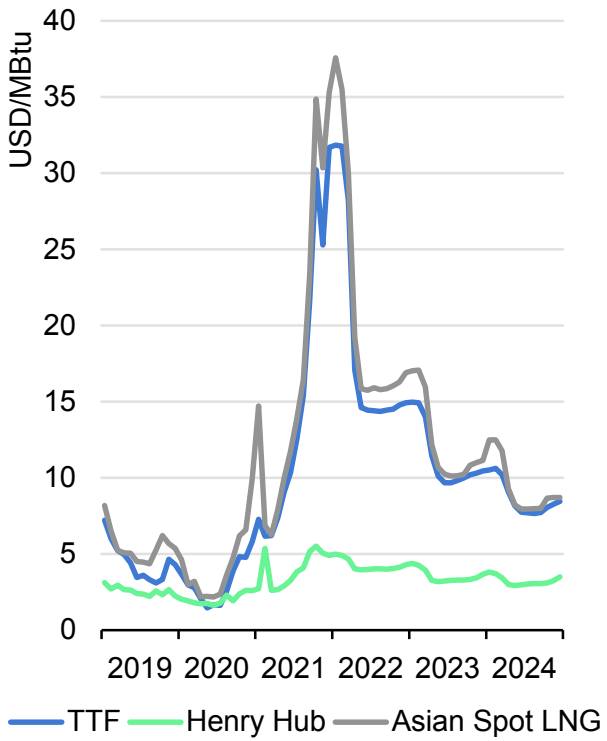
As coal is the cornerstone of the electricity supplies of India, China and some Southeast Asian countries, we estimate coal-fired power generation during 2021-2024 to increase 4.1% in China, 11% in India and 12% in Southeast Asia. Meanwhile, a return to declining trajectories is expected in the United States (-21%) and the European Union (-30%).

As low-carbon sources meet most but not all additional power demand, gas and coal fill the gap

Additional global power demand and generation by source, 2020-2024



Gas price markers, 2019-2024



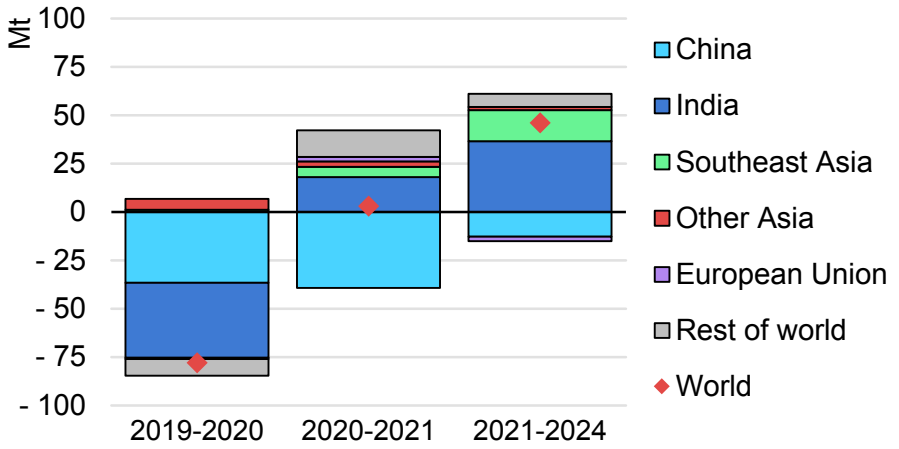
Note: RES = renewable energy source.

After recovering, non-power coal consumption resumes weak growth

In addition to power generation, thermal coal is used for operations such as cement production and industrial and household heat applications. In 2020, non-power thermal coal consumption decreased 5.4% to 1 368 Mt, mostly because of developments in China and India. In China, which is by far the largest consumer of thermal coal for non-power purposes, consumption declined 4.4%. In India, the world's second-largest consumer, consumption plummeted 20%, severely impacted by the economic downturn resulting from the pandemic.

Nevertheless, non-power thermal coal use is expected to increase very slightly (+0.2%) to 1 370 Mt in 2021 as economies around the globe recover. Replacing coal with other energy resources for non-power applications takes longer than for electricity generation because substitution in the non-power sector is more difficult. In India, we expect a 12% rebound as the cement and other industries recover from the recession. Further slight increases of 1.1% per year are also forecast as industrial consumption continues to expand, especially in India and Southeast Asia, for a total of 1 417 Mt in 2024. In contrast, non-power coal use in China is set to continue declining as the country sustains efforts to reduce coal consumption for residential heating and small industries.

Changes in thermal coal consumption for non-power purposes by region, 2019-2024



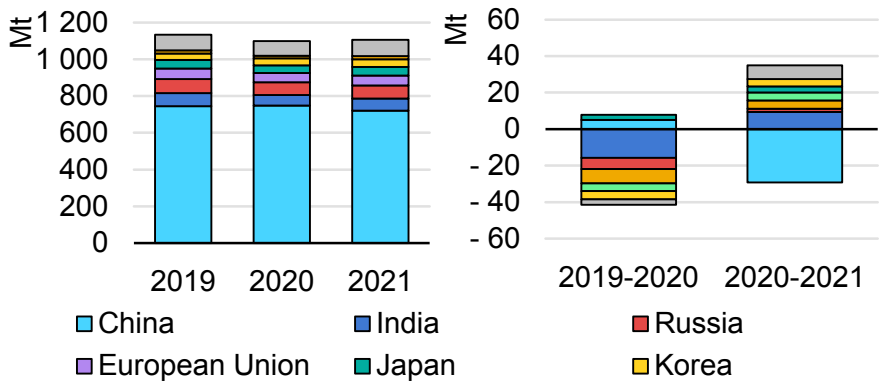
Metallurgical (met) coal, which includes coking coal (hard, medium and semi-soft) and coal for pulverised coal injection (PCI) is a primary ingredient in steelmaking. Coke (produced by heating coking coal in a coke oven in the absence of oxygen) is also used to produce carbides, ferroalloys and other compounds. Accordingly, steel production projections of organisations such as the World Steel Association are a key basis for our met coal forecast.

In 2020, global met coal consumption declined 3% to 1 100 Mt as steel production (outside of China) decreased, mainly due to pandemic-related effects. China is by far the world's largest met coal consumer, accounting for 68% of the global total in 2020. Other significant met coal consumers were Russia (6%), the European Union (5%) and India (5%). In contrast with most other countries, met coal consumption in China increased slightly in 2020 (+0.7%/+5 Mt). The largest decline was in India (-22%/-16 Mt).

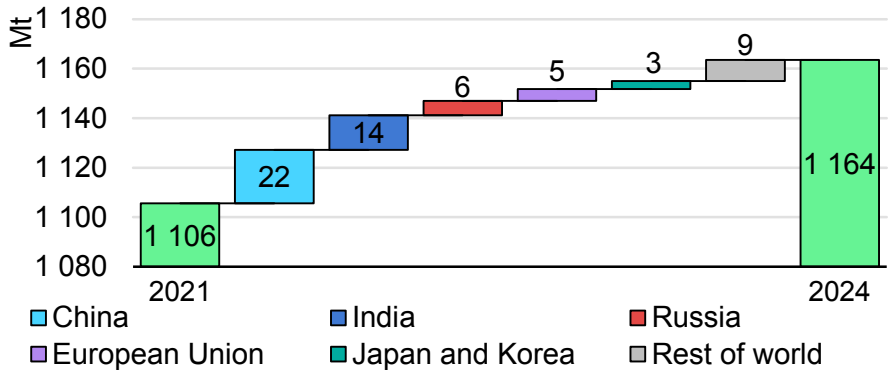
We expect a slight increase of 0.5% in 2021, raising consumption to 1 106 Mt. As steel production recovers, met coal use increases in all major steel-producing regions, i.e. India (+17%/+9 Mt), the European Union (+9%/+5 Mt), Russia (+2.4%/+2 Mt) and Japan (+10%/+4 Mt). While consumption in China remained high in the first half of 2021, steel production fell in the second half of the year, directly affecting met coal demand and leading us to expect a decline in consumption (-3.9%). Despite the overall recovery in steel production, global met coal use remains below the 2019 level.

Nevertheless, as met coal remains a central element in steel production, consumption is forecast to increase to 2024, rising at an annual average of 1.7% to 1 164 Mt. Output of electric arc furnaces will depend on scrap availability, but our forecast assumes only a small increase in the EAF/BOF production ratio through 2024, based on historical trends. Alternative manufacturing processes such as hydrogen direct reduction will be marginal by 2024. While consumption in China flattens, growth in India (+14 Mt) and other developing economies continues as new blast furnaces are constructed to meet rising steel demand.

Met coal consumption and annual changes by region, 2019-2021



Changes in metallurgical coal consumption by region, 2021-2024



China’s coal consumption hits all-time high in 2021 and continues to rise through 2024

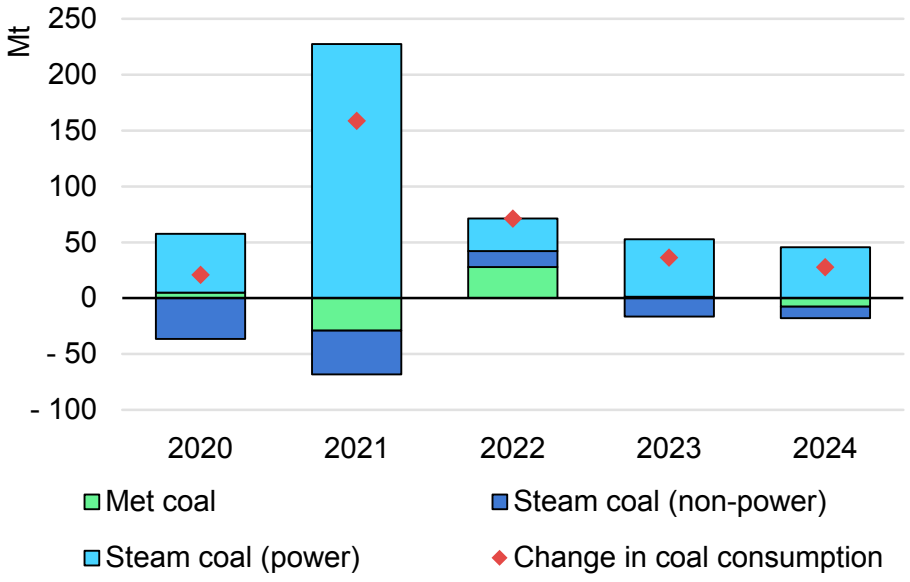
China’s total coal consumption amounted to 3 971 Mt in 2020, of which 2 433 Mt (61%) was thermal coal for power generation. Another 789 Mt of thermal coal was used in non-power applications, and the rest was met coal (749 Mt), used primarily in steelmaking. Although the Covid-19 pandemic outbreak and resulting lockdowns reduced coal demand in the first quarter of 2020, a strong rebound in economic activity caused overall consumption to increase 0.5% in 2020, making China, along with Viet Nam, one of the very few countries in which coal use actually increased.

Thermal coal consumption surged in late 2020 and early 2021, driven by revived industrial production and an unusually cold winter. In 2021, strong economic growth, high summer cooling demand and low hydropower generation further boosted coal consumption. Despite the country’s coal shortage and corresponding implications for industrial production and electricity demand, we still expect China’s coal consumption to increase 4% to 4 130 Mt in 2021 – surpassing the record set in 2013.

China’s coal consumption to 2024 is forecast to increase slightly (1.1% per year on average), mainly to satisfy power sector needs, to reach 4 266 Mt. Despite intensive nuclear and renewable energy capacity expansions, China will still have to rely on coal and, to a lesser extent, gas to keep pace with rising electricity demand.

Thermal coal use in non-power applications (e.g. residential, commercial and small-scale industry) is expected to decrease further as the continued phase out of small, inefficient coal boilers adds to progress made in the last seven or so years. As domestic steel demand is expected to stabilise, met coal consumption is not forecast to increase through 2024. Outside of power, the only sector in which coal demand still grows is coal conversion.

Annual changes in coal consumption by grade and use in China, 2020-2024



China's severe thermal coal shortages are impacting the electricity system

Power generation in China alone is responsible for almost one-third of global coal consumption. No other sector in any other country – or any other fuel – has a comparable influence on global trends.

In 2020, the amount of coal China consumed for power generation increased 2.2% to 2 433 Mt. Although consumption at the beginning of the year declined when measures to contain the Covid-19 outbreak were imposed, quick economic recovery, supported by domestic stimulus and high industrial output to compensate for production losses elsewhere significantly boosted electricity demand for the year. An unusually cold winter further increased electricity and heat demand.

A large share of China's coal-fired power capacity is co-generation (combined heat and power production), an essential factor in the country's heat supply.[2] Therefore, as demand spiked to meet higher-than-usual heating needs in December 2020, China was confronted with power shortages due to inadequate capacity in at least five regions.

Chinese coal consumption for power generation is set to increase drastically in 2021. On the demand side, it is driven by continued strong industrial growth, especially in the first half of 2021, as well as by weather conditions. The cold spell that spanned late 2020-early 2021 put extra pressure on coal plants. In the summer, a heatwave intensified cooling demand at the same time as low rainfall amounts reduced hydropower generation.

In the third quarter of 2021, an imbalance between coal supply and demand became apparent when coal producers were unable to keep up with surging demand (see also the Supply chapter). The shortage's effects were exacerbated by China's rigid electricity tariff system. Because Chinese electricity prices are regulated, they do not follow coal prices. Therefore, as coal prices rose and electricity prices remained rigid (they could oscillate only 10% from the benchmark price, although this was reformed in October to allow a higher range), coal-fired power producers had no incentive to secure sufficient coal.

In mid-2021, China began to curtail industrial activity in some provinces as coal supplies and imports were unable to keep up with demand. In September, power rationing for industrial consumers occurred in 20 provinces. In Guangdong province, for example, manufacturers of ceramic products experienced power cuts of up to 70%, and Yunnan province ordered cement producers to cut production by 80%. Similar measures – and even complete power

[2] This report accounts for coal used in co-generation plants (for combined heat and power generation) under consumption for power generation.

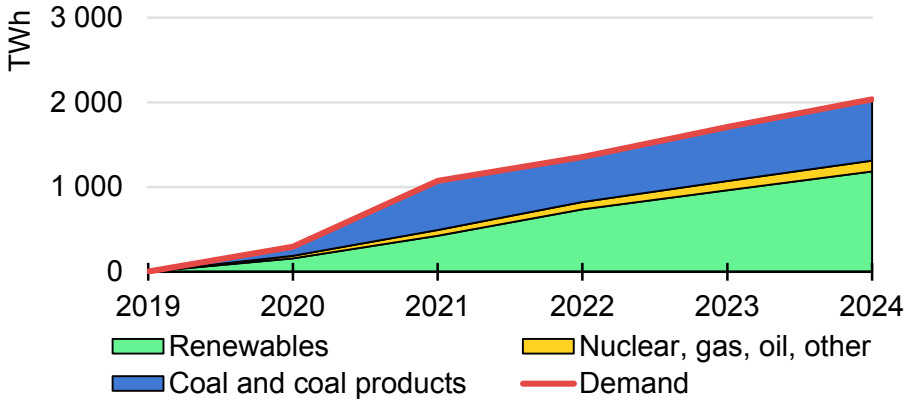
cuts – affected aluminium, steel and other energy-intensive industries all over China. In Heilongjiang, Jilin and Liaoning, even residential consumers were affected as power supplies fell short of demand by as much as 20% at times.

Coal prices increased rapidly, which also put pressure on coal demand. The Chinese government reacted quickly, however, and the coal shortage was over by November owing to higher production and lower demand from energy-intensive industries, as their output plummeted in the last quarter of 2021. Nevertheless, we expect coal consumption for power generation to increase ~9% (+227 Mt) in 2021 despite the supply shortage.

We also forecast that Chinese power demand will continue rising by ~3.9% annually. Although China is expanding its renewable energy capacity, growth of 9.5% per year on average from 2021 to 2024 is not likely to be sufficient to meet additional demand. China is also increasing its net coal-fired generation capacity at a pace of ~30 GW per year. Between 2021 and 2024, China's coal-based power generation is forecast to increase 1.4% annually, and coal consumption by just slightly less owing to higher plant efficiency.

Cold snaps and heat waves increase electricity demand, and hence, coal demand – as in China coal-fired generation is largely the marginal supplier of electricity. Moreover, with the expansion of renewable energy capacity, weather conditions increasingly affect electricity supplies; in particular rainfall and wind conditions can vary significantly from one year to the following. The impact of weather variability on China's coal use in power generation can be significant and makes it hard to predict.

Additional power generation and demand in China, 2019-2024



A deeper look at China's coal shortage and its implications

Coal still represents more than half of China's primary energy supply. In addition to being pivotal for the power sector, it supports the country's wider economic activities. The Chinese economy started 2021 at full steam and industrial production was pushed to new heights. For the first half of the year, we estimate a ~15% year-on-year increase in coal-based power generation and rises of 17% for steelmaking and 11% for cement production, for an estimated coal consumption growth of 11%.

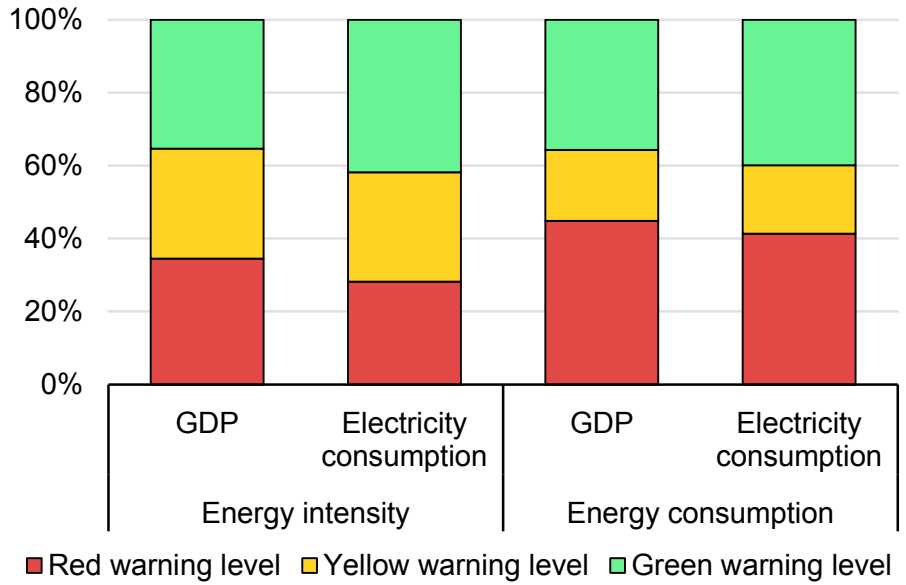
In the third quarter, however, economic activity decelerated. On top of high prices and shortfalls for coal (and associated power shortages), the targets of the "dual-control" policy[3] affected industrial production. By halfway through the year, ten provinces – accounting for around 40% of China's GDP – had reached the "red" warning level for either energy intensity or energy consumption. The red level is a first-level warning when implementation is more than 10% off the target. The yellow level indicates that implementation is below the target, but lower than 10%. Towards the end of the third quarter (end September), some provincial governments were forced to mandate power cuts to energy-intensive industries to achieve their quarterly targets. It is not clear what role air pollution and the slowdown of the real estate sector played on the fall of industrial production.

High coal prices and shortages, power shortages and the dual-control policy therefore led to curtailed production of some energy-intensive products. Thermal power generation remained above 2019 levels, but China's steel and cement production declined considerably. In September 2021, cement production was 13% below the 2019 level and steel production was 21% lower.

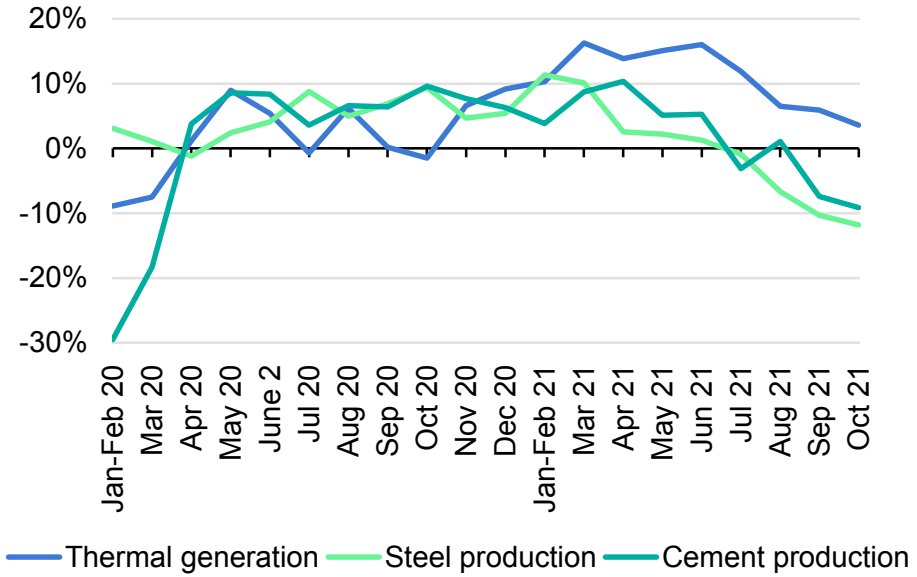
Since coal shortages threaten to reduce annual GDP growth, the Chinese government has lifted coal import limits and modified electricity tariffs, and Chinese utilities have announced that they will buy coal "at any cost". (Please see the Supply chapter for a discussion of supply-side measures.)

[3] Binding targets for energy consumption and energy intensity, i.e. energy consumption per unit of GDP for all of China's states, provinces and municipalities, are controlled on a quarterly basis.

Share of GDP and electricity consumption affected by China's dual-control policy, H1 2021



Year-on-year percentage changes for various economic indicators in China, 2020-2021 (compared with same period in 2019)



Note: Because of 2020's exceptional industrial activity fluctuations, this chart illustrates percentage changes as month-by-month comparisons with 2019. Monthly values for coal-fired power generation are not available.

Source: National Bureau of Statistics of China (2021), Statistical Database.

China’s non-power thermal coal demand continues its decline

Thermal coal consumption for non-power applications in China amounted to 789 Mt in 2020, comparable with the combined total consumption of the European Union and the United States.

Around half of China’s non-power thermal coal consumption is in energy-intensive industries, with cement production accounting for roughly 50%. We expect some coal substitution in cement and building material production to continue, but the process is slow. Overall, coal consumption in energy-intensive industries is forecast to remain stable until 2024, despite the effect of current shortages on processes such as aluminium, fertiliser and silicon production, which use coal and coal products, and the government’s unequivocal aim to reduce the energy intensity of China’s economy.

We estimate that 37% of non-power thermal coal use was for residential heating and non-energy-intensive industries in 2020. This share is declining, however, thanks to sustained efforts to reduce air pollution by replacing small, inefficient coal boilers with gas and electric options. Although considerable progress has been made, the shift from coal will continue as it is far from completed. Whereas gas coverage in coastal regions is extensive, other regions lag far behind. In 2019, access to gas was very low in the northern provinces of Heilongjiang (5%), Jilin (5.5%) and Liaoning (16%). In February 2021, the Chinese government vowed to promote the construction of gas networks in rural areas. This commitment, combined with the shift to gas in some industries, indicates that coal consumption in this sector will fall by ~100 Mt – almost one-third of 2020 consumption.

The direction of the coal conversion sector has been unclear for the past decade, despite its role in assuring energy security and reducing oil and gas imports. The potential to extract value from coal that would otherwise be stranded – either for quality or location reasons – and to use it as a hedge against oil and gas price increases is also relevant. At the same time, however, coal conversion’s environmental footprint in terms of water consumption and CO_2 emissions is huge, especially in the absence of CCUS. In its 14th Five-Year-Plan, China foresees the continued development of the coal conversion sector. In fact, it aims a production capacity by 2025 of 15 bcm of gas, 12 Mt of oil products, 15 Mt of olefins, 8 Mt of ethylene glycol plus some ethanol and aromatics produced from coal. Although current gas prices should encourage projects to go forward, it is difficult to predict how the supporting drivers, constraining factors and potential risks will play out in upcoming years. Whether goals will be achieved, and planned projects implemented, is therefore quite uncertain. With this in mind, we forecast a moderate (just over 20 Mt) increase in coal consumption for conversion processes between 2020 and 2024.

India's coal demand rebounds in 2021 but supply shortages hamper growth

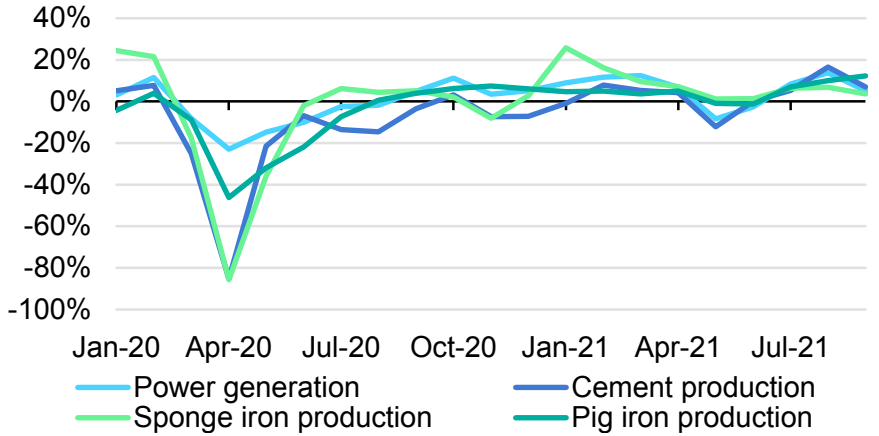
India consumed 931 Mt of coal in 2020, the largest share of which was thermal coal (including lignite) for electricity generation (705 Mt), followed by thermal coal for non-power applications (170 Mt). The remainder was metallurgical coal used mainly in steel production. Coal consumption fell 8% across all end uses from 2019, a result of the pandemic lockdowns. Coal-fired power generation dropped 3.5% in 2020.

Despite a minor Q2 slump in growth due to lockdowns during India's second wave of Covid-19, the country's coal consumption is expected to rise sharply to 1 056 Mt in 2021, exceeding the 2019 pre-pandemic level.

Power demand in India rose sharply in 2021. Utility power generation,[4] which accounts for more than 85% of total power generation, was up 13% from January to August 2021, compared with the same months in 2020, and was 5% higher than in 2019. Despite the continuous push for renewables, we expect coal-based generation to make up 74% of the power mix in 2021, up from 72% in 2020. New electricity connections for 28.2 million households and reopening of the economy after India's second Covid-19 wave are the main factors behind this increase.

Production of large coal-consuming industries, such as cement, sponge iron and pig iron, rebounded from the drops of 2020, though growth in industrial activity has been subdued in the second half of 2021. As most domestic coal is earmarked for power generation and as international coal prices are high, cement and sponge iron production are being curtailed due to coal supply restrictions.

Year-on-year changes in selected economic indicators for India, 2020-2021 (compared with same period in 2019)



Notes: Because of 2020's exceptional industrial activity fluctuations, this chart illustrates percentage changes as month-by-month comparisons with 2019. Data for pig iron production in India is based on hot metal production for steelmaking.

Sources: Office of the Economic Adviser (2021), Eight Core Industries; Joint Plant Committee of Ministry of Steel (2021), Steel Production.

[4] Data for captive plants, accounting for ~15% of power production, are not yet available.

With robust economic growth on the horizon, India's coal demand is set to rise through 2024

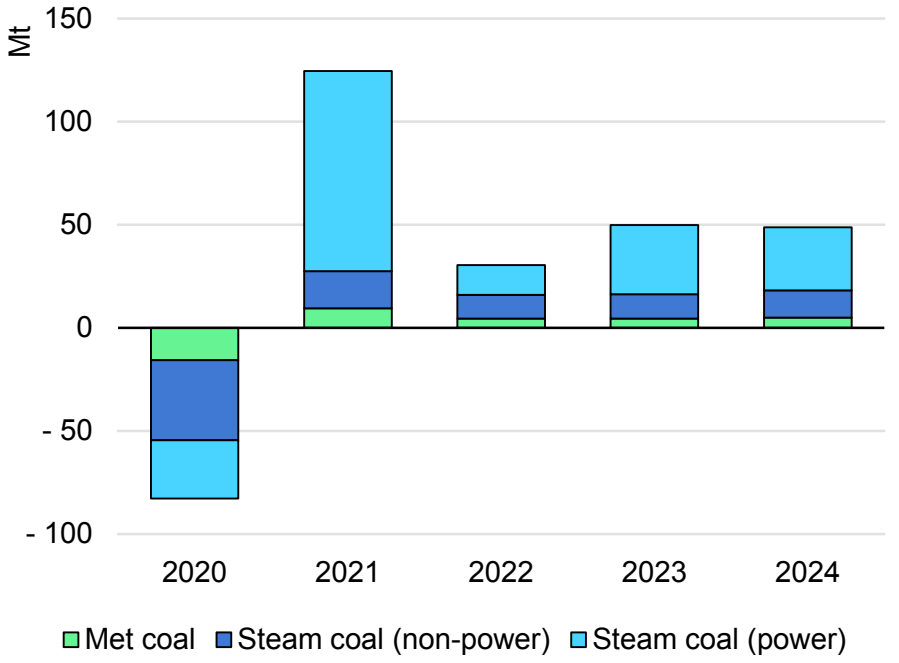
Continued expansion of India's economy is expected during 2022-2024, with annual average GDP growth of 7.4%, fuelled at least partially by coal. We forecast coal consumption to increase at an average annual rate of 3.9%, to reach 1 185 Mt in 2024.

As more households get connected to the grid and incomes continue to rise, higher sales of household electrical appliances (and electric vehicles in the near future) will lead to a steady increase in electricity demand. Power demand is also expected to grow in industries such as aluminium, as well as steel and cement production to meet the needs of construction and infrastructure projects.

Historically, steel production based on direct reduced iron (commonly known as sponge iron) has been very popular in India. For this reason, less than half of India's steelmaking capacity relies on the blast furnace-basic oxygen furnace (BF-BOF) method, contrary to the global average of about 70%. But by fiscal year 2022, the BF-BOF route is expected to be 65% of India's steelmaking capacity, with significant implications for met coal demand and imports in India's steel sector.

Additionally, the government plans to invest USD 55 billion in coal gasification and liquefaction, targeting 100 Mt of capacity by 2030. India's first coal gasification-based fertiliser plant at Talcher, to be commissioned by 2023, will have a coal capacity of 3.3 Mt, producing 2 200 t/d of ammonia and 3 850 t/d of urea. The government also plans to implement a Methanol Economy programme with five methanol plants based on high-ash coal.

Annual coal consumption changes in India by type and use, 2020-2024



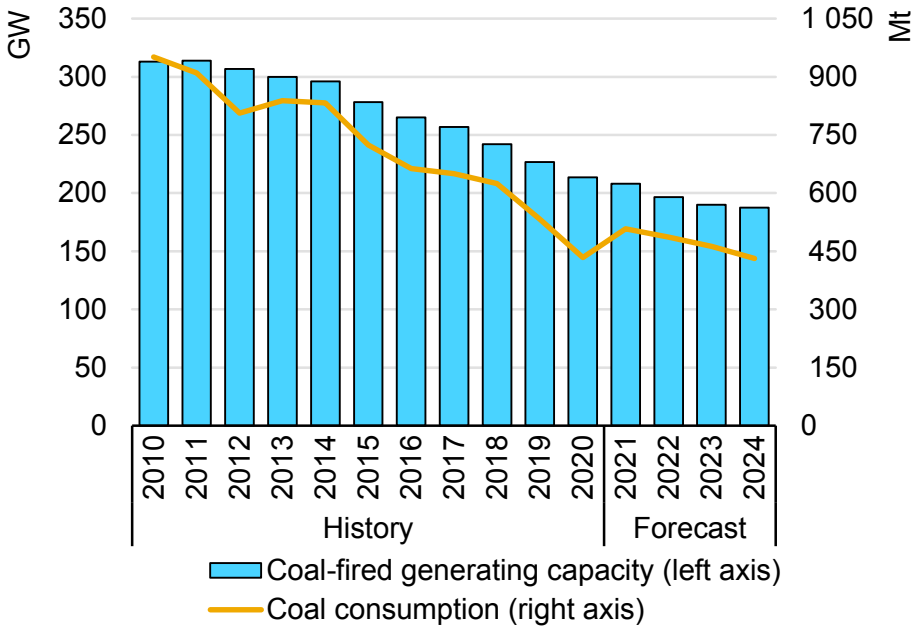
US coal demand recovery in 2021 is only a temporary respite from vanishing coal use

The share of coal in power generation in the United States has been decreasing for the past decade, pushed out of the electricity market by inexpensive gas, renewable energy expansion and plateauing power demand. Between 2011 and 2020, 88.7 GW of coal-fired capacity was retired or converted to natural gas – a capacity decline of almost one-third – and no new coal-fired capacity has come online since 2013. In just one decade, US coal consumption halved from 885 Mt in 2010 to 434 Mt in 2020, 93% of which had been used in power generation. In 2020 alone, coal use fell 18% from the previous year, with the effects of the Covid-19 pandemic accelerating the pre-existing structural decline.

In the first three quarters of 2021, coal consumption in electricity generation rebounded ~22% from the same period in 2020. As electricity demand recovers and gas prices are the highest they have been for a decade, we expect a 21% y-o-y increase in thermal coal consumption for power generation for the whole year. This would be the first increase in coal-fired electricity generation since 2014.

Despite the temporary surge in 2021, we expect the decline in coal-fired power plant capacities continue to decline until 2024, leading to a steady drop in thermal coal consumption. We therefore expect US coal consumption of 431 Mt in 2024, a decline of 15% from 2021, and similar to the 2020 level. The drop could be even greater if climate policies are strengthened or gas prices are lower than assumed.

US coal-fired generation capacity and coal consumption, 2010-2024



Notes: Capacity values for 2021 and 2022 are based on EIA forecast; capacity values for 2023 and 2024 are forecast by the IEA.

Sources: EIA (2021), Annual U.S. Coal-Fired Electricity Generation will Increase for the First Time Since 2014; EIA (2021), Coal Data.

The EU coal rebound in power generation will be short-lived, while declines of varying degrees are expected in other regions

In the European Union (EU), declining electricity demand and historically low gas prices led thermal coal consumption to drop 85 Mt (-20%) to 340 Mt in 2020. In the summer of 2020, the variable costs of European gas-fired power plants were even lower than for Germany's lignite-fired plants.[5] In the third quarter, however, gas prices rose and gas-fired power plants moved back in the merit order to follow lignite-fired and efficient coal-fired power plants, despite higher European Union Allowance (EUA) prices.

Global gas markets became tight in 2021 and gas prices jumped to historical highs. In consequence, coal-based power generation in the European Union is rebounding in 2021, even though coal and EUA prices have roughly doubled since the beginning of the year. Gas and coal prices are expected to decline in 2022, making it difficult for inefficient coal-fired power plants to compete with gas. In the medium term, therefore, falling gas prices and high EUA rates will place gas-fired power plants ahead of coal-fired ones.

In 2024, even the variable costs of lignite-fired power plants are expected to be higher than those of gas-fired units. Plus, coal-fired capacity will decrease as European countries implement their coal phaseout plans. In Germany, for example, 2.9 GW of lignite-fired and 6.7 GW of hard coal-fired capacity are scheduled to be decommissioned by 2024.

Nevertheless, coal-fired capacity will become more important in Germany as all the country's remaining nuclear power plants are closed by December 2022. Poland, where a strong coal rebound in 2021 is expected after the 2020 drop, will return to a slow and steady decline from 2022. In the European Union overall, thermal coal consumption is expected to fall from 380 Mt in 2021 to 274 Mt in 2024.

In Japan, coal-fired power generation decreased 5% in 2020, a slower decline than in the European Union, partly because of the low availability of nuclear power plants. Also, Japanese utilities were not able to benefit fully from low spot gas prices due to the country's high share of oil-indexed pricing. At the same time, though, this means that Japan's gas-fired power plants have been less affected than plants in other countries by the gas price hikes of 2021, although Japan still does contract a high share of its coal on one-year terms at fixed prices.

[5] In some cases, such as co-generation plants, additional revenue streams have to be considered when assessing the profitability of generation units.

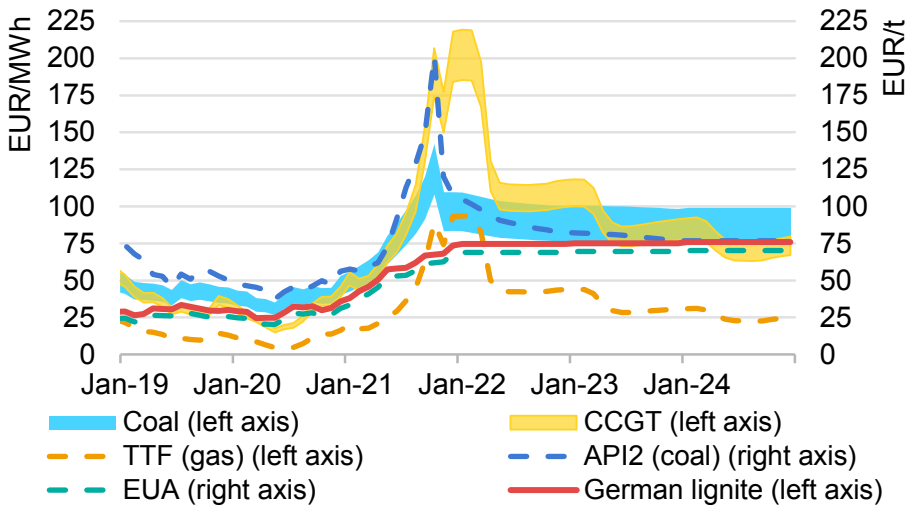
Even though Japan plans to close all its inefficient subcritical and supercritical coal-fired power plants by 2030, the impact in 2024 will be inconsequential. Furthermore, with forward gas prices indicating that coal will remain competitive with gas in power generation, coal-fired generation is expected to decline only slightly.

In Korea, as nuclear power was readily available in 2020, coal-fired power generation fell a substantial 8% compared with 2019. For 2021, we expect it to decline even further (-2.6%) while gas-based electricity generation increases. As in the case of Japan, gas is procured through long-term contracts, exposing Korea less to record-high spot prices. Coal-fired generation is likely to remain at around the 2021 level until 2024, subject to policy changes.

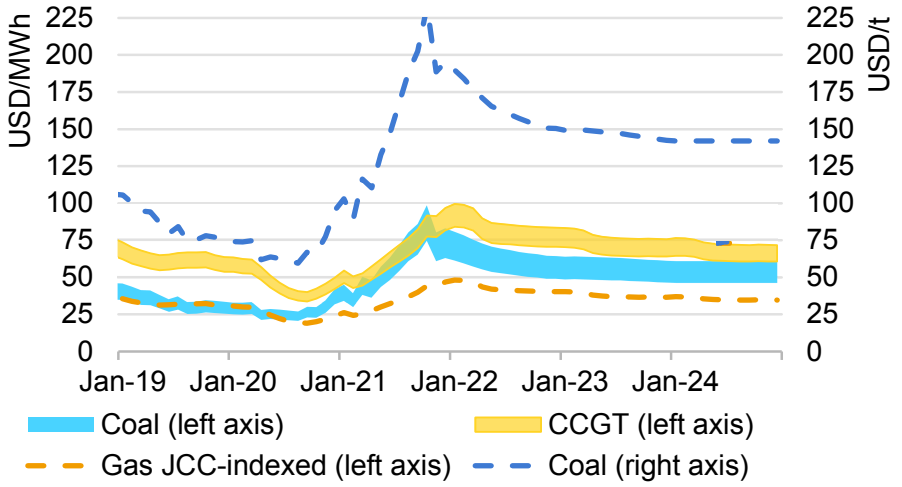
Coal demand in both Turkey and Australia is expected to contract slowly as growth in renewable energy output outpaces electricity demand, shrinking the thermal gap normally filled by coal and gas.

In Australia, more than 2 GW of coal-fired power plants are to be closed by 2024.

EU marginal coal- and gas-fired power generation costs, 2019-2024



Japan's marginal coal- and gas (JCC-linked)-fired power generation costs, 2019-2024



Notes: TTF = Title Transfer Facility. EUA = European Union Allowance. CCGT = combined-cycle gas turbine. API = Argus/McCloskey's Coal Price Index. JCC = Japan Crude Cocktail. CCGT net efficiency: 49-58%. Coal net efficiency: 35-46%. Lignite net efficiency: 39%.

Southeast Asia's coal consumption continues to grow although expectations have moderated

Overall coal use in Southeast Asian countries totalled 357 Mt in 2020, roughly the same as in 2019, as consumption in the region proved resilient to the global pandemic and economic crisis. The two largest coal consumers are Indonesia (40%) and Viet Nam (25%), with Viet Nam's consumption even increasing (+4.5%). In fact, Viet Nam and China are the only high-consuming countries to register increases in 2020.

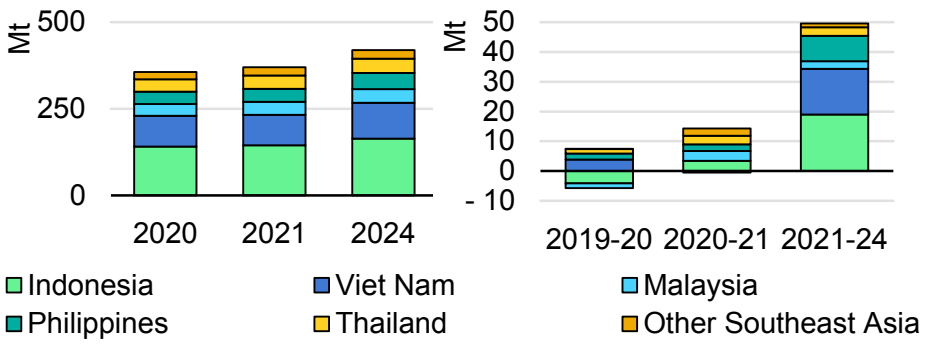
Furthermore, we expect coal consumption in the region to increase another 3.8% in 2021. Thereafter, an annual growth rate of ~4.3% is forecast, based on Southeast Asia's strong economic outlook, some new coal power projects (especially in Viet Nam and Indonesia) and Indonesia's inexpensive coal supplies, bringing consumption to 420 Mt in 2024.

Indonesia and Viet Nam plan to construct additional coal-fired power plants. PLN, Indonesia's state-owned electricity utility, expects an additional 14-16 GW of coal-based generation capacity to be online by 2030. The company also announced it will stop planning new coal power plants after 2023, which should not interfere with the completion of units already under construction or having achieved financial closure.

Although Viet Nam had severely downsized its coal development plans, it has since increased its 2030 target for coal-fired generation capacity from 37.3 GW to 40.7 GW. Funding and construction of these power plants could, however, become difficult. After Japan and Korea decided to stop financing new coal-fired plants abroad, in September 2021 China's president also announced that China will no longer build new coal power projects in other countries. In addition, the Global Coal to Clean Power Transition Statement was recently released during COP26. Nevertheless, the effects of all these decisions will be felt in the longer term and will hardly affect coal consumption through 2024.

Both Malaysia and the Philippines have declared they will shift away from coal use. While in October 2020 the Philippines announced a moratorium on approvals of new greenfield coal power projects, in 2021 Malaysia committed to stop building new coal power plants.

Southeast Asian changes in coal consumption by country, 2019-2024



Southern Asia's coal demand continues to rise

Pakistan and Bangladesh face the same challenges as other emerging countries in Asia and elsewhere. As their economies grow, so does their demand for energy – especially electricity. While the two countries rely at least in part on coal to meet their rising energy needs, they have both recently downsized their coal development plans. Including Sri Lanka, the region has a population of more than 400 million.

In 2020, coal consumption rose to 23 Mt in Pakistan (+5% from 2019) and 14 Mt in Bangladesh (+37%). The steep rise in Bangladesh resulted from the first unit of two 660-MW USC blocks at Payra power station starting operations. This is Bangladesh's second power plant, but the first one to depend on imported coal. We therefore expect growth in coal use to continue in 2021 and through 2024.

Pakistan has 5 GW of coal-based power capacity under construction, adding to the 5 GW built in recent years. While recent additions were based on imported coal, plants under construction now will be fuelled mostly by domestic lignite from Thar (Sindh province). Although Pakistan's prime minister announced in December 2020 that the country will have "no new coal-fired power", we do not expect this announcement to affect projects under construction, which will be the last coal-fired plants to be built in Pakistan.

At the same time, the Pakistani government has also declared it will go ahead with plans to turn Thar lignite into liquid fuels and fertilisers, but in 2024 (the limit of our forecast period) no plants will yet be operational. We therefore expect coal consumption in Pakistan to be ~67% higher in 2024 than in 2021, rising to 42 Mt with most of the increase stemming from new power plants fuelled by domestic lignite.

In Bangladesh, most of the 30 projects announced in recent years have been cancelled. Nevertheless, around 5 GW of coal projects are under construction, all of them based on imported coal. We assume these plants will be completed, while the few others in the pipeline will probably be cancelled. In July 2021, ten coal-fired power plants with an aggregated capacity of 8.4 GW were cancelled and replaced with LNG- and imported hydro-based generation.

Although Bangladesh's coal projects are advancing slowly, we do expect some capacity additions in upcoming years, most likely the 1 320-MW Rampal and 1 200-MW Matarbari projects. Coal consumption is therefore forecast to rise ~65% by 2024 as new coal-fired power plants come into operation.

In Sri Lanka, with cancellation of the Sampur project, Lakvijaya will be the only coal-fuelled power plant, so we expect demand to remain stable through 2024.

Developments in Africa do not indicate major coal consumption changes through 2024

The total coal consumption of African countries decreased by 22 Mt (-10%) to 198 Mt in 2020. Although we expect consumption to rise steadily to 212 Mt by 2024, this is still below pre-pandemic levels.

As South Africa accounts for around 90% of coal consumed in Africa, the 2020 decline can be attributed largely to a drop in demand there. For 2021, South Africa's coal consumption is expected to increase 4.3% to 183 Mt, only partially recovering from an 8% decline in 2020. As the country's economy is still suffering from the Covid-19 pandemic, South Africa's GDP is expected to increase only 4.8% this year, after a decrease of 6% last year. Despite measures taken to increase the reliability of its electricity system, South Africa experienced load-shedding about 15% of the time in the first half of 2021, as its coal-fired fleet was only 61% available, compared with 65% in 2020 and 70% in 2019. To increase security of supply and financial stability to the state-owned utility Eskom, the utility is to be restructured and new regulations will remove barriers to private investment in power generation.

South Africa's government has secured US, UK, German, French and EU financial support of USD 8.5 billion over the next five years to reduce the country's dependency on coal. Eskom announced that it will shut down 8-12 GW of coal-fired power plants (roughly 30% of its current fleet) by 2030. The company also declared in August 2021 that it will install a 100-MW solar photovoltaic plant, including a 244-MWh battery system at its 1 000-MW Komati coal power plant. The Grootvlei, Hendrina and Camden power plants, which are scheduled for closure in 2025, are also to be converted to renewable energy. As these measures will have a limited impact in the short term, South African coal consumption is expected to be 2.7% higher in 2024 than in 2021 but remain below the 2019 level. Sasol, the country's second-largest coal consumer behind Eskom, aims to reduce the carbon footprint of its Secunda chemical complex by switching from coal to less-carbon-intensive fuels, but we do not expect this to occur before 2024. In other developments, the environmental impact assessment of Musina-Makhado Special Economic Zone, which includes a 3-GW coal-fired plant and various industries, was issued in September 2021. While this complex could boost coal consumption, it is not likely to be online before 2024.

In addition, African countries are also being affected by China's pledge to stop funding coal-based power plants abroad. Zimbabwe is probably the most concerned, as it has 990 MW of coal-fired plants under construction and plans for around 4.5 GW of additional capacity, with Chinese institutions being the main source of capital. With the prospect of China pulling its funding, however, the future of these projects is uncertain. Botswana, Tanzania and Mozambique have also been counting on Chinese financing to increase their coal-fired power generation capacity.

Are we on track for net zero emissions by 2050?

Global coal consumption is not on the Net Zero trajectory and is unlikely to be before 2024

In the IEA's *World Energy Outlook 2021* published in October, the Net Zero Emissions by 2050 Scenario models a rapid plunge in fossil fuel consumption. Demand for coal in particular is shown to drop sharply (-21%) by 2025 and continue to decline thereafter. Some recent developments seem to point to that direction. Japan and Korea pledged to stop financing coal power plants abroad. In September, China's President also announced the end of new coal power projects abroad. During COP26, 45 countries, some of them big coal consumers, have signed the Global Coal to Clean Power Transition Statement.

But data point to a different direction. Global coal consumption did contract in 2020 as the Covid-19 pandemic impeded economic activity, but it has rebounded in 2021 and even surpassed the 2019 level. This increase resulted from robust global economic recovery, adverse weather conditions and high gas prices. The global economy has grown strongly this year, and particularly China's, which produces and consumes over half of the world's coal.

Global coal consumption is rising for both industrial use and power generation, and is rising in most of the big coal-consuming regions, such as China, India, the United States and the European Union.

The growth of global coal consumption expected in 2021 put the world further from the Net Zero Emissions by 2050 trajectory.

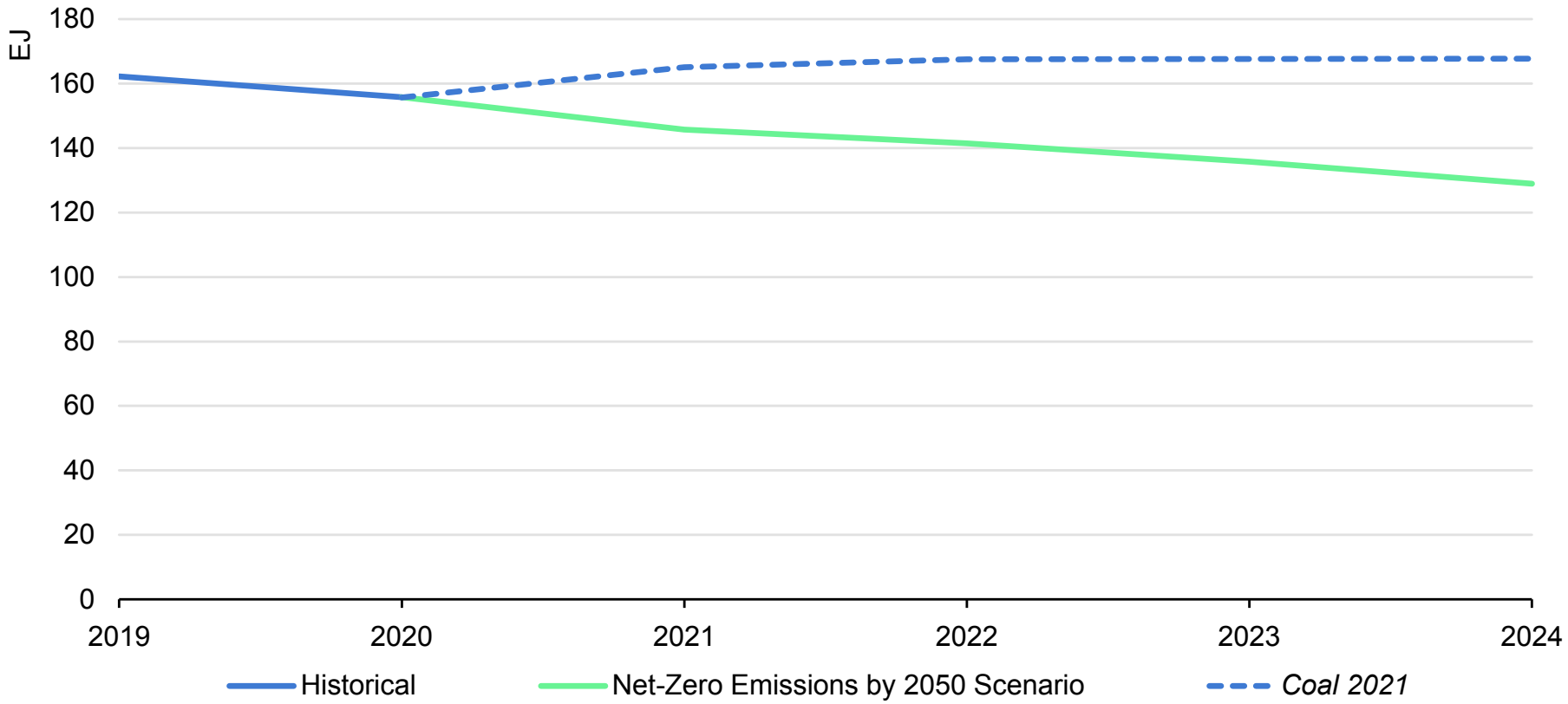
However, with supplies being limited in the second half of 2021, consumption would have been even higher if weather conditions, Covid-19 containment measures and low investment in mining in recent years had not constrained coal production.

Furthermore, we do not expect (unabated) coal consumption and production to be on the Net Zero by 2050 pathway by 2024. Although global investment in renewable energy will be strong in the medium and long term, coal supplies are expected to expand until 2024. China and India especially plan to invest in their domestic mining capacity to raise the security of their energy supply, while Indonesia and Russia will invest in new export capacity to boost their economic growth in light of coal demand expectations.

In short, all evidence indicates a widening gap between political ambitions and targets on one side and the realities of the current energy system on the other. This disconnect has two clear implications: climate targets are getting further out of reach, and energy security is at risk because, while investments in fossil fuels are shrinking, funding for clean energy and technologies is not expanding quickly enough. This should be concerning not only for policymakers and industry, but all stakeholders.

CO_2 emissions from coal in 2024 are expected to be well over 3 Gt higher than in the Net Zero Emissions by 2050 Scenario

Coal consumption in the Net Zero Emissions by 2050 Scenario and the *Coal 2021* forecast, 2019-2024



Supply

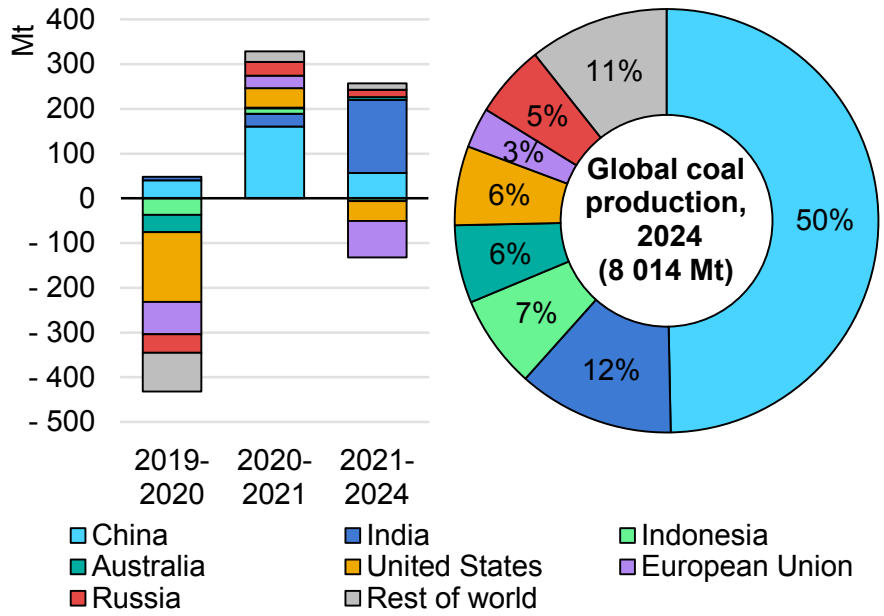
Responding to rising demand, global coal production continues to increase to 2024

Worldwide coal production declined 4.8% to 7 560 Mt in 2020. The United States (-24%/- 156 Mt) and the European Union (-19%/-72 Mt) led the drop in production as their domestic demand plummeted. Thermal coal and lignite made up ~86% of this production and the remainder was metallurgical (met) coal. China – the world largest coal producer – accounted for about 50% of global coal production in 2020.

In 2021, the global coal supply is set to expand 4.5% to 7 889 Mt (just below the 2019 pre-pandemic level) following the global rebound in demand. However, production increases in 2021 were hampered by, among other things, adverse weather conditions, supply chain disruptions and Covid-19 containment measures. With demand increasing more quickly than production, stocks built up in 2020 were depleted in 2021.

In response to coal supply shortages, large coal-producing countries such as China, India, Indonesia and Russia are expected to boost efforts to expand their output. We therefore anticipate the global coal supply to be ~125 Mt greater in 2024, totalling 8 014 Mt. In our forecast, all-time-high production of 8 111 Mt will occur in 2022. The biggest increases are expected in India (+163 Mt), China (+57 Mt), Russia (+16) and Pakistan (+12 Mt), while production diminishes in the United States (-44 Mt) and the European Union (-82 Mt).

Regional and global coal production changes, 2019-2024



China's 2020 coal production recovered quickly from early-year setbacks to reach a new high

Under China's 13th Five-Year Plan (2015-2020), about 5 500 coal mines with a total production capacity of ~1 000 Mtpa were closed, reducing the total number of mines to 4 700. New modern, large-scale opencast and underground mines are being approved to replace this capacity, mostly in the main coal mining regions of Inner Mongolia, Shaanxi, Shanxi and Xinjiang.

In 2020, coal production increased 1.1% to a new high of 3 764 Mt, surpassing the previous record set in 2013. Although the Covid-19 pandemic disrupted China's coal production in the first quarter of 2020 (despite a production capacity expansion), it has been climbing since the second quarter. Higher production was prompted by sharply rising domestic demand to support strong economic expansion; the government's tightening of import restrictions to protect and assist domestic coal producers; and the ban on Australian coal resulting from political discord.

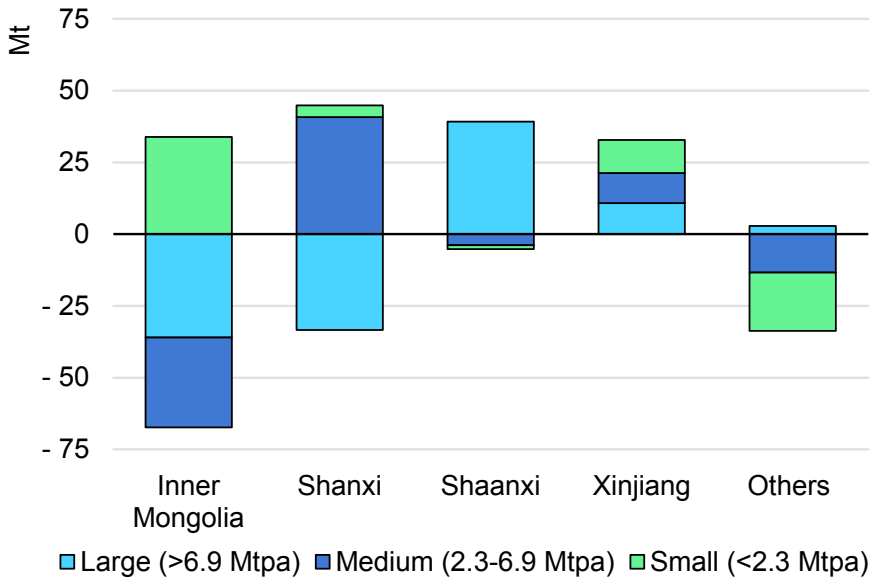
Thermal coal made up ~85% of Chinese coal production in 2020, the rest being met coal.[6] About 80% of China's thermal coal is mined in just four coal mining regions: Inner Mongolia (30%), Shanxi (22%), Shaanxi (21%) and Xinjiang (6%). Inner Mongolia was the only large coal mining region in which thermal coal production decreased (-3%) in 2020, while it expanded in Shanxi (+2%), Shaanxi (+5%) and Xinjiang (+22%). Thermal coal production in other regions fell 5%, mainly due to declining exploitation by small mines.

Met coal production rose 4% to 675 Mt in 2020, with more than half of this production in Shanxi. Other important met coal mining regions are Shandong and Anhui in the east, Henan and Guizhou in the south, and Inner Mongolia and Heilongjiang in the north. Met coal production in Shanxi alone increased 11% in 2020, mainly from large and medium-sized mines, while it dropped in most other parts of the country. As with thermal coal, this reflects the continuing shift from small, decentralised mines to large-scale ones in the main coal mining regions.

[6] Although China also produces anthracite and lignite, available data do not report these categories separately.

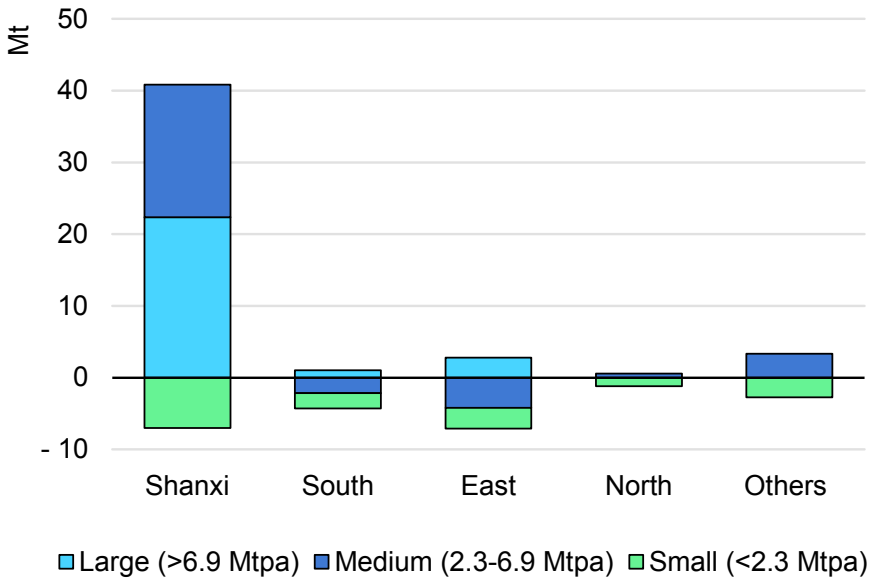
China’s coal production continues to be concentrated in four regions

Year-on-year change in thermal coal production in China’s major thermal coal-producing regions by mine size, 2019-2020



Source: Adapted from CRU (2021), Thermal Cost Model (database).

Year-on-year change in metallurgical coal production in China’s major met coal-producing regions by mine size, 2019-2020



Source: Adapted from CRU (2021), Metallurgical Cost Model (database).

China's supply failed to catch up with demand for most of 2021, leading to an energy shortage

For 2021, we expect China's coal production to rise 4.3% to 3 925 Mt. In the first three quarters of 2021, coal output increased in Inner Mongolia (+3%), Shanxi (+14%), Shaanxi (+4%) and Xinjiang (+11%) while it decreased in other smaller coal mining regions. The share of the four primary coal mining regions in China's total production rose to ~80% in 2021.

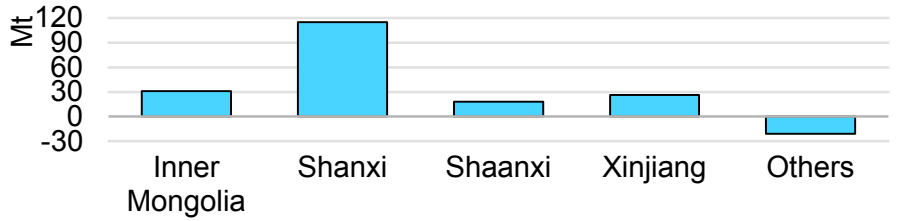
Nevertheless, coal production has not been keeping pace with rising domestic demand. Starting in 2020, Inner Mongolia's coal supply growth was hampered by an anti-corruption probe that strengthened control of mine production for approved capacities. Safety and environmental regulations also became stricter throughout the country and punishments for failing to comply with safety guidelines were increased. These factors, together with natural disasters such as floods, disrupted China's coal production and logistics in 2021. In October, for example, flooding in Shanxi forced mines to shut down and made the supply situation even worse just as northeastern China's heating season was beginning.

Because of strong demand growth, constrained production and limited imports, power plants have been running low on stocks. At the same time, provinces have been at risk of missing the energy consumption and intensity targets set by the government. Power rationing was therefore initiated in two-thirds of China's provinces in September 2021 (see also the Demand chapter).

To ease the supply shortage, the Chinese government has asked regional authorities and coal mining companies to boost coal production. At the same time, the National Development and Reform Commission (NDRC) has called on major producers to cap prices on a voluntary basis (rail availability will be limited for producers pricing above the cap).

Nevertheless, output is not likely to expand quickly enough, even though authorities in Inner Mongolia approved the restart of 38 disused opencast mines with a capacity of 66.7 Mtpa, and the NDRC has eased conditions for mine extensions taking place before April 2022. In addition, Shanxi province ordered its 98 coal mines to increase their annual output by 55.3 Mt over the remainder of the year and allowed 51 coal mines that had reached their annual production cap to keep producing and raise capacity, adding roughly 20 Mt of extra supply.

Year-on-year change in China's coal production by region, January to September, 2020-2021



Source: National Bureau of Statistics of China (2021), Statistical database.

China’s 14th Five-Year Plan promotes coal production to raise energy security

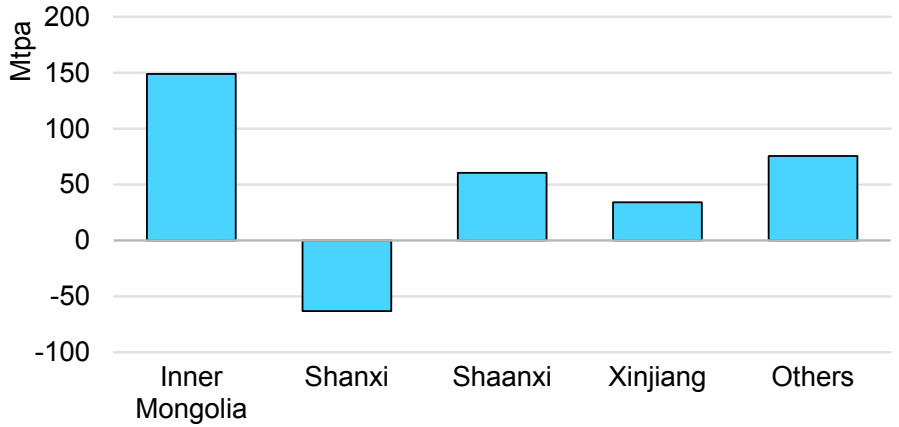
The 14th Five-Year Plan, which outlines China’s economic priorities for development during 2021-2025, attempts to balance environmental (i.e. climate), energy security and affordability considerations. Therefore, despite China’s commitment to peak its carbon emissions by 2030 and achieve carbon neutrality by 2060, the plan considers coal an irreplaceable energy source in upcoming years.

The plan’s aim is to stabilise coal production to secure 4 100 Mt by 2025.[7] At the same time, it targets average annual coal consumption growth of 1%, resulting in 4 200 Mt tonnes in 2025. The balance would therefore be supplied by imports.

Following the direction already charted by the 13th Five-Year Plan, Chinese mining companies are to make their mines increasingly safe, automated and digitalised, as per the “large-scale, modernisation, intensification and ecology” development directive. As part of this process, China’s total number of mines is to be reduced by 700 to 4 000, meaning that small mines will continue to be closed. The government of Shanxi, currently the largest coal-producing province, has already announced a production cap of 1 000 Mt per year. Meanwhile, production increases are planned for Inner Mongolia’s Shendong Coal Basin, and for mines in Shaanxi and Xinjiang.

China’s coal production is thus expected to expand ~4.3% in 2021 and then by a more moderate 0.5% per year. Total coal production of 3 982 Mt is therefore forecast for 2024.

Planned changes in China’s mining capacity by region, 2020-2025



Source: Government of China (2021), 14th Five-Year-Plan.

[7] As China’s official statistics usually refer to raw coal, the production values they quote cannot be compared directly with those of this report, which refer to saleable coal.

India experienced critical coal supply shortages despite ramping up production in 2021

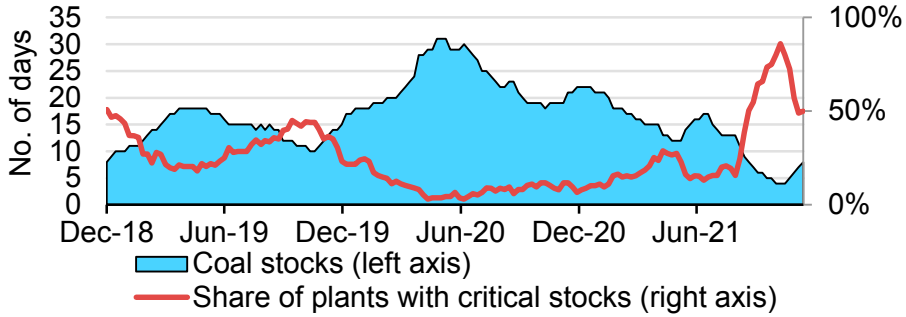
India's coal production in 2020 was 764 Mt, a slight increase (+1%) from 2019. Overall output for 2020 rose despite a 14% drop in the second quarter of the year (compared with the same period in 2019) as the Covid-19 pandemic hit the country.

2021 coal production is estimated at 793 Mt, an increase of 3.7%. Despite this rise, India started experiencing coal shortages in August, when a number of power stations began reporting that their coal stocks had fallen to critical or supercritical levels.[8] By early October, power plants were down to average stocks of four days' supply, with stocks improving slightly but continuously since. The supply shortage was caused by several factors: a surge in power demand attributable to post-pandemic economic recovery; heavy monsoons in mining areas, which affected production and transportation from pitheads to power plants; high prices on imported coal, which led to curtailment of plants relying on those imports; and insufficient stock build-up in the first half of 2021.

Because India's energy system relies heavily on long-term agreements (for coal and electricity), the country's tight supply conditions were reflected in higher domestic coal auction prices (56% above notified prices in the third quarter) as well as massive spot price increases for power on the Indian Energy Exchange (e.g. a 193% y-o-y increase in October).

The government addressed the situation by regulating coal supplies for plants with the most critical stocks; ramping up mine production and offtake; encouraging captive block owners to not only raise production to meet their own needs but to sell up to 50% of their production (the limit is normally 25%); and allowing blending of up to 10% imported coal. The Minister of Power has also said that he is working to operationalise captive blocks that could start production immediately.

Coal stocks of India's power plants and share of plants with critical stocks, Dec 2018 - Oct 2021



Source: Central Electricity Authority (2018-2021), Daily Coal Stock Report.

[8] In India, critical stocks refer to less than five days' supply for mine-mouth plants, nine days for those linked to a coal mine further than 1 500 km away, and seven for the rest. Supercritical stocks refer to less than three, five and four days of supply, respectively.

India’s coal producers have ambitious plans to open new projects by 2024

To reduce its import bills and alleviate the coal supply crisis of late 2021, India plans to boost domestic coal production. We therefore expect India’s total coal production to rise to 955 Mt by 2024, an increase of 163 Mt at a CAAGR of over 6%. Responsible for this expansion will be India’s three coal mining public sector undertakings – Coal India Limited (CIL), Singareni Collieries Company Limited (SCCL) and Neyveli Lignite Company (NLC) – as well as captive blocks for self-consumption and, potentially, new commercial coal blocks auctioned by the government.

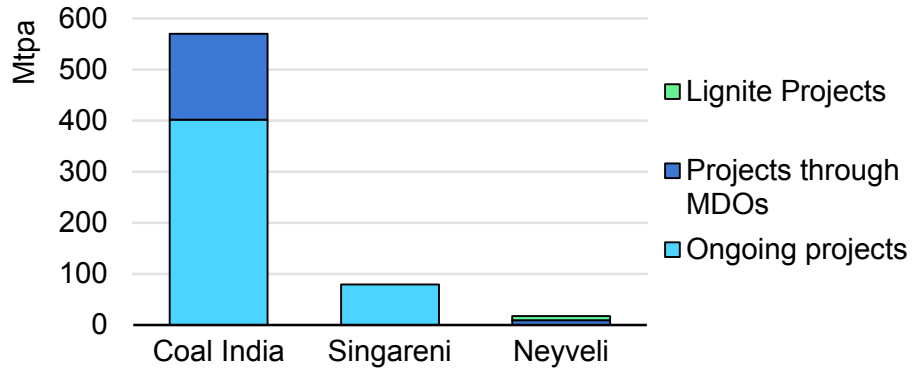
CIL, the world’s largest coal mining company, accounted for ~80% of India’s total coal production in 2020. CIL operates 345 mines: 151 underground, 172 opencast and 22 mixed. More than 95% of CIL’s coal comes from opencast mines.

To support the government’s goal of raising domestic coal production, CIL is aiming for 1 000 Mt by fiscal year 2023-24. To achieve this target, the Ministry of Coal has announced 55 greenfield projects (92 Mtpa of production capacity) and 193 brownfield ventures (310 Mtpa) to be launched by 2024. CIL also plans to open 15 mines – 12 opencast and 3 underground with 168 Mt of annual capacity– through mine developers and operators (MDOs). Five of these mines have been tendered so far, and MDOs have been selected for two of them. Procedures for tendering and contracting the remaining mines are to be completed in 2022.

SCCL is the main coal producer in India’s southern region. In 2020 it accounted for ~7% of India’s total coal production and currently operates 20 opencast and 26 underground mines, with plans to ramp up production to 85 Mt by 2024.

State-owned NLC, India’s largest lignite producer, aims to expand its lignite production capacity with two greenfield and two brownfield projects next year. Following its involvement with the Talabira II and III mines, NLC also hopes to commence production in Jharkhand at Pacchwara South block by fiscal year 2022-23. Like the Talabira opencast project, NLC plans to operate the Pacchwara South block through an MDO, though none has been selected yet.

Planned increases in India’s coal mining capacity by public sector undertaking, 2021-2024



Note: MDO = mining developer and operator.

With several Indian mines signed with MDOs, captive blocks are expanding

In addition to the three public sector undertakings (CIL, SCCL and NLC), many smaller companies produce coal for their own consumption and are called captive miners in India. Captive mining, India's first exception to the state-owned monopoly, was created to ensure that power producers and other industries such as cement, steel and aluminium manufacturing could be guaranteed a regular supply of high-quality coal for their end uses.

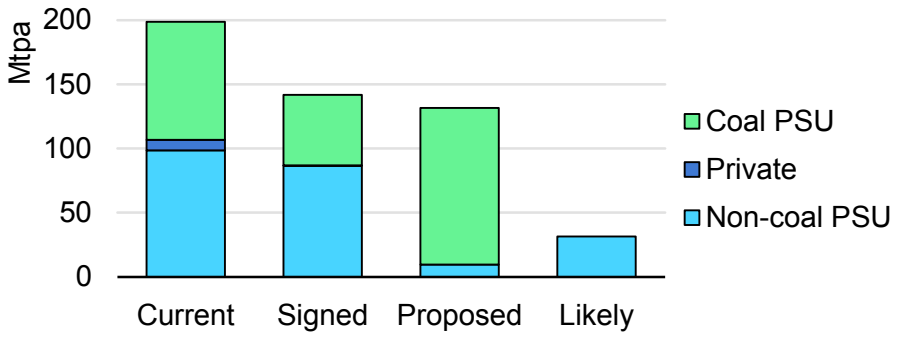
As captive coal blocks began being allocated in the 1990s, many private mining and logistics companies saw an opportunity to enter the market as contractors. Eventually, many of the private miners moved from being outsourced as part of mining operations to providing end-to-end services for inexperienced captive block owners who lacked technical expertise in coal mining. This came to be known as the mine developer and operator (MDO) model. Currently, 19 of India's 24 MDO-operated mines are captive coal blocks and the remaining are registered to CIL (4) and NLC (1). Some of the most active companies in the MDO domain are Adani Enterprises, BGR Mining, Ambey Mining, Thriveni Earthmovers, AMR and EMIL.

There have been ten tranches of captive block allocations since 2015, with over 100 blocks allocated. However, due to environmental clearance, land acquisition, and resettlement and rehabilitation issues, only 26 of these blocks are operational.

Of the remaining unallocated blocks, 19 are expected to become operational by 2024: 14 captive blocks have already engaged MDOs; 2 captive blocks are to be developed through MDOs; and 3 more blocks allocated to non-coal-mining public sector undertakings are also likely to be developed by MDOs.

The National Thermal Power Corporation (NTPC), India's largest power generator, has been allocated ten mines for captive use. Of these, three with a peak rated capacity of 40 Mtpa are currently operational and produced 11 Mt in 2020, and three more with a peak capacity of 33 Mtpa are expected to be operational by 2024. Meanwhile, two captive blocks containing 10 Mtpa of coking coal and one captive block with 2.3 Mtpa of thermal coal are on the 2024 horizon, though it is not clear whether they will engage MDOs.

MDO mines in India by status and owner type by 2024



Note: PSU = public sector undertaking.

Commercial blocks receive a policy push for earlier starts and more auctions

To further boost coal production, India's government broke the state monopoly on coal in 2018 by approving a procedure for auctioning coal blocks to private companies for commercial sale of coal.

In June 2020, the government launched the first tranche of commercial coal block auctions in India. Altogether, 38 mines were put up for auction, of which 19 received the minimum requirement of two qualifying bids. The winners of these 19 blocks included state-owned enterprises, MDOs, captive industrial consumers and several other companies, many with little coal mining experience.

None of these 19 mines is operational so far, having been delayed by the usual land acquisition, permitting, clearance, and resettlement and rehabilitation obstacles. However, it is anticipated that around six of these mines (with total capacity of ~22 Mtpa) will be operational by 2024.

In 2021, the Ministry of Coal announced several measures to ensure the fast-tracking of production from the commercial coal blocks won in auctions. First, a project management unit has been assigned to work with bid winners to help them resolve bottleneck issues. Second, a single-window clearance portal was launched to provide a unified platform that will accept all applications for necessary coal mining clearances and approvals. Last, a system of rolling auctions has been proposed, wherein a new tranche of coal block auctions will be arranged and second rounds for mines receiving only one qualifying bid will be conducted every few months. Eighty new mines have been proposed for addition to the mine pool for auction in the next four years.

In 2021, the government allotted a total of 9 mines through auctions: 1 of 4 mines from the second round of the first tranche, and only 8 of the 67 mines on offer from the second tranche of commercial auctions.

In line with its proposed rolling auctions, in October 2021 the Ministry of Coal announced 11 mines on offer for the second round of the second tranche, as well as 40 new mines for the next (third) tranche of commercial coal block auctions, with a total of 88 mines on offer, including mines rolled over from previous tranches. Auctions for these mines are likely to take place in the first quarter of 2022.

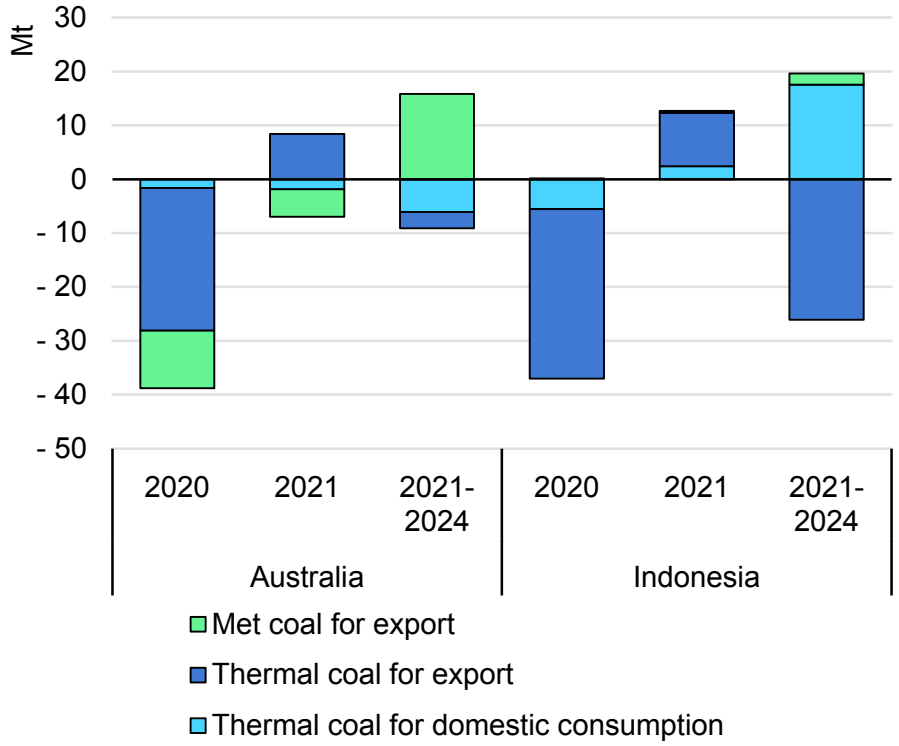
Australian and Indonesian coal production remains high, but the output future depends on export opportunities

Australia's coal production declined 8% to 468 Mt in 2020, with production falling in all coal grades. 62% of production was thermal coal, including lignite, the remainder being met coal.

Coal exports to China vanished in 2021 due to China's unofficial ban on Australian coal. Since then, global trade flows have largely been rebalanced with other importing countries such as India and Korea filling the gap. Although prices for both Australian thermal and metallurgical coal surged in the second half of 2021, issues such as bad weather and temporary mine closures due to mining incidents prevented Australian mining companies from benefitting fully. (Please see the Prices and Costs chapter for a more detailed discussion of supply-side disruptions in 2021.) While we expect thermal coal production to increase 7% in 2021, met coal is anticipated to amount to 180 Mt, remaining at around the 2020 level.

Australia's thermal coal production is forecast to remain constrained through 2024. While we expect the Carmichael mine to ramp up to 10 Mtpa in late 2021 or early 2022, growing pressure from legal disputes and from federal and state regulators hampers the expansion of existing mines and the development of new ones. Furthermore, financing and insurance conditions for coal mining projects are becoming more challenging, leading to higher costs and sometimes rendering projects economically unfeasible.

Coal production changes in Australia and Indonesia, 2020-2024



Consequently, Australia's thermal coal industry is expected to shrink slowly as mine closures outpace capacity additions. Additionally, as Russia's infrastructure improves it will give Australia more competition in high-calorific-value coal. We therefore expect Australia to produce 287 Mt of thermal coal in 2024, about 31 Mt less than in 2019, with lower demand for coal for domestic power generation also contributing to the decline.

However, met coal production in Australia is expected to increase 11 Mt by 2024, as the country's federal and state governments have approved a number of new mine developments for met coal projects. In fact, several metallurgical mines are about to reopen or be commissioned. (Please see the Coal Mining Projects chapter for a detailed analysis of Australia's coal mining investments.)

In Indonesia, coal production fell 6% to 564 Mt in 2020. About 99% of the country's output is thermal coal.[9]

In 2021, Indonesia's coal production is expected to expand 2.2% to 576 Mt, even though coal mining companies have had difficulty ramping up production due to the low availability of heavy-duty equipment. Furthermore, heavy rains and flooding, particularly in the third quarter of 2021, curbed coal production and some exporters were forced to declare force majeure.

A 0.4% per year decline in Indonesia's coal production is forecast, resulting in 570 Mt of output in 2024, as both China and India – the main importers of Indonesian coal – are redoubling their efforts to reduce coal imports.

[9] There is a substantial production of lignite in Indonesia, but it is reported as thermal coal.

US coal production growth in 2021 should not be mistaken for a trend reversal

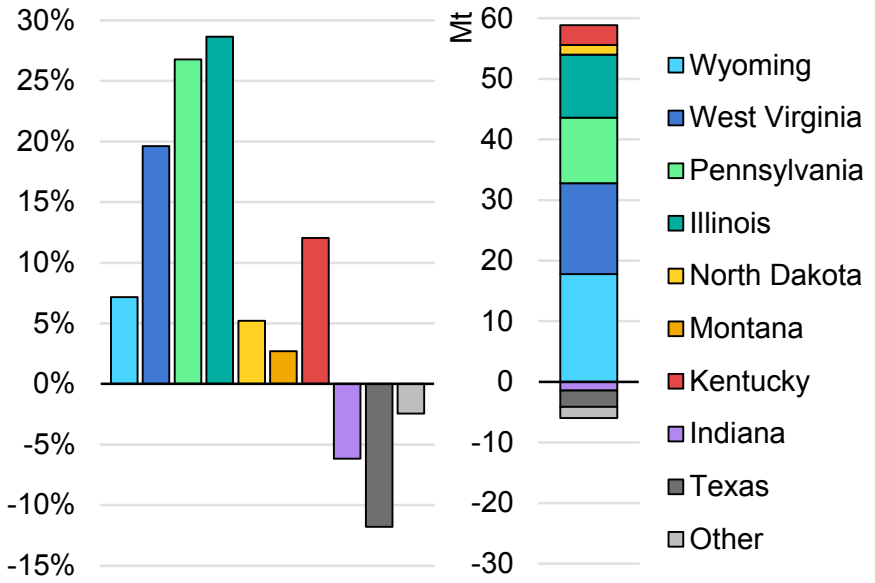
US coal production dropped a drastic 24% in 2020 to 485 Mt, the lowest level since 1965. It had already been falling since the production peak of 2008, a trend prompted mostly by declining domestic coal use for power generation and shrinking demand by Europe, the leading importer of US coal. Additionally, industrial activity – and especially power demand – declined in 2020 during the Covid-19 pandemic, which, together with low gas prices, depressed coal production. As a result of this consumption slump, the number of producing coal mines in the United States fell 18% to 551 mines in 2020, a 62% drop from 2008.

In 2021, coal output is expected to increase 9% (+43 Mt) from 2020, stimulated by a rebound in domestic consumption as well as overseas exports. Still, production is not expected to keep up with the strong recovery in demand, leading to a 56-Mt decline in US coal stocks.

Although the United States is registering an overall production increase in 2021, output is uneven across the US coal mining regions. While production in the main coal-producing states of Wyoming, West Virginia, Pennsylvania and Illinois rose, it continued to decline in other states with less production capacity, such as Indiana, Texas, New Mexico and Alabama.

We forecast that US coal production will continue to expand in 2022 before resuming its declining trajectory, which will lead to 484 Mt of output in 2024. The return to last decade's production downturn reflects the anticipated drop in North American and European coal demand.

Expected US coal production changes by state, 2020-2021



Source: IEA estimates from EIA (2021), Weekly Coal Production.

In the Americas, Canada's production falls while Colombia's is limited by Prodeco closure

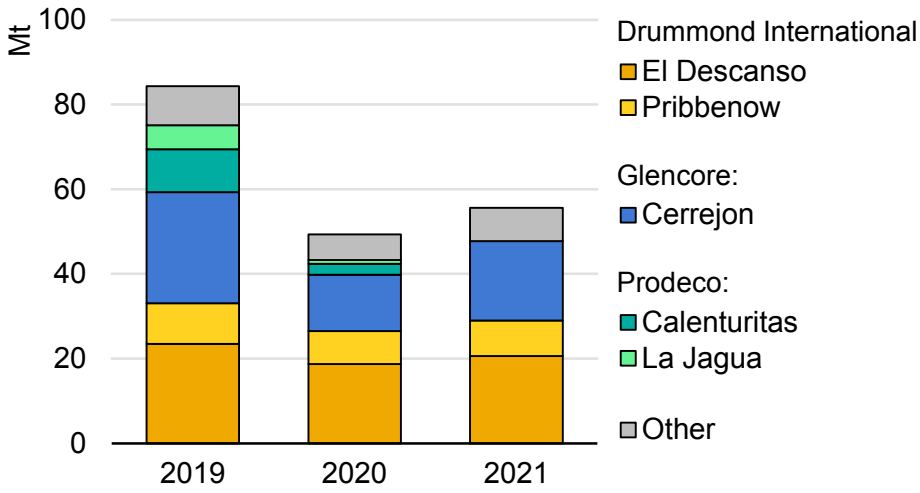
Canadian coal production fell ~18% in 2020 to 46 Mt, with the effects of the Covid-19 pandemic reinforcing the steady decline from ~69 Mt of production in 2014. Output is not expected to recover in 2021, with coal production remaining around the 2020 level.

The country's output is forecast to continue shrinking to 43 Mt by 2024. This 38% drop in coal output reflects the Canadian government's intentions to discontinue coal use for power generation and to stop exporting thermal coal by 2030. In contrast, we expect Canada's met coal production to remain stable at the 2021 level.

In Colombia, coal production fell a drastic 42% in 2020 to 49 Mt. Low coal prices, plummeting demand in the Atlantic Basin and interruptions due to Covid-19 containment measures – in addition to industrial action at El Cerrejón, the country's largest coal mine – prompted the drop. Labour and social crises have been coinciding with progressively shrinking international demand for coal and a loss of markets for Colombia, creating a sustained production decline. Nevertheless, we expect production to recover 35% in 2021 as demand in key markets increases.

This year, Prodeco (a subsidiary of Glencore) announced it is ceasing operation of its Calenturitas and La Jagua mines, which together had an output of ~16 Mt in 2019. The mines were put in care and maintenance mode in March 2020, and operations are not to be restarted, leaving Colombia with three major mines: El Descanso and Pribbenow, owned by Drummond International, and Cerrejón (its largest mine), soon fully owned by Glencore, which recently bought Anglo American's and BHP's shares. As a result, we do not expect Colombia's coal production to recover to the 2019 level but to remain at its 2021 output, declining slightly to 62 Mt in 2024.

Colombia's coal production by mine and company, 2019-2021



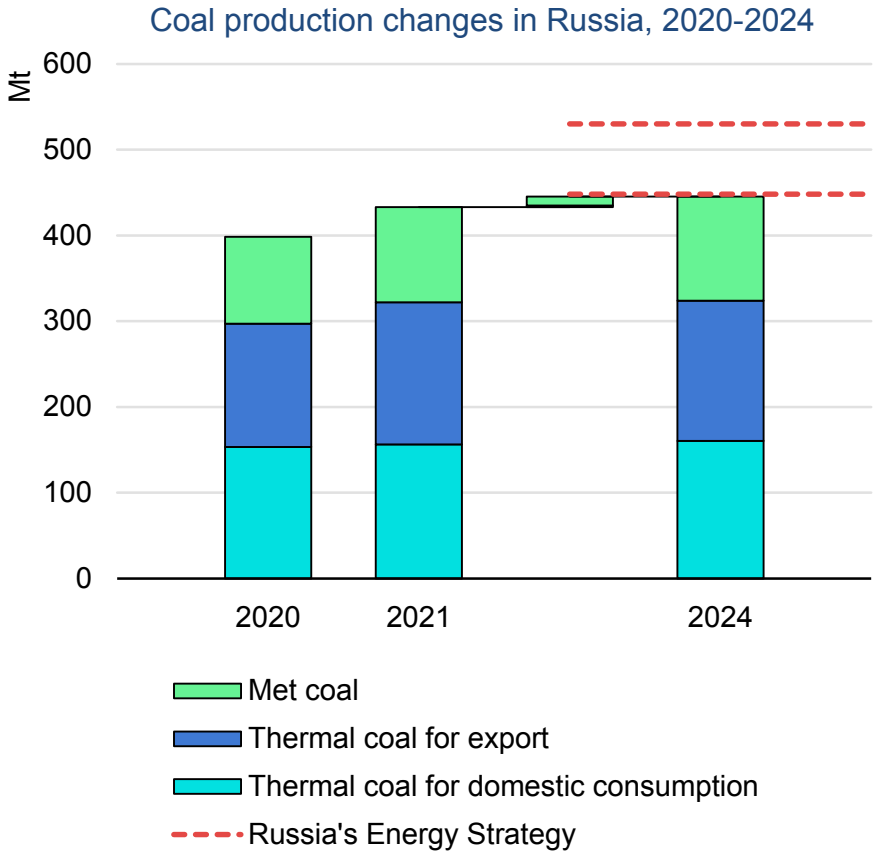
Russia is set to raise its coal production and export capacities

Coal production in Eurasia declined to 526 Mt in 2020, from 578 Mt in 2019 (-9%). The region's largest coal producer is Russia, where production fell 9% to 398 Mt in 2020.

In 2021, Eurasian coal output is expected to increase ~7%, mainly as Russian production rises 9% to 433 Mt. The level in Kazakhstan, the region's second-largest coal producer, will be stable at almost 100 Mt, and Ukraine's production is also expected to remain stable, although this is more uncertain.

In the forecast to 2024, Russia's coal output is expected to expand 2.8% to 445 Mt, this being the driving force for a 3.5% increase in Eurasia overall. Already the world's largest exporter of fossil fuels, Russia announced a new energy strategy in 2020 to expand its coal production to 448-530 Mtpa by 2024 and to 485-668 Mtpa by 2035, with the goal of doubling its coal exports within this period.

To this end, Russia is developing new coal fields (e.g. in its Far East and Arctic region) and expanding export facilities such as railways and export terminals. Examples include development of the Syradasayskoye coal field on the Taimyr Peninsula, a 44% capacity increase of the Baikal-Amur Mainline and Trans-Siberian Railway network, and the construction of various export terminals (e.g. at the Yenisei port, Port Dickenson and the Port of Lavna). (Please see the Coal Mining Projects chapter for a more detailed discussion of Russian investment in coal export capacity.)



Europe's coal production recovered in 2021, but will decline again through 2024

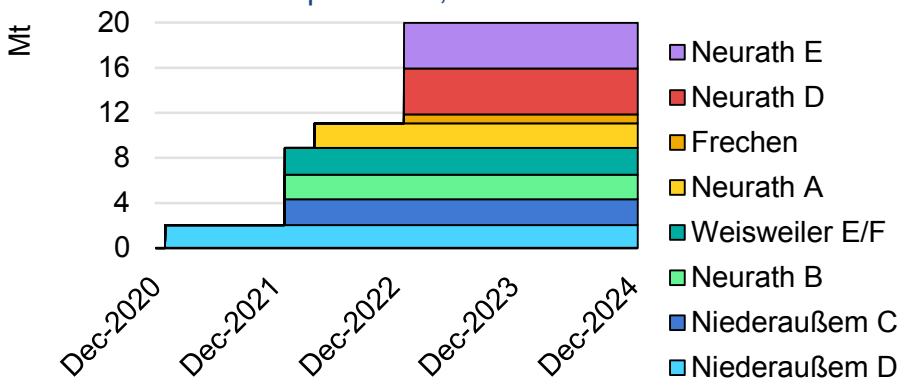
EU coal production dropped 19% to 301 Mt in 2020, mainly due to declining demand for power generation. Output fell in both Germany (-18%) and Poland (-10%), Europe's main coal-producing countries. In 2021 we expect coal production to rebound strongly to ~329 Mt before returning to a declining trajectory, falling to 247 Mt by 2024.

In Germany, the economic upturn, low electricity generation from renewable energy sources and, above all, high gas prices led to a rebound in lignite-fired power generation in 2021, which will raise coal production ~17% to 125 Mt, surpassing 2019 output. As part of Germany's plan to phase out coal by 2038, the lignite power plant fleet will be reduced almost 3 GW (-16%) by 2024. Therefore, as carbon prices are high and the country is expanding renewable power generation, Germany's coal production is expected to decrease strongly to 85 Mt by 2024.

Poland's coal production increased 6% to 107 Mt in 2021, also due to higher electricity demand and steep gas prices. In September 2020, the Polish government agreed with trade unions to gradually cease coal mining by 2049, and in April 2021 both parties signed the deal. This agreement resulted from EU pressure to reduce carbon emissions as well as rising mining costs, which make domestic supplies uncompetitive with imports from countries such as Russia.

Furthermore, at the behest of the Czech Republic, in September 2021 the European Court of Justice ruled that operation of the Turow opencast lignite mine near the Czech border must cease because it endangers water supplies. Poland has rejected closure of the opencast mine on grounds of energy supply security, and bilateral negotiations are currently under way between the two countries. Through 2024, these decisions will have only a limited impact on Poland's coal production, which is expected to decrease by 8 Mt to 99 Mt.

Expected production decline from Germany's lignite power plant phaseout, 2020-2024



Notes: Assumed capacity factor = 0.7. Assumed calorific value = 2 150 kcal/kg.

African developments are minor, and production in South Africa remains below the 2019 level

South Africa accounted for around 94% of Africa's coal production in 2020, amounting to 247 Mt, down 4.4% from 2019. In 2021, its output is expected to decrease slightly to 244 Mt. Logistical problems, including civil unrest, train derailments and ongoing maintenance work on the export line to Richards Bay reduced coal exports, and domestic demand recovered only partially. Through 2024, South African coal production is expected to remain stable at the 2021 level, as a recovery to 2019 output is being prevented by the withdrawal of major mining companies such as Anglo American, as well as by cuts to planned domestic coal-fired power capacity. The only major new mine likely to become operational by 2024 is Seriti's New Largo mine, for which construction began in 2020.

Mozambique, Africa's second-largest coal producer, had total production of 7 Mt in 2020, down from 11 Mt in 2019. The country was hit hard by the Covid-19 pandemic in 2020 and 2021, but coal production is expected to remain stable. Coal India conducts coal exploration in the country, and Ncondezi Energy has announced a 300-MW coal mine/power plant project, but no investment decisions have yet been made. Also, with Vale preparing to discontinue coal exploitation in Mozambique this year, future coal production in the country will depend on the operation's new ownership. We expect coal production to increase, as current production capacity is not being fully utilised, with output in 2024 amounting to ~11 Mt.

Coal production in other southern African countries has been minimal, but Botswana, Tanzania, Zambia and Zimbabwe are planning to expand their coal operations, especially for domestic power generation. However, as mentioned in the Demand chapter, it is still uncertain which projects can be implemented now that China is not building new coal-fired power plants abroad.

The future of coal mining in Botswana appears promising, as the government is offering support for coal exploitation with the aim of reducing the country's dependence on diamonds. Up to 2019, the state-owned Morupule Coal Mine was the only mine operating in Botswana, but since then, mining licences have also been issued to private companies. Minergy exported the first coal from its Masama mine in July 2020, and several other projects are under construction or in early planning. Botswana is also pursuing construction of a rail link to South Africa to gain access to export markets.

Meanwhile, Zimbabwe's government is planning new mines with corresponding coal-fired power plants in the northwestern district of Hwange. The plan is for mining companies to extract thermal coal first, for power generation, and then to extract coking coal from beneath these deposits. One project already under development in the region is the Lubu complex, which could produce up to 0.5 Mtpa of metallurgical coal and is scheduled to start operations this year. It is not yet clear whether other projects will go ahead.

Trade

Global coal trade rebounds in 2021 then plateaus

Global coal trade dropped 11% from the record volume in 2019 to 1 298 Mt in 2020,[10] with traded coal making up 17% of global coal consumption in 2020. While trade in thermal coal (which includes lignite and some anthracite in this section) decreased 11%, metallurgical (met) coal trade volumes (which account for one-quarter of traded coal) also declined (-9%). The overwhelming majority of coal traded in 2020 (92%/1 183 Mt) was seaborne.

International thermal coal trade patterns shifted in the 2010s. Traditionally, trade had been concentrated on the Pacific Basin and the Atlantic Basin, with South Africa and – to a much lesser extent – Russia linking the two. International coal trade no longer follows this pattern, however, as the Atlantic market has shrunk drastically and separated from the Asian market. Turkey's imports (40 Mt in 2020) have surpassed Germany's (30 Mt) to make it the largest coal importer outside the Asia Pacific region, which accounted for 84% of global coal imports in 2020.

Indonesia remained the world's largest exporter of coal (by weight), with total exports of 405 Mt in 2020. Australia ranked second, at 372 Mt, although it remains at the top in terms of energy and economic value. China was the largest importer of coal in 2020 at 314 Mt, followed by India at 214 Mt.

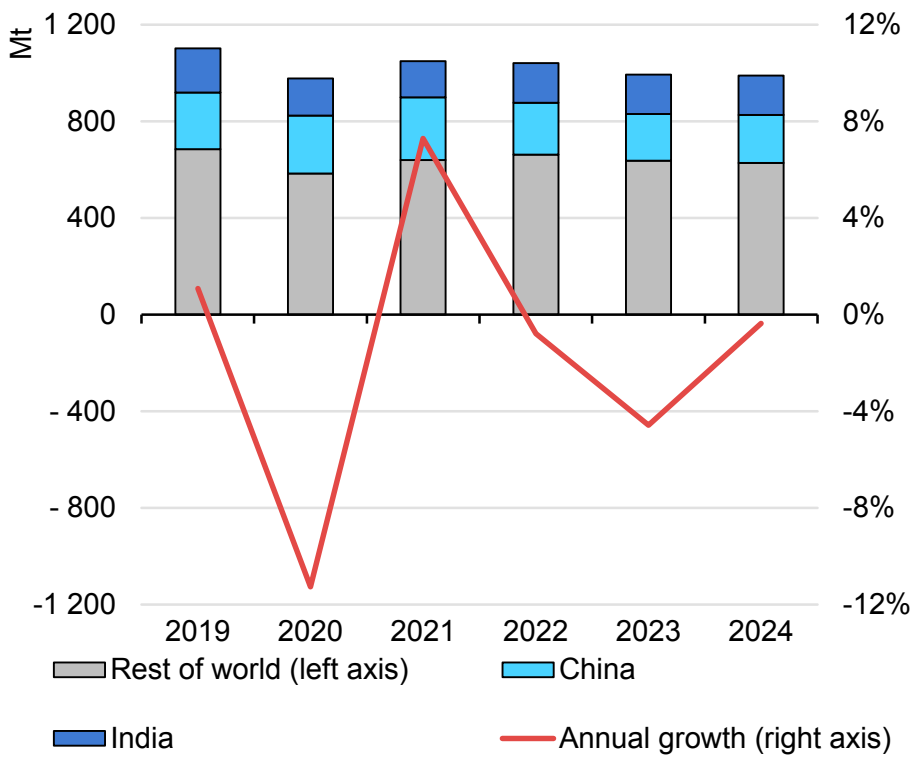
In 2021, we expect trade volumes to recover by over 5%, or ~70 Mt, and thereafter remain below 2019 levels. For thermal coal, a volume increase of 7% is expected, while for met coal the same volume is traded as in 2020. In addition to rising exports from Indonesia (+9%), Russia (+6%) and Australia (+1.1%), those of the United States are expected to increase (+28%) as European import demand rebounds.

For the next three years to 2024, we foresee global coal trade stability, with thermal coal volumes declining 1.9% per year and met coal increasing 2.8% annually. Thermal coal trade will be altered as China and India – the world's two largest importers – raise domestic production to reduce import reliance, and as the European Union, Japan and Korea reduce their coal-fired power generation. Conversely, we expect higher volumes of met coal to be traded because China and India – the countries with the highest consumption – cannot raise their domestic production substantially, and because met coal demand for steel production remains high globally.

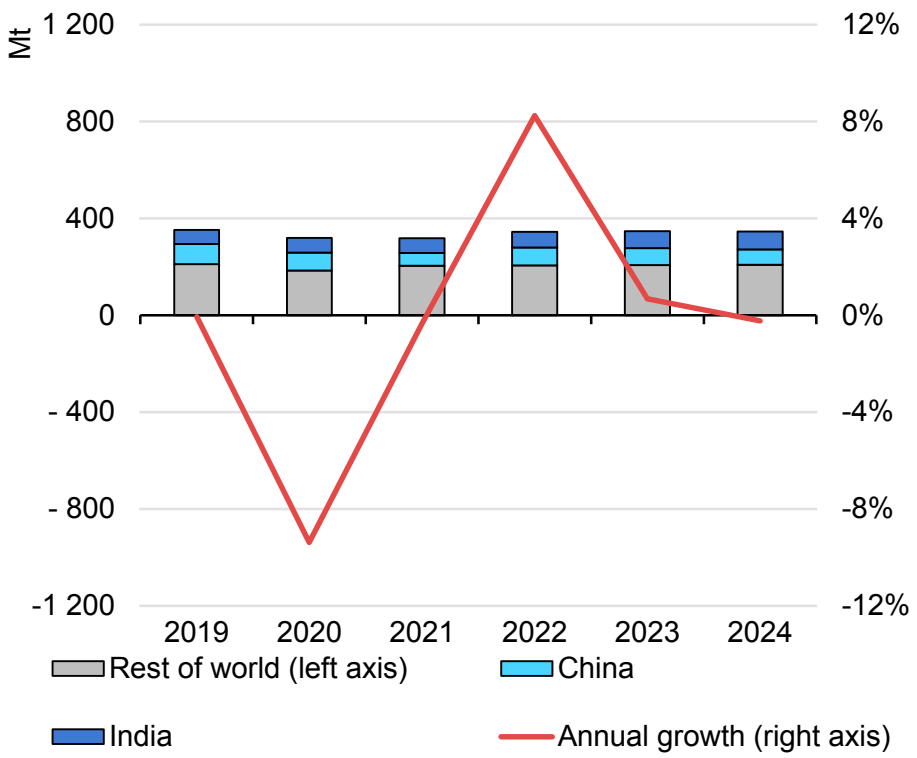
[10] For various reasons, annual imports and exports do not match: for example, some exports reported in December may be reported as imports in January. Trade volumes in this section refer to exports.

Thermal and met coal trade depend on China and India

Thermal coal trade development, 2019-2024



Metallurgical coal trade development, 2019-2024



Thermal coal

After reaching an all-time high in 2019, thermal coal exports plummeted in 2020

In 2020, 978 Mt of thermal coal were traded internationally – a 124-Mt drop from 2019 due to declining demand during the global pandemic. Approximately 916 Mt (94%) of this trade was seaborne.

The share of internationally traded thermal coal in global coal consumption fell slightly to 15% in 2020. Annual data on thermal coal imports and exports are different, partly due to China's trade practices and import quotas. Because of China's quotas, ships that left ports at the end of 2019 were not discharged and registered as imports in China until January 2020. Therefore, higher values for imports than exports were recorded for 2020.

Most seaborne thermal coal trade occurs in the Asia Pacific region, where the largest importers and exporters are both concentrated. Indonesia provided 41% of globally traded thermal coal in 2020, and Australia ranked second with 20%, increasing its market share from 19% in 2019. Other important exporters are Russia (18%), South Africa (8%), Colombia (5%) and the United States (2.5%).

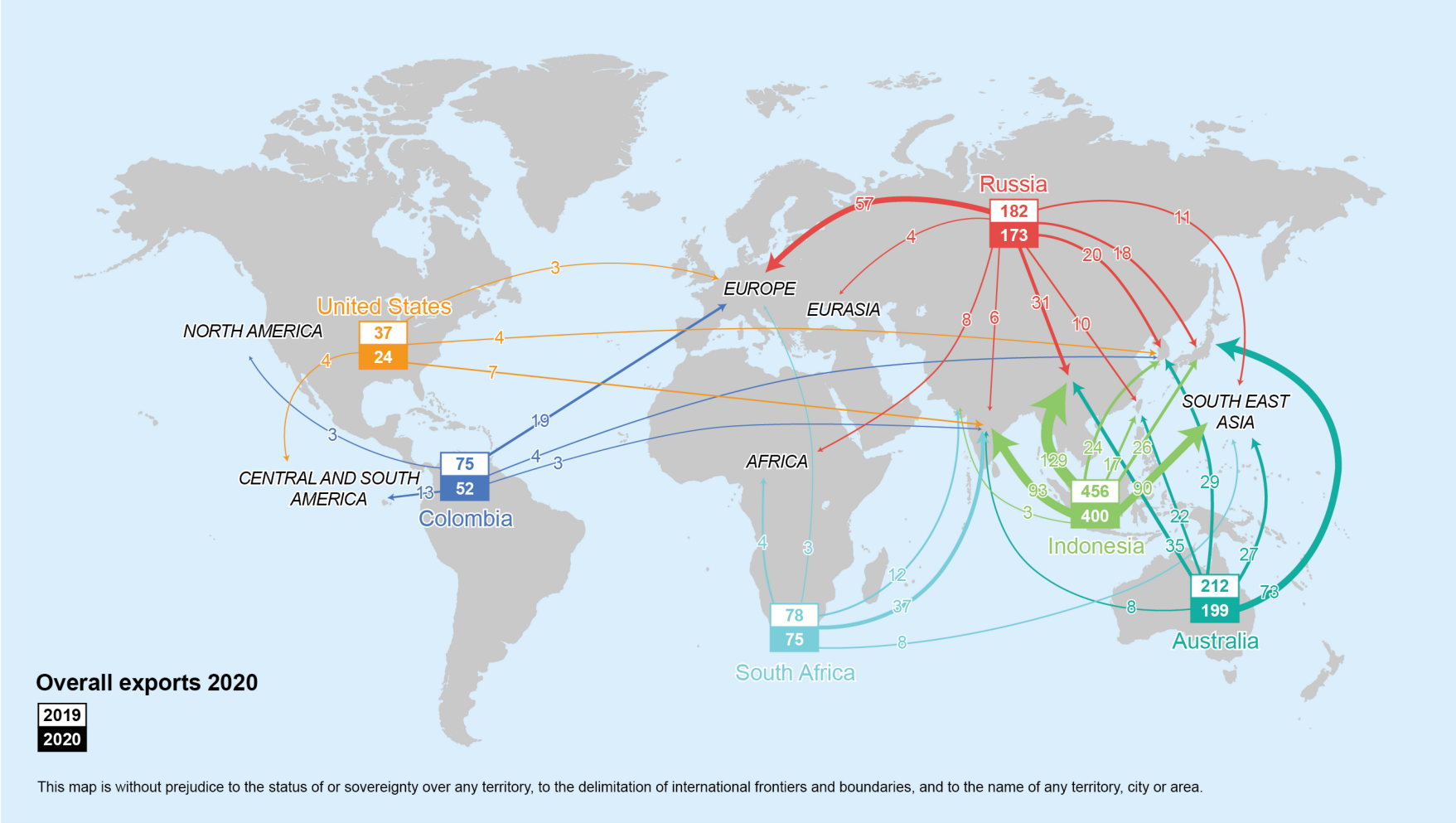
China was the largest importer of thermal coal in 2020, accounting for 23%, followed by India (15%) and Japan (14%) as well as Southeast Asia (13%). Europe receives around 8% of thermal coal imports.

Southeast Asia's imports expanded 8% in 2020 as coal demand increased, especially in Viet Nam, in response to strong economic growth. Imports by the Philippines and Thailand also rose slightly during the global pandemic, as did those of Japan (+1.7%) and China (+4.4%). Conversely, drastically lower imports by India (-16%) and Europe (-25%) were the main reason for the overall decline in thermal coal trade.

Thermal coal exports from all the main exporting countries decreased in 2020. The most severe drop was in Indonesia (-57 Mt/-12%) because its exports depend highly on the Indian market, which shrank dramatically in 2020. As demand from the Atlantic Basin market (especially Europe) was also severely impacted by the pandemic, thermal coal exports plummeted for Colombia (-23 Mt/-30%) as well as the United States (-13 Mt/-34%). Australian exports declined 12 Mt (-6%), underpinned by Chinese import restrictions. Other countries that exported lower volumes of thermal coal in 2020 are South Africa (-5%), which exported less to India, and Russia (-5%). However, even though Russian exports to Europe declined 18 Mt, its share in European imports overall increased slightly to 66%.

Largest exporters and importers are in Asia Pacific

Main trade flows in the thermal coal market, 2020 (Mt)



Note: Map values are based on available export data and do not necessarily match import numbers.

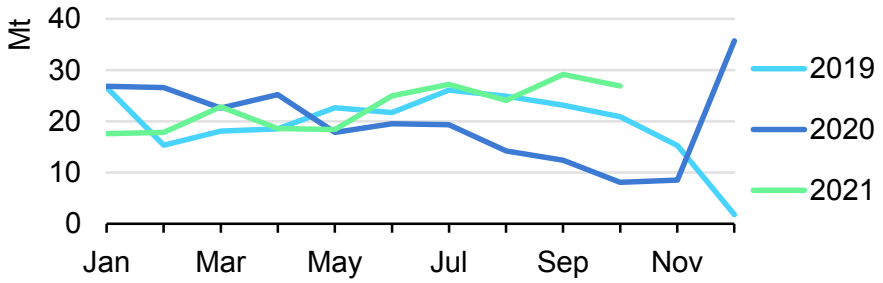
China's import policies are altering international markets

China's changing import policies have been affecting international markets for some years, and its recent import quotas have raised import volatility considerably. For instance, China's thermal coal imports jumped from just ~8.5 Mt in November 2020 to a record ~36 Mt in December 2020 as the government relaxed import restrictions in response to high demand resulting from a cold winter and industrial recovery, as well as domestic supply constraints. This increase in imports in December 2020 benefitted Indonesian producers, as it coincided with China's ban on coal imports from Australia due to worsening diplomatic relations.

In 2021, China's thermal coal imports of the first four months were lower than during the same period in 2020, as it filled the Australian coal gap only partially with coal from other exporting countries. Starting in June 2021, however, its imports rose to exceed those of the previous year, as domestic production could not keep pace with consumption and coal stocks were diminishing. The beneficiaries of China's increase in imports (still in the absence of Australian coal) were Russia, owing to quality reasons, and Indonesia to a lesser extent. Even South Africa, taking advantage of China's relaxation of imported coal fluorine levels, sent its first coal shipment to China since 2014. In fact, China's ban on Australian coal even opened up opportunities for Colombian and US producers in other markets.

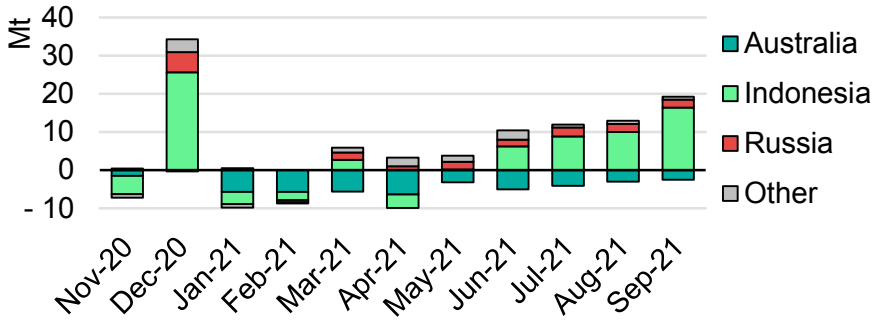
In October, China's coal imports rose 96% y-o-y as it battled coal shortages and replenished its inventories for the winter. Therefore, for 2021 overall, we expect Chinese thermal coal imports to be 8% (20 Mt) higher than in 2020.

China's monthly thermal coal imports, 2019-2021



Source: IHS Markit (2021), Coal Price Data and Indexes.

China's monthly y-o-y changes in thermal coal imports by origin country, 2020-2021



Source: IHS Markit (2021), Coal Price Data and Indexes.

Thermal coal import volumes remain stable to 2024, with increases limited to Asia

At 1 059 Mt, total global thermal coal imports for 2021 will be ~3.6% (50 Mt) higher than in 2020. In addition to China, thermal coal imports are rebounding in many other regions around the world, especially the European Union (+39%/+19 Mt). With very few exceptions (notably Poland), EU countries rely on imports to meet their thermal coal demand. Rising demand (driven by greater coal use for power generation) therefore results in higher imports.

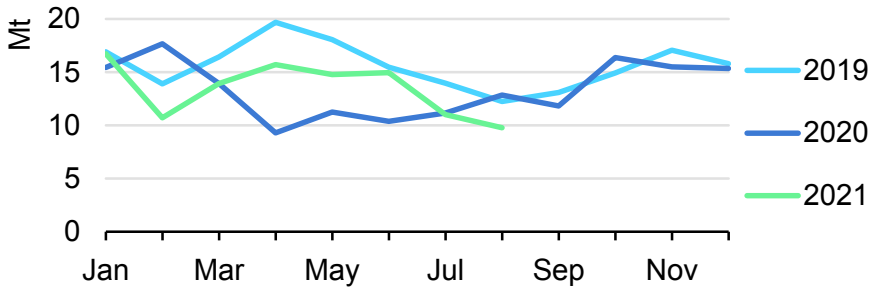
In India, consumers are very price-sensitive, so high international coal market prices have a stronger effect on imports here than elsewhere. Therefore, even though coal shortages have impacted India's electricity supply as well as some of its industries, we expect the country's total thermal coal imports for 2021 to fall 5 Mt (-3%).

The situation is more complex in Korea and Japan, where high coal spot prices compete marginally with high gas spot prices, but considerable portions of the countries' fuels are supplied through term contracts (with gas prices being oil-indexed and coal prices being generally fixed). The imports of both these countries fluctuate with weather conditions, fuel prices or nuclear output.

Leading up to 2024, total global thermal coal imports are forecast to decrease slightly, to 990 Mt, as declines in China and other countries outweigh import expansion in India. We expect an increase in thermal coal imports by India (+13 Mt) as well as other regions of Asia (for example Southeast Asia [+26 Mt]) with continued economic growth and greater coal use for power generation. Although India's increase in thermal coal imports is dampened by efforts to expand its own production, domestic output will not be sufficient to meet increasing demand unless commercial blocks ramp up production very quickly.

China's efforts to replace imports with larger shares of domestic production are expected to be more successful, leading to an import decline (-60 Mt), although of all countries' thermal coal imports covered in this forecast, those of China are probably the most uncertain. We further expect lower thermal coal imports by the European Union (-24 Mt), Japan (-14 Mt) and Korea (-8 Mt). In these regions, falling import volumes reflect declining coal demand, especially for electricity generation.

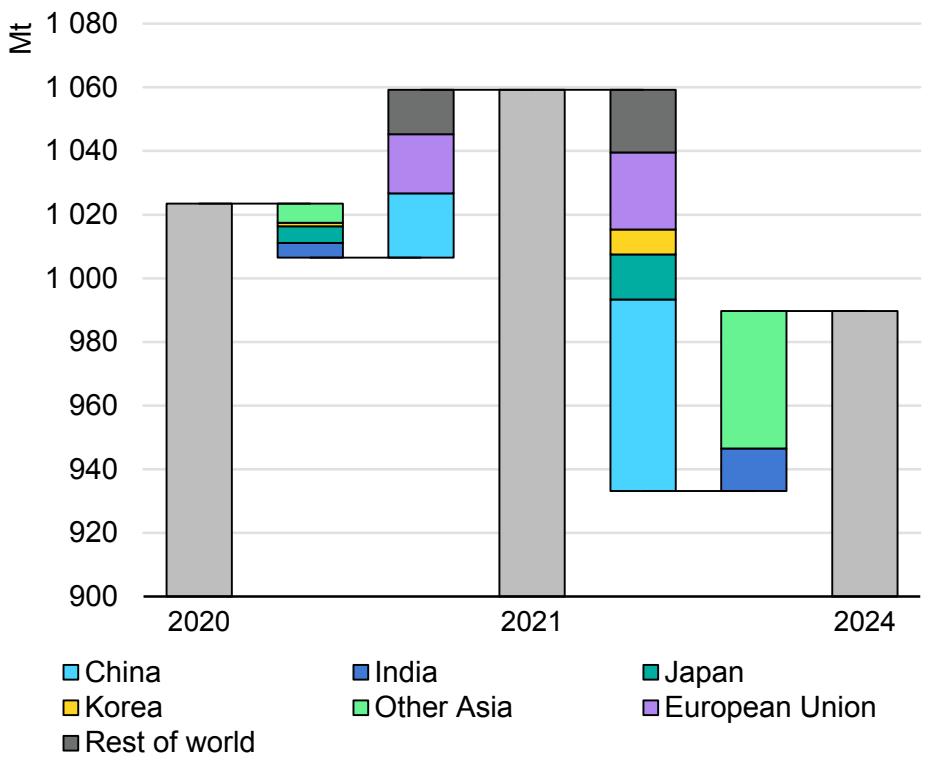
India's monthly thermal coal imports, 2019-2021



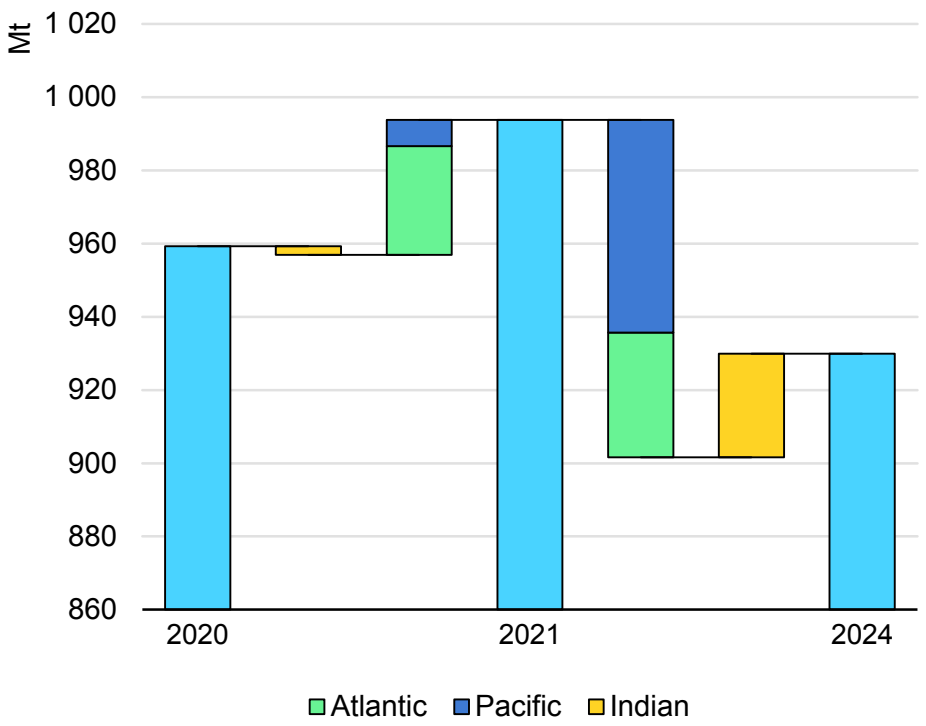
Source: IHS Markit (2021), Coal Price Data and Indexes.

The 2021 uptick in Atlantic Basin thermal coal imports is a short-lived phenomenon

Thermal coal import changes, 2020-2024



Seaborne thermal coal trade changes by basin, 2020-2024



Note: The “Indian” category covers India, Pakistan, Bangladesh and Sri Lanka.

Thermal coal exports recovered in 2021, while China's ban on Australian coal distorted flows

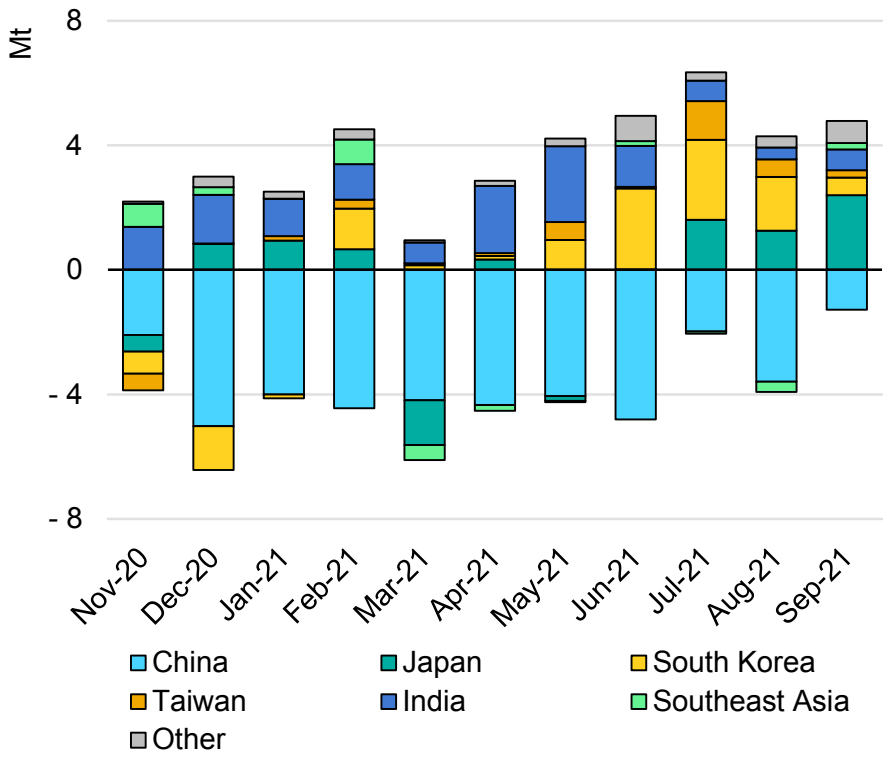
With coal demand rebounding in 2021, thermal coal exports are expected to be 71 Mt (+7%) higher than in 2020. 2021's exports will surpass its imports because 2020's recorded imports were artificially high due to delays in discharging coal ships at China's ports at the end of 2019.

We expect Indonesia to register the largest increase in thermal coal exports (+9%/+35 Mt). Indonesian exporters are profiting the most from rising import demand in Asia, especially China, as Chinese customers prefer Indonesian coal for its quality and price. In the first half of 2021, the share of Indonesian thermal coal in China's imports rose to 72%, up from 61% in 2020. As a result of China's ban on Australian coal, Australian exporters have found other markets, mainly in Asia, and their exports are expected to recover by 8 Mt (+3.8%) in 2021 as they send more coal to India and Korea.

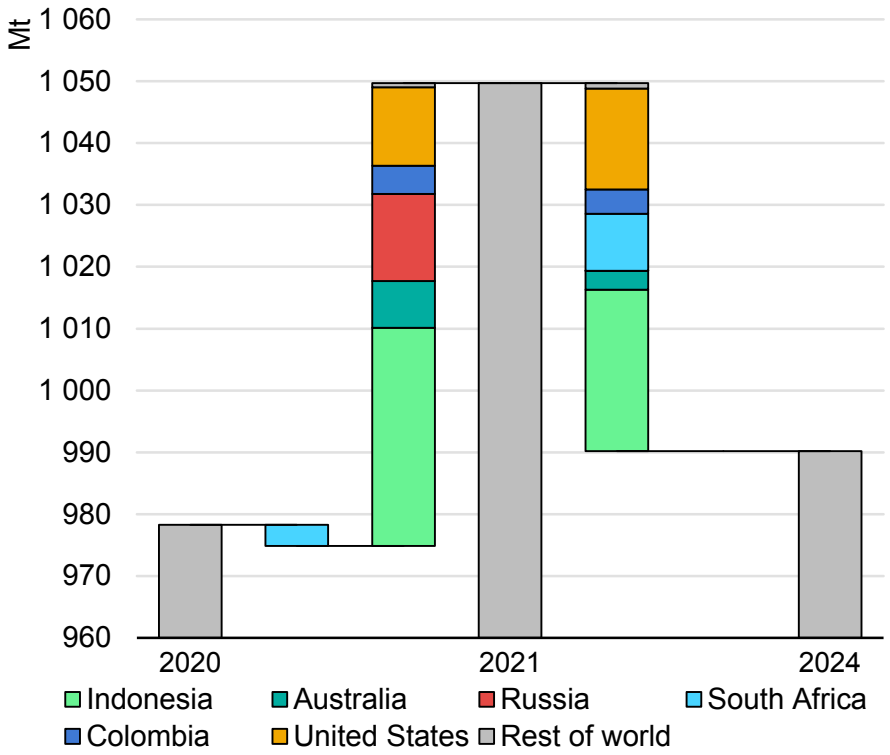
With the strong recovery in import demand in the Atlantic Basin, especially Europe, higher exports are expected from Russia (+14 Mt), the United States (+13 Mt) and Colombia (+5 Mt). South Africa is the only major thermal coal exporter for which a decline is foreseen (-3 Mt), resulting from structural issues such as underinvestment in recent years, rail network problems and social unrest following detention of the country's former president. In addition, India's market, which is the key buyer of South African coal, is very price-sensitive and therefore reduced its imports when coal prices skyrocketed.

Looking ahead to 2024, we expect thermal coal exports to fall to 990 Mt (-6%), the main contributor being the United States (-16 Mt), as demand in the Atlantic Basin, particularly Europe, returns to a declining trajectory. South Africa (-9 Mt), Australia (-3 Mt) and Indonesia (-26 Mt) are also affected by the overall contraction in thermal coal imports, but Russia's exports are likely to remain roughly stable. As a low-cost supplier, Russia will gain market shares if it can expand its rail infrastructure quickly enough.

Australia's monthly y-o-y thermal coal exports changes by destination, 2020-2021



Global thermal coal export changes, 2020-2024



Source: IHS Markit (2021), Coal Price Data and Indexes.

Metallurgical coal

Met coal trade is concentrated in Asia, with Australia leading exports

Although the met coal market has only one-third the volume of the thermal coal market, international trade is more important for met coal. In 2020, about 318 Mt or 29% of total met coal consumed was imported, of which 286 Mt (88%) was acquired through seaborne trade. Met coal trade declined 33 Mt or 9% from 2019 to 2020.

The market for met coal is highly concentrated on the export side, with Australia being the dominant global supplier (54% share in 2020). Other countries with significant market shares are the United States (12%), Canada (9%), Russia (12%) and Mongolia (7%).

Asia Pacific countries accounted for 74% of all met coal imports in 2020, with China leading the way at 24%, although China's imports were 8 Mt (-10%) lower than in 2019 because its domestic production had increased. Japan's imports also decreased (– 9%) as its steel industry suffered significant production cuts due to the economic slowdown during the pandemic, as well as structural changes.

Meanwhile, Southeast Asia registered higher met coal imports (+15%) in 2020 as more coking coal was required for new blast furnaces, especially in Indonesia, Viet Nam and India (+3.7%). Europe as a whole remained one of the largest importers because of its large iron and steel production capacities and limited domestic met coal supply, accounting for 16% of all imports. Yet, imports by Europe declined 9 Mt (-15%) in 2020 as reduced steel production cut demand.

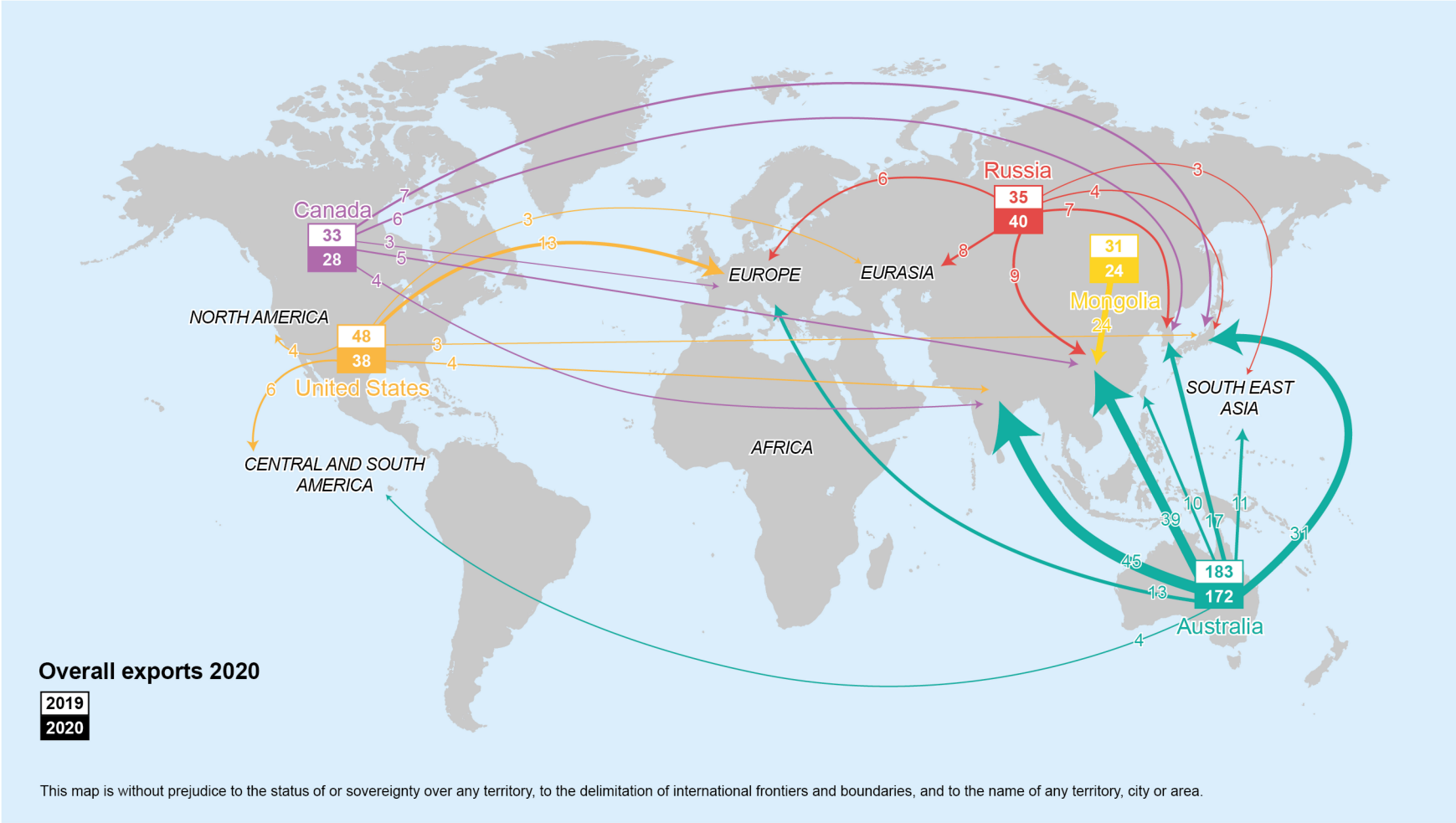
In terms of exports, 26% of the met coal Australia exported in 2020 went to India, its other major buyers being China (23%) and Japan (18%). Australian exporters benefitted from increasing imports by Southeast Asia in 2020, but less of their met coal was imported by China (due to its ban on Australian coal) and by India. Australian exports therefore decreased 6% in 2020.

At the same time, exports from the United States contracted strongly (– 20%) as low coal prices made production uneconomical for higher-cost US producers. In Mongolia, which exports met coal by truck to China only, exports dropped 23% in 2020 due to temporary closures and pandemic-related restrictions at the Chinese-Mongolian border.

In contrast with the other major met coal exporters, Russia's exports expanded 12% in 2020.

Australia dominates met coal trade

Main trade flows in the metallurgical coal market, 2020 (Mt)



Note: Map values are based on available export data and do not necessarily match import numbers.

India is set to overtake China as the world's largest met coal importer

Global met coal imports are expected to increase 3 Mt (+1.0%) to 323 Mt in 2021. Despite this growth, however, total imports remain below the 2019 level.

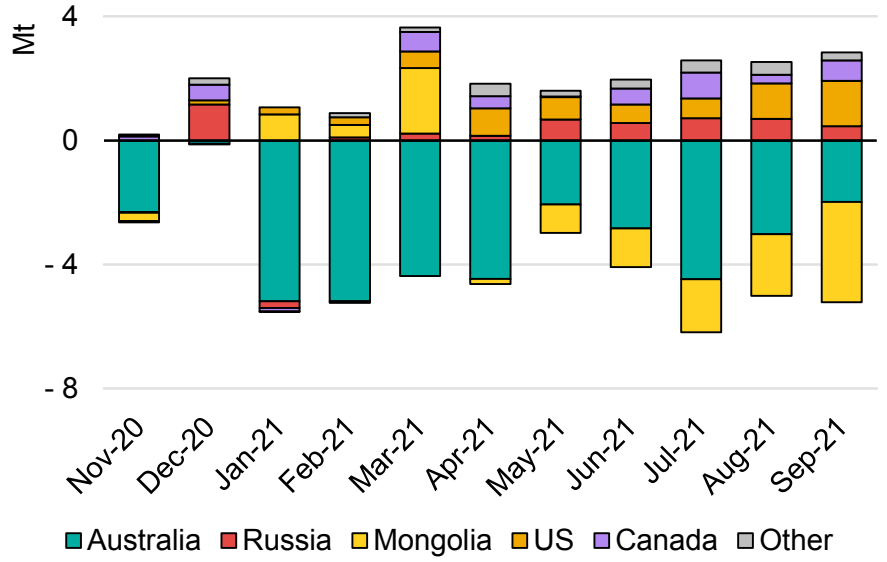
In 2020, Australia accounted for ~50% of China's met coal imports, and when China banned Australian coal, other suppliers filled the gap. Mongolia became China's leading supplier of met coal, even though its exports were hampered by pandemic-related restrictions at the Mongolia-China border. As a result, US, Canadian and Russian met coal made up a greater share of China's imports.

We expect China to remain the world's primary importer of met coal in 2021, even though it appears set to register a decline of 8 Mt (-10%) this year. China's lower imports result from two compounding factors: while falling steel production since July has reduced its coking coal needs, the country has remained firm in its ban on Australian coal despite record-high domestic coking coal prices and arbitrage opportunities.

Meanwhile, other countries' met coal imports are rising as their economies and steel production recover from the 2020 downturn. Considerable increases are being recorded in Korea (+6 Mt) and Japan (+4 Mt).

Leading up to 2024, we expect the imports of advanced economies such as Japan, Korea and European countries – as well as China – to flatten, following anticipated demand developments. India is the only country for which we foresee a significant import increase (+13 Mt) as pig iron and steel production continue to expand. In fact, India is forecast to overtake China as the largest importer of met coal in 2024, and India's rising imports lead us to expect global met coal imports to increase 23 Mt to 346 Mt.

China's monthly y-o-y met coal import changes by origin country, 2020-2021



Source: IHS Markit (2021), Coal Price Data and Indexes.

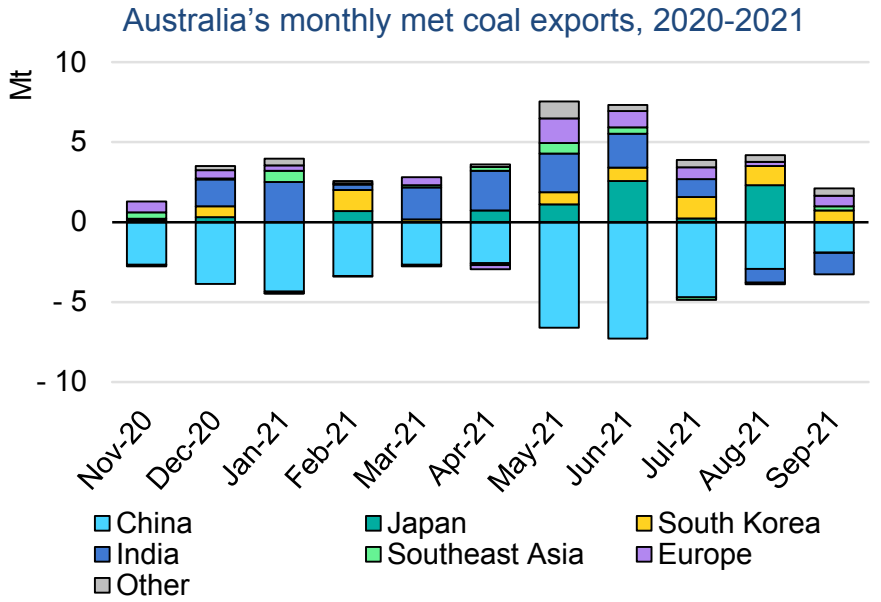
Australia remains the leading exporter of met coal by far

Met coal exports are estimated to rise ~3 Mt (+1.0%) in 2021, with Australia, by far the world's largest met coal exporter, responsible for the bulk of the increase. Australia's anticipated 3-Mt export expansion in 2021 is rather small, but the destination of its met coal exports has changed dramatically. While one-quarter of Australia's met coal exports were destined for China in 2020, in 2021 it had to find other buyers. It exported more met coal to India in particular, but Japan, Korea and Europe also received more Australian coal.

Looking forward to 2024, US and Canadian met coal exports are forecast to remain roughly stable, as we do not expect these countries to increase their production in the short term to take advantage of rising demand. The main met coal suppliers to benefit from rising imports are Australia (+9 Mt), Russia (+5 Mt), Mongolia (+7 Mt) and Mozambique (+3 Mt).

All these countries have potential to increase their exports in the short term, either by expanding their production capacity (e.g. Australia and Russia) or by removing constraints that currently hinder export expansion (Mongolia). Mozambique's increase represents an almost doubling of its exports between 2021 and 2024, although it must be noted that Vale's assets in the country are for sale. While future exports will essentially depend on the new owner's strategy, the country has all necessary mining, rail and shipping capacity in place.

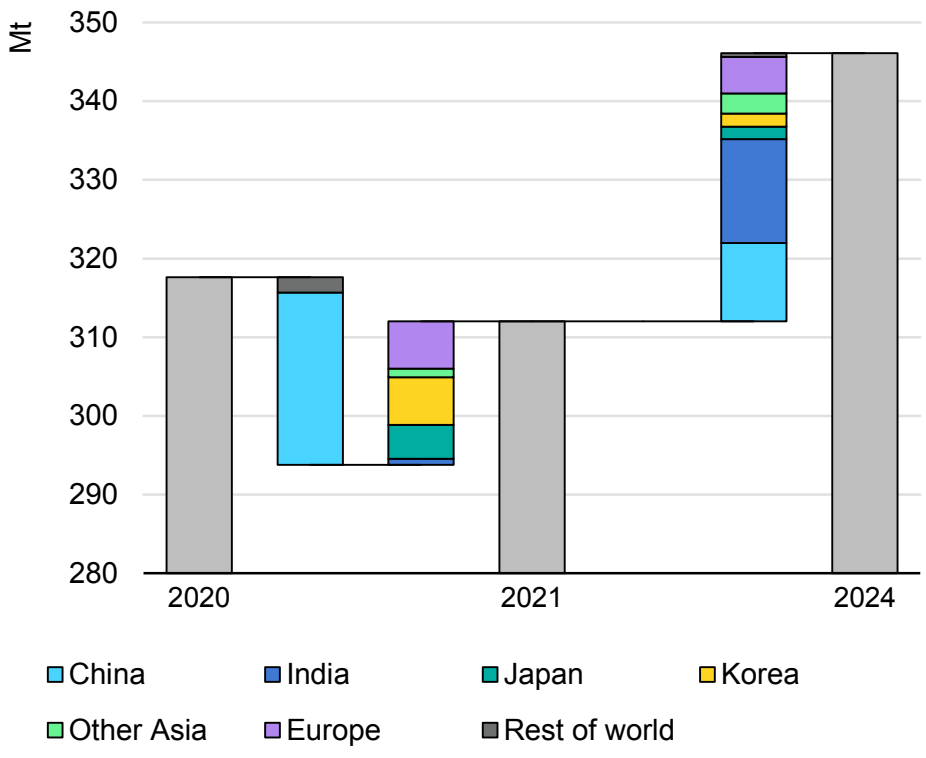
We therefore expect total global met coal exports to increase to 346 Mt in 2024.



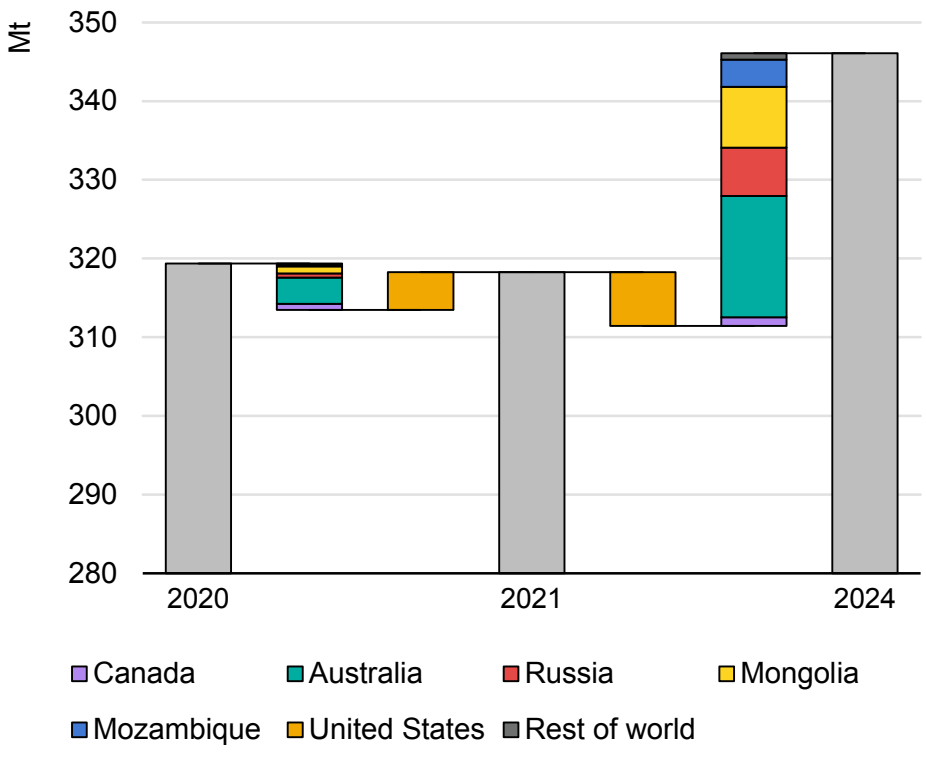
Source: IHS Markit (2021), Coal Price Data and Indexes.

Driven by India, met coal trade continues to expand

Met coal import changes, 2020-2024



Met coal export changes, 2020-2024



Source: IHS Markit (2021), Coal Price Data and Indexes..

Prices and costs

Prices

China’s policies, supply disruptions and gas prices drove coal prices to record highs in 2021

Newcastle free on board (FOB) prices for thermal coal with a calorific value (CV) of 6 000 kcal/kg had fallen to a 14-year low at USD 46.5/t in late August 2020 but then recovered (and almost quintupled) within 14 months to USD 230/t in October 2021 – the highest price ever recorded. Coking coal prices followed a similar trend: after falling below USD 100/t at the end of 2020, they rebounded to more than USD 390/t in October 2021, also a record high. After peaking, thermal coal prices eased in November, dropping by 40%, whereas met coal prices remain very high.

Spot prices for **thermal coal** started recovering in the third quarter of 2020 after supply cutbacks were made to adjust production to reduced pandemic-level demand and China began importing more for prewinter stockage. Demand also rose with the beginning of the Northern Hemisphere’s heating season, and weather events such as China’s cold snap December 2020 further boosted thermal coal consumption and also disrupted the transport of coal from Inner Mongolia to demand centres on the coast.

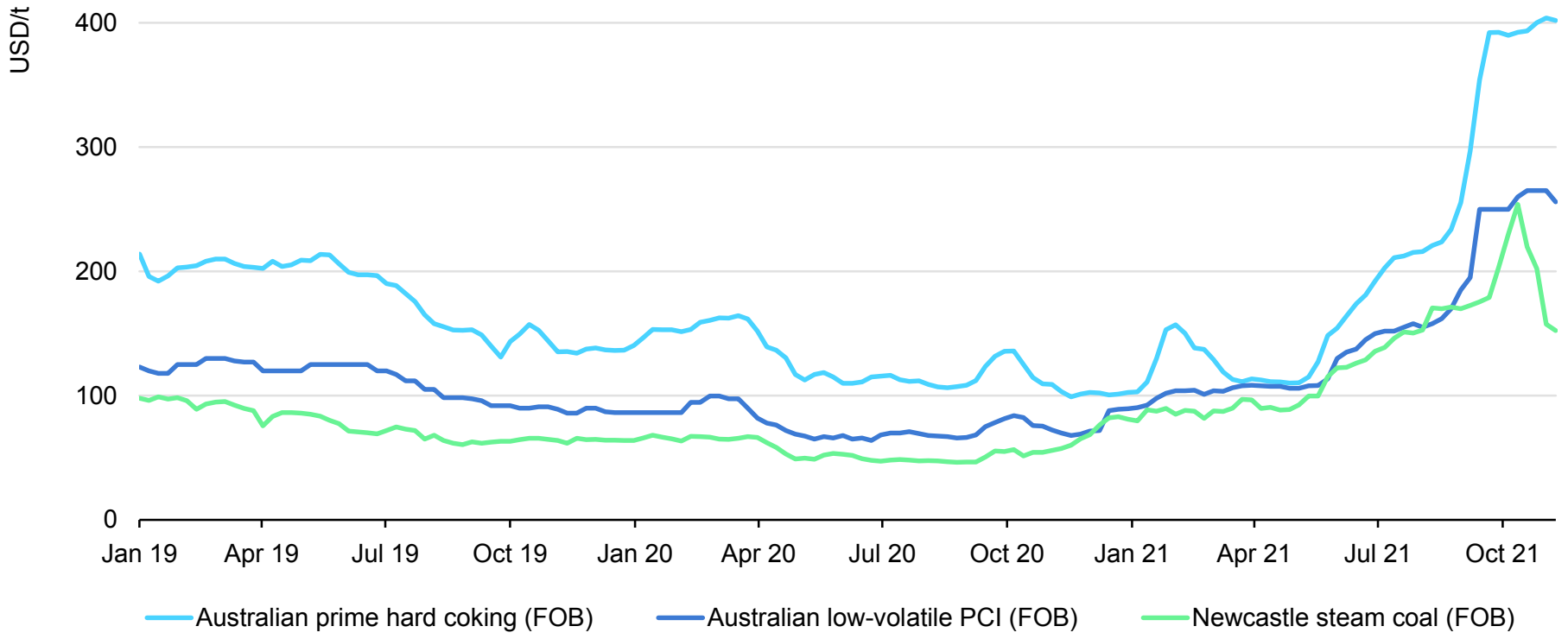
Thermal coal prices continued to rise in the first five months of 2021, then began to surge in May as supplies were unable to keep pace with strong demand in China. When Chinese domestic prices began to climb, international markets followed. Likewise, in October when a combination of higher production and lower demand in China pushed prices down, the effect was felt worldwide.

Tight global gas supplies and an even sharper rise in gas prices further raised demand for thermal coal, as coal remained more affordable in many regions. On the supply side, output was constrained by several disruptions: heavy rainfalls in Indonesia, floods in North China and storms in Australia. At the same time, logistical problems and pandemic-related restrictions delayed the loading and unloading of ships, causing freight rates to rise.

Coking coal prices collapsed in 2020 due to weak global steel production and poor economic outlooks during the first wave of the Covid-19 pandemic, and they did not recover until end of the year. Prices for Australian metallurgical (met) coal came under additional pressure due to the Chinese-Australian dispute over coal trading. Spot prices for coking coal rose to USD 157/t at the beginning of 2021 but fell back to the low level of ~USD 110/t within the first quarter as low steel production in 2020 had left high coking coal stocks. Prices increased again in mid-2021 as demand recovered in India and as Australia’s supplies became tight because of weather conditions, cleared inventories and low freight availability. Even though China’s steel production fell considerably in the third quarter, coking coal prices soared to record highs because of domestic supply constraints. In October 2021, one tonne of coking coal in the Dalian Commodity Exchange was worth up to USD 600, the highest price ever recorded.

After two years of decline, coal prices rebound to all-time highs

Marker prices for different types of coal, 2019-2021



Notes: FOB = free on board. PCI = pulverised coal injection.

Source: IHS Markit (2021), Coal Price Data and Indexes.

Supply disruptions underpinned coal price hikes

While strong demand growth has been the main driver of surging coal prices, supply issues have also played a role. In the second half of 2021, as coal production and logistics disruptions around the globe tightened coal supplies and made it difficult for suppliers to get their coal to market, prices rose sharply in the face of declining stocks and high demand.

In China, thermal coal production decreased and coal transports to coastal provinces were delayed by heavy rainfalls and flooding in North China in July, August and October 2021. Furthermore, following a series of accidents, safety regulations were tightened and mining operations were interrupted more frequently for safety reasons. At the same time, pandemic-related restrictions hampered coal supplies. Coking coal imports from Mongolia, already low due to pandemic containment measures, were suspended for a week in August after several truck drivers tested positive for Covid-19. Plus, Chinese ports require foreign ships to quarantine for 7 to 21 days, and some ports have also been partially or fully shut down, delaying ship loading and unloading and raising coal freight rates in Asia.

Indonesian coal exporters have not been able to fill China's supply gap. Heavy rainfalls in the coal-rich regions of Kalimantan and Sumatra constrained coal production in 2021 and even forced several producers to declare force majeure in the third quarter of the year. Low heavy-equipment availability also limited the ramping up of coal production, so to secure the country's own domestic supply, Indonesian authorities called for compliance of domestic market obligations for more than 30 mining companies to limit coal exports. This intensified supply scarcity in East Asian seaborne coal markets and drove prices up in August and September 2021.

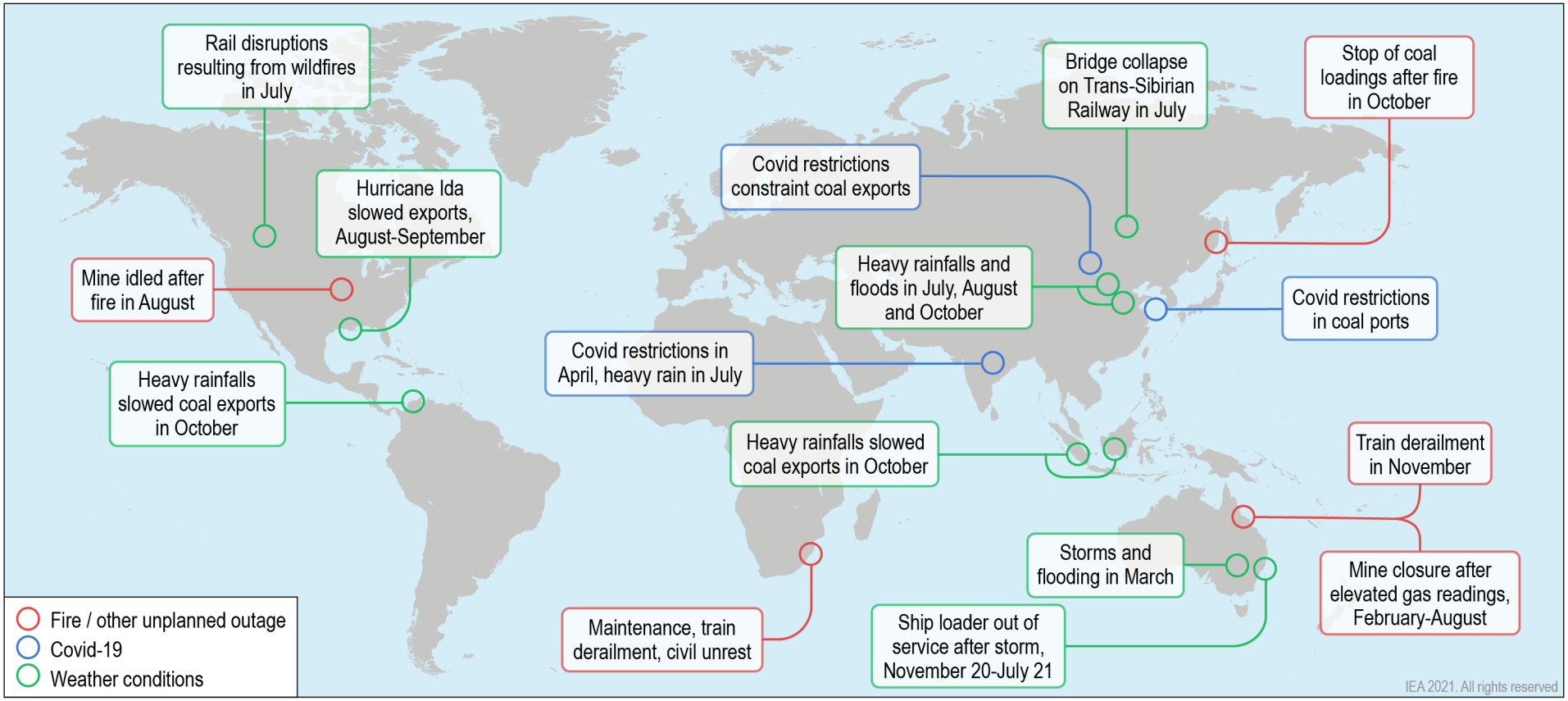
Meanwhile, Australian exporters struggled to raise production as a result of strategic decisions, weather conditions and problems related to the Covid‑19 pandemic. Because of the premium on high-quality coal, producers focused on production in this segment, with the result that total coal output is in fact lower when the yield of the washing process is considered. Several weather-related events have adversely affected both Australia's export and production capacities. At the Port of Newcastle, a storm that blew a shiploader off its rails reduced export capacity by 1.25 Mt/month from November 2020 to the end of July 2021. A second shiploader was inoperative for two weeks in March 2021, forcing all coal exports to go through Newcastle's Port Waratah Coal Services (PCWS).

Furthermore, the 6.5-Mtpa Moranbah North coal mine was closed between February and August 2021 due to elevated gas readings, and in March, storms and severe flooding disrupted coal production, transportation and exports in New South Wales. The Grosvenor mine, with a capacity of 5 Mtpa, stopped mining between May and August after an explosion, and Covid-19 outbreaks have been disrupting supplies since August (e.g. the 7-Mtpa Boggabri coal mine had to be shut down for a week in August after a worker tested positive). Plus, the Government of Queensland closed its borders to both international and interstate arrivals, making the recruitment of

new workers difficult. Indeed, a shortage of skilled workers is the number-one concern at the moment. Last, a recent derailment on the 15-Mtpa Moura coal rail line constrained Australia's exports.

Other supply-side disruptions include a partial closure of the United States' largest coal mining complex, Sugar Camp, in August, by order of the US Mine Safety and Health Administration, as well as rail and port logistics disruptions in South Africa due to inadequate maintenance, train derailments and civil unrest. In Canada, Teck Resources' four open-pit coking coal mines in the Elk Valley have had significant logistical disruptions due to wildfires. At Port Vanino, one of Russia's largest ports (it handled 23 Mt of coal in 2020), a fire destroyed a conveyor belt in October, forcing SUEK to declare force majeure for coal loading. In Colombia, the heaviest rains in a decade complicated Drummond's coal exports in October.

Selected major coal supply disruptions, 2021

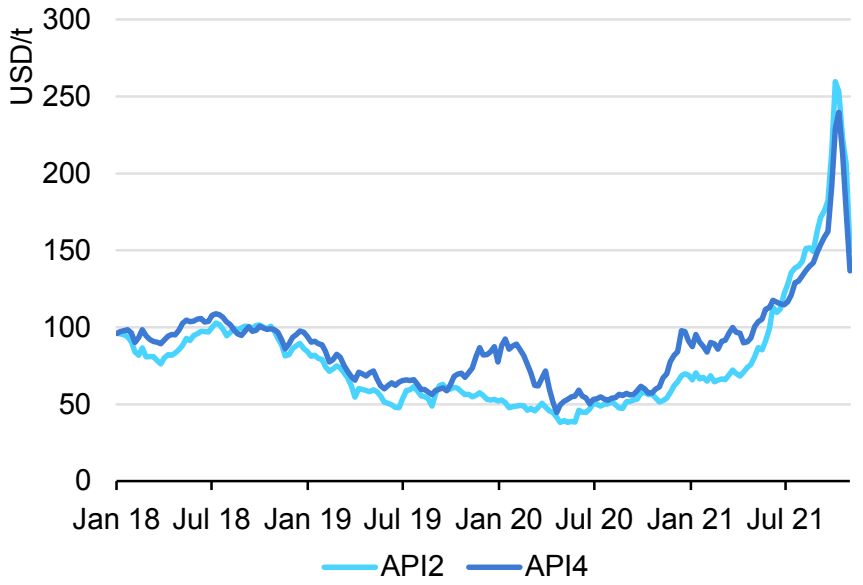


European coal prices are increasing considerably as gas prices offset rising carbon prices

The Argus/McCloskey's Coal Price Index[11] (API) 2, which tracks cost, insurance and freight (CIF) prices in Europe, was for a long time lower than the API4, which charts Richards Bay FOB prices. This trend began when South African exports shifted from Europe to Asia. In winter 2019/2020, when demand in Asia was high, API4 spot prices were significantly higher than European API2 prices. However, API4 prices fell sharply when the Covid-19 pandemic impacted Asian coal demand in the first half of 2020. They were close to but still above those of the API2, but at the end of 2020 the price spread increased again. The API2 spot price began climbing in June 2021, and in July it surpassed the API4, breaking the trend of recent years.

The API2 price finds strong support from a natural gas shortage in Europe. Although carbon prices have reached record highs of EUR 80/tCO_2, rising gas prices are provoking a power generation switch, back from gas to coal. Taken together, limited emissions allowances and tight coal and gas supplies are creating a positive feedback loop. While restricted access to EU emissions allowances has boosted gas demand, tight supplies have caused gas prices to rise so high that they are fully offsetting the effects of carbon pricing. This in turn has driven up coal demand and prices, providing support for the EU emissions allowance price. Following China's dynamics, prices went down in November from October peaks.

Thermal coal (6 000 kcal/kg) price markers, 2018-2021



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

Source: IHS Markit (2021), Coal Price Data and Indexes.

[11] Index prices for international physical and derivative coal markets.

Chinese consumers continue to pay a premium for coal

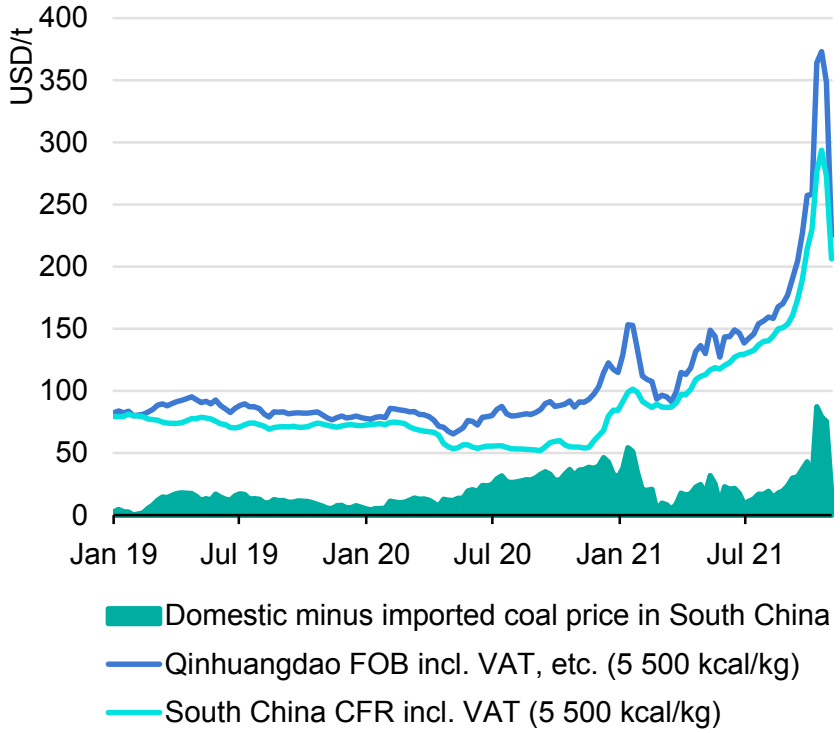
China's policies to rein in imports have led to spreads between coal prices in China and the Pacific Basin. For some years now, the main driver has been China's import quotas, of which the exact terms and volumes are not disclosed by official sources. More recently, its ban on Australian coal has further raised the premium Chinese consumers pay for coal.

In 2019, domestic thermal coal prices (Qinhuangdao FOB) were 14% above international prices (South China cost and freight) on average. This price spread rose further when China stopped importing coal from Australia in April 2020, widening it to USD 21/t or 38% in 2020.

In January 2021, the price spread jumped to USD 54/t due to high domestic coal demand for power generation as well as heating during an exceptionally cold winter in China. Shortly afterwards, however, the domestic coal price fell sharply and the price spread shrank to USD 4/t as demand decreased with milder temperatures and the Chinese New Year holidays in February. In the second quarter of 2021, both Chinese domestic and international coal prices rose again, and in mid-October the price spread spiked at USD 87/t, a relative premium of about 30%.

This price spread signals arbitrage opportunities for Chinese traders, but they were not able to exploit them due to China's import restrictions. This situation increases pressure for China's policymakers, who must balance support for domestic production against the economic attractiveness of lower import prices.

Price arbitrage in China, domestic vs imported coal, 2019-2021



Notes: FOB = free on board. CFR = cost and freight. VAT = value-added tax.

Source: IHS Markit (2021), Coal Price Data and Indexes.

Segmentation by coal quality in Asia continues

Thermal coal, traded in the Pacific Basin, can be categorised by its calorific value (CV). Although there is potential for substitution among the various coal qualities, their differences designate separate market segments.

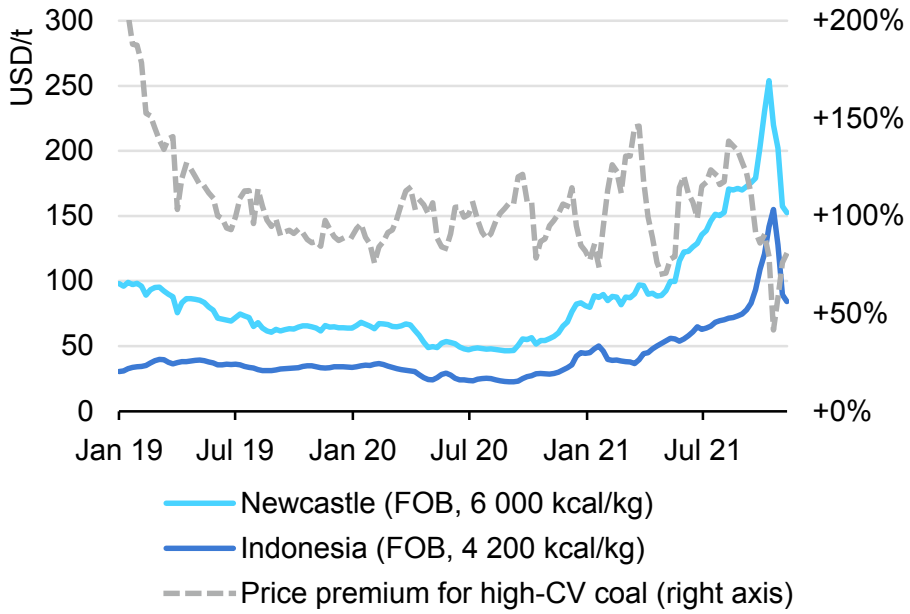
In 2020, high-CV coal (> 5 700 kcal/kg) made up less than half of thermal coal exports to the Asia Pacific region. Australia held the largest market share (44%), with ~86% of its thermal coal exports being high-CV. The main importers were Japan, China, Korea and Chinese Taipei.

Low-CV coal (< 4 500 kcal/kg) represented about one-quarter of coal exports to the Pacific Basin. The largest exporter is Indonesia, which accounted for 96% of global low-CV thermal coal exports in 2020, and the primary importers of its coal were China and India.

In 2019, mild winter conditions and low gas prices during the global economic slowdown put downward pressure on Australian high-CV coal prices, causing the relative price premium to fall from 200% to around 100% within half a year. Although China's ban on Australian coal imports has narrowed the gap, the relative price premium did not change significantly as Australian exporters found new buyers in India, South Korea and Viet Nam. Low-CV coal prices also fell as demand in India slumped in the wake of the Covid-19 pandemic.

Since late 2020, prices for both coal qualities have increased again due to a cold winter in northeastern Asia and recovery of the global economy. Supply shortages in China and India occurred in the third quarter of 2021, sending both prices upwards. The link between the two coal market segments has further diminished, which is reflected in a more volatile price spread between the two.

Thermal coal FOB price markers for different qualities of coal, 2019-2021



Note: FOB = free on board.

Source: IHS Markit (2021), Coal Price Data and Indexes.

Strong backwardation does not encourage investment

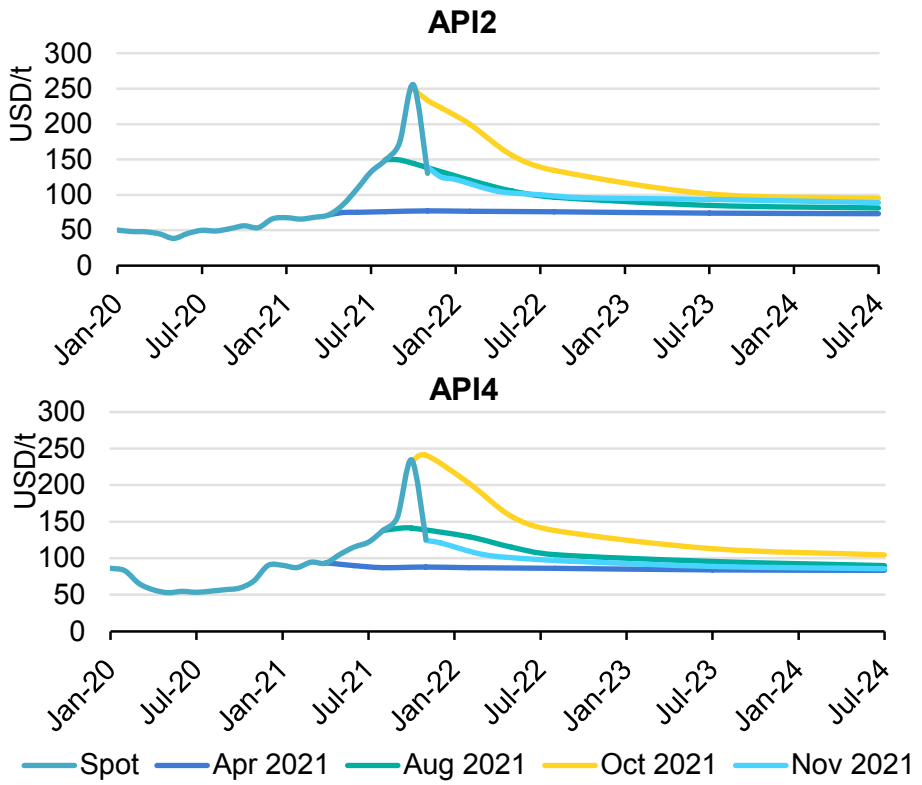
API2 (European CIF) forward price curves show strong short- and medium-term backwardation (i.e. when spot prices are higher than forward prices). Meanwhile, the API4 (South African FOB) price curve shows a contango (opposite to backwardation) until December 2021, with strong backwardation afterwards. While forward curves were flat in the first months of 2021, backwardation increased with surging spot prices until mid-October.

The European and Asian markets have become disconnected in recent years, as the API2 price (which is a CIF price) has fallen well below the API4 price (an FOB price). However, due to rising coal demand in Europe in 2021 because of high gas prices, a tight global coal supply and high freight rates, short-term API2 forward prices (t+3 months) have been above those of the API4 since July 2021.

In October 2021, market participants expected energy supply bottlenecks to be resolved more quickly in Europe than in Asia, resulting in higher forward prices for South African thermal coal for the winter, while Europe's forward coal prices fell. As of mid-November, API2 prices were already below API4 prices again, signalling a volatility episode in Europe. For 2022, a decline in both coal price indices is expected, yet anticipated prices for 2024 are more than USD 10/t higher than what was expected at the beginning of 2021.

This price backwardation does not offer incentives for investment in new production capacity that would take several years to realise.

API2 and API4 spot prices and forward curves, 2020-2024



Source: IHS Markit (2021), Coal Price Data and Indexes.

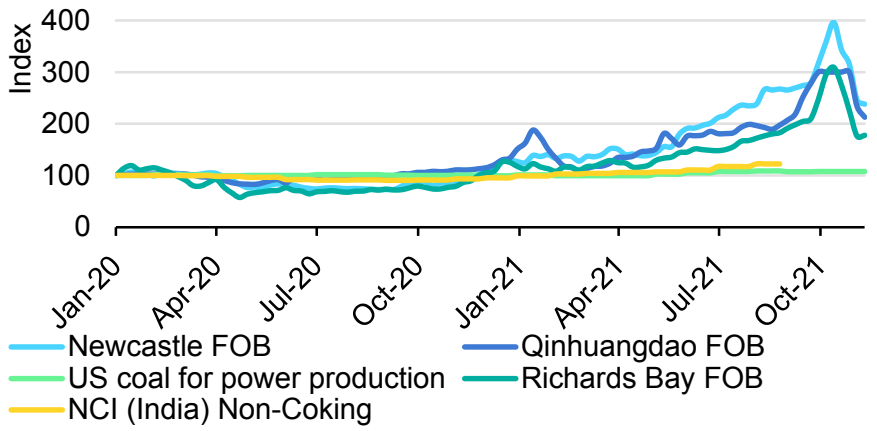
Price stability varies by region

A country's coal price volatility depends on how much its coal market is exposed to the global seaborne market, and on conditions in its domestic market. FOB prices in countries such as Indonesia, Australia and South Africa are correlated to a certain extent, as they are determined by global coal demand and supply development and are strongly influenced by China. Therefore, coal prices in countries relying mostly on imported coal are determined by prices set by China and major exporters. In markets such as India and the United States, however, coal prices depend more on domestic dynamics.

In 2020, the major price markers for seaborne coal declined 30-40% before rebounding and more than tripling in 2021. In China, ~30% of coal for power generation is contracted by the year and ~40% is by the month, with the balance procured through spot markets, which have recorded large increases. In contrast, domestic coal prices in India and the United States were largely stable and decreased less than 10% in 2020. Although prices in India had risen ~22% by August 2021, the increase was still well below that of seaborne thermal coal. In the United States, the price for coal delivered to power plants had risen only 5% by October 2021. Even though US coal consumption expanded sharply in 2021 as a result of rising gas prices, the country's coal prices hardly changed because existing mines and infrastructure were able to meet the increased demand and distribute higher production volumes. Clearly, domestic US coal consumption does not depend on imports: in fact, less than 1% of coal consumed in the United States in 2020 was imported. Interestingly, however, market tightness in United States is also pushing up coal spot prices in its domestic market.

In India, the National Coal Index (NCI) is a good gauge of coal prices for the various channels and markets. Since most coal is produced domestically and sold at regulated prices, the index reacts to global coal prices to a small extent only, compared with other coal market prices.

Indexed thermal coal price markers, 2020-2021



Notes: FOB = free on board. NCI = National Coal Index. Prices in China show large regional differences, but different regional prices follow similar trends.

Sources: IHS Markit (2021), Coal Price Data and Indexes; U.S. Energy and Information Administration; Ministry of Coal (2021), National Coal Index.

Costs

Falling prices in 2019 and 2020 reduced coal supply costs, as well as profitability

Met coal supply costs are typically higher than for thermal coal. As met coal mines are more often underground and on average smaller than thermal coal mines, their mining costs are higher. Furthermore, preparation costs for met coal are higher than for thermal coal.

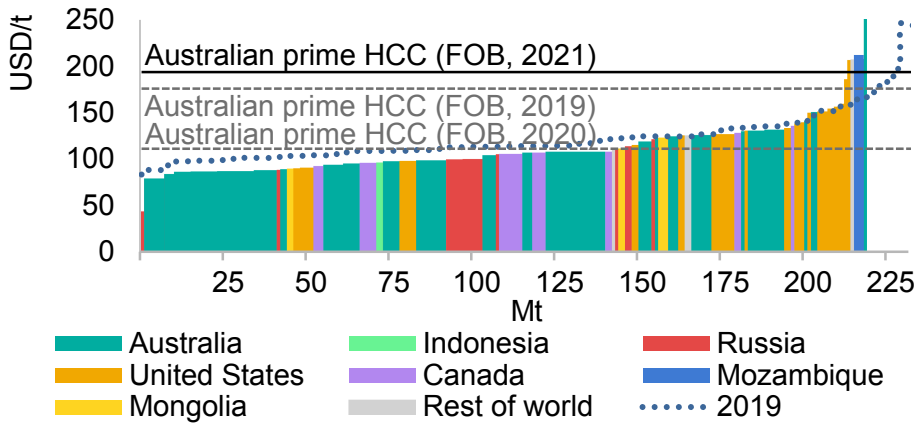
As supply costs for most coking coal mines decreased from 2019 to 2020, the average FOB price for Australian coking coal fell 37% to ~USD 111/t. Since supply costs for coking coal fell slightly, the profitability of met coal production decreased.

The supply cost curve for both high- and low-CV thermal coal veered downwards from 2019 to 2020. Average supply costs decreased in all countries, particularly Indonesia, Australia and South Africa, as fuel and labour costs fell. Total thermal coal exports also decreased in 2020, creating a shorter supply cost curve, at the expense of higher-cost producers, with Colombia's output especially declining strongly.

The average FOB price for Australian thermal coal with a CV of 6 000 kcal/kg fell 24% from 2019, to ~USD 58/t in 2020. Some coal is contracted at a fixed price in the Pacific markets, but the profitability of thermal coal mines contracting at indexed prices declined in 2020, and some mines even went into deficit, leading to supply cuts and mine closures.

Coal prices recovered in 2021: between January and October, the average FOB price for Australian high-CV thermal coal was ~USD 129/t. Despite rising costs (e.g. due to high fuel prices), the profitability of coal mines has increased significantly. Producers who reduced their output in 2020 are trying to increase production again, and some of the closed mines have reopened or are about to.

Indicative FOB hard coking coal supply curve, 2020, and average FOB marker prices

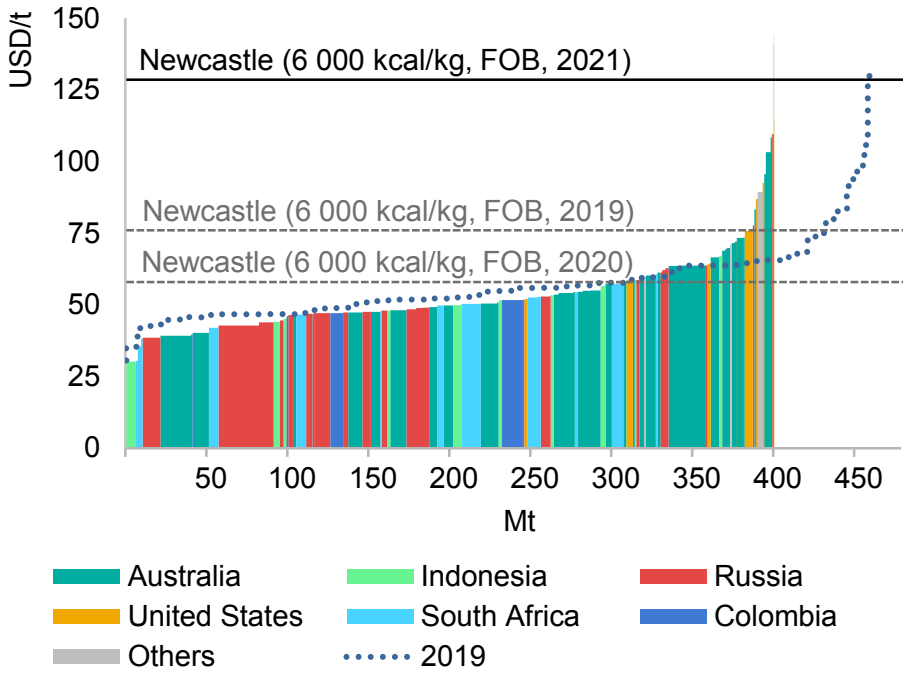


Notes: FOB = free on board. HCC = hard coking coal. Cost curves account for variable production costs, overburden removal, royalties, inland transportation and port usage fees. The annual average FOB marker price is based on the monthly average index for Australian prime hard coking coal. The 2021 price is based on the average for January-October.

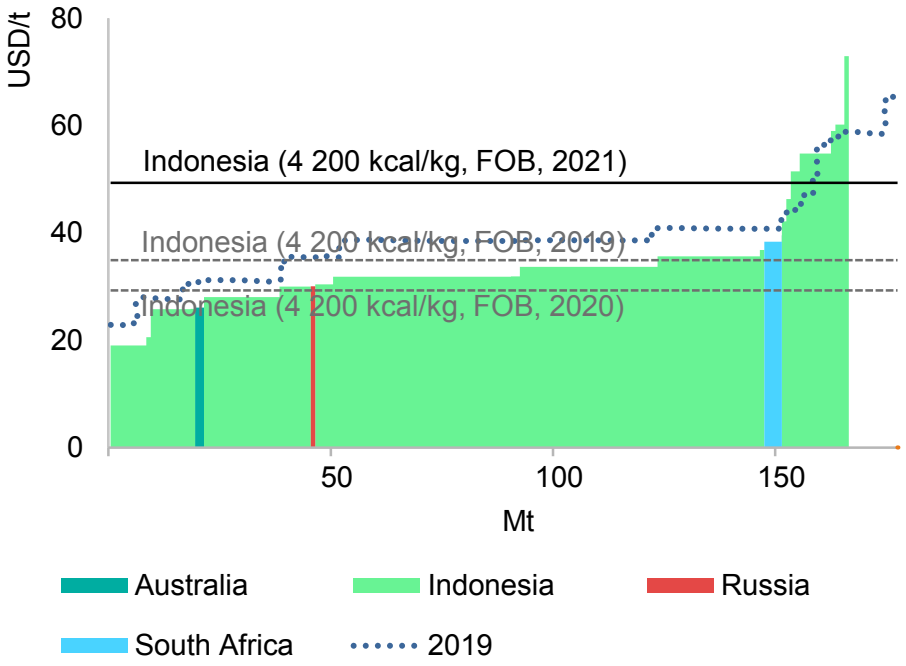
Sources: Adapted from CRU (2021), Metallurgical Cost Model (database); IHS Markit (2021), Coal Price Data and Indexes.

2021 was a once-in-a-decade year for coal producers

Indicative FOB high-CV (> 5 700 kcal/kg) thermal coal supply curve, 2020, and average FOB marker prices



Indicative FOB low-CV (< 4 500 kcal/kg) thermal coal supply curve, 2020, and average FOB marker prices



Notes: FOB = free on board. CV = calorific value. Cost curves account for variable production costs, overburden removal, royalties, inland transportation, and port usage fees. Cost curves are not adjusted for different qualities of coal. Transportation costs are to the closest port, so the FOB costs for Russian producers in Asia are somewhat higher than shown. Average annual FOB marker prices are based on the monthly average index for Newcastle/Indonesian steam coal. 2021 prices are based on the average for January-October.

Sources: Adapted from CRU (2021), Thermal Cost Model (database); IHS Markit (2021), Coal Price Data and Indexes.

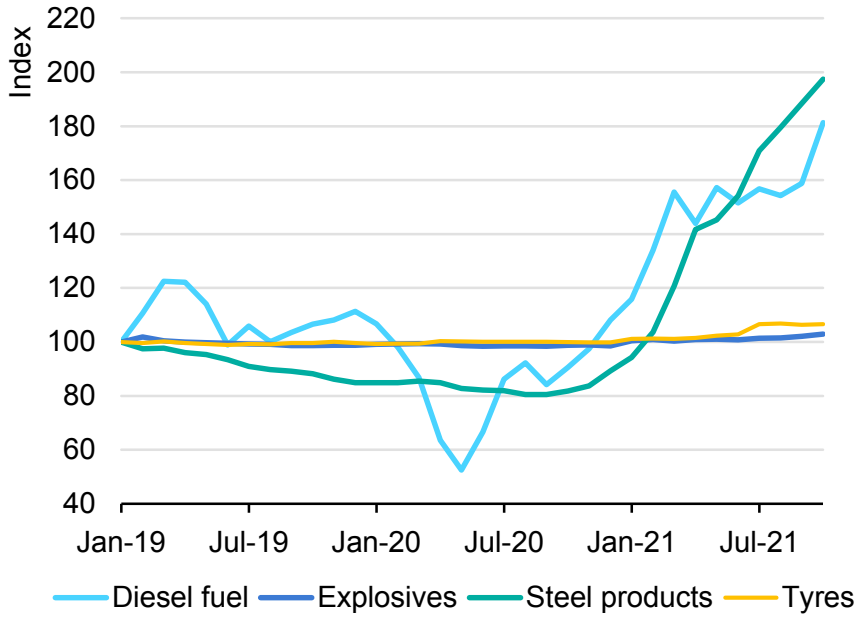
Coal mining input costs are rising sharply

Coal mining's cost structure is determined mostly by operating expenses such as cash costs (e.g. labour, fuel, taxes and royalties) and transportation expenditures (e.g. for inland transportation, port fees and seaborne freight). Cost proportions depend on the mining method, i.e. surface or underground, and can also vary significantly depending on the producer, country and specific mine location.

Inputs such as fuel, explosives, tyres and steel products are internationally traded, so their prices follow global trends. Prices for tyres and explosives have remained stable in recent years, whereas those of steel products fell in 2019 and 2020 because of trade friction, demand growth uncertainty and persistent excess production capacity. Due to global economic recovery and supply chain constraints since the end of 2020, however, prices for steel products have been rising significantly, and almost doubled between January and October 2021 to reach an historic high.

Similarly, diesel fuel prices dropped sharply in the first quarter of 2020 when oil demand and prices fell in the wake of the Covid-19 pandemic. By the end of 2020, both oil and diesel prices were recovering, and they reached 2018 levels in early 2021.

Nominal prices of selected coal mining commodities and inputs, 2019-2021



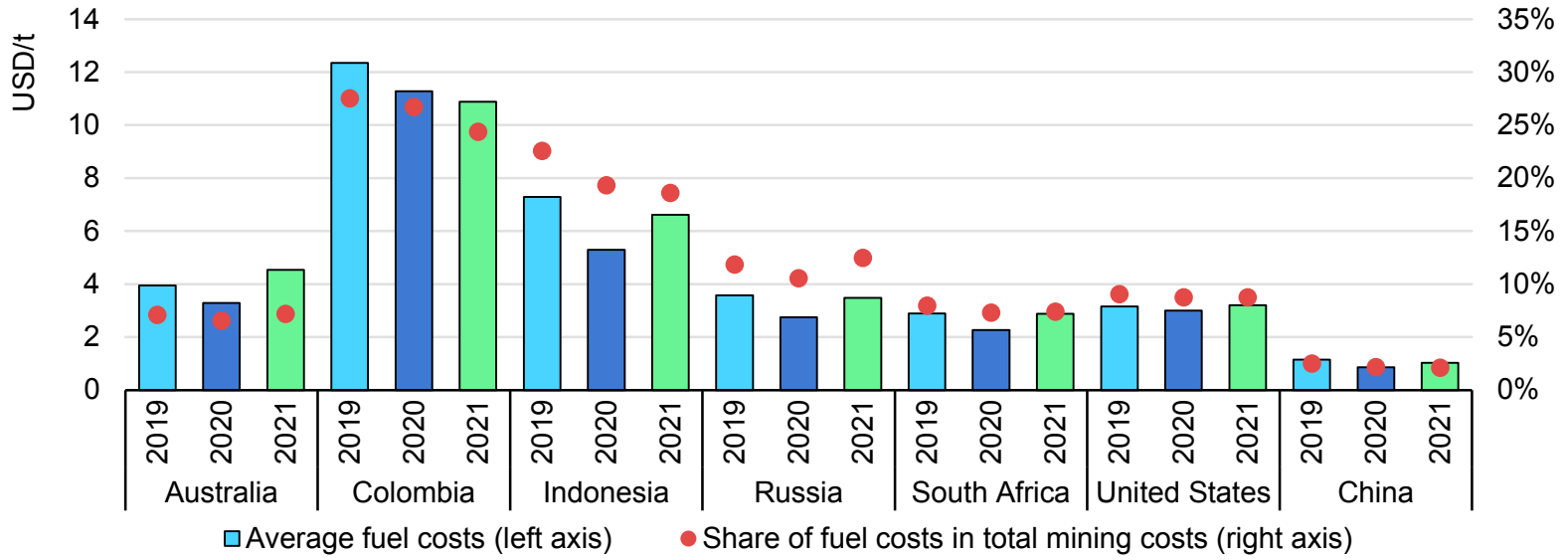
Source: US Bureau of Labour Statistics (2021), Producer Price Indexes.

Opencast mining costs have been more volatile due to higher diesel consumption

Diesel prices have a direct impact on a mine's operating costs, with opencast mines being particularly sensitive because they rely on diesel-fuelled trucks and other equipment. Fuel prices are therefore an important factor, especially for countries in which opencast mining predominates (e.g. Indonesia and Colombia). Countries such as China, where opencast mining represents a smaller fraction of production (just over 10%), are less affected by fuel price changes.

In 2020, the decline in oil demand caused by the Covid-19 pandemic led to a sharp plunge in diesel prices. The largest drop was in Indonesia, where prices were more than one-quarter lower on average than in 2019. When oil prices recovered in 2021, coal mining fuel costs in most countries rose again to close to 2019 levels. The proportional share of fuel costs increased in most countries in 2021.

Average fuel costs and their share in total coal mining costs in selected countries, 2019-2021

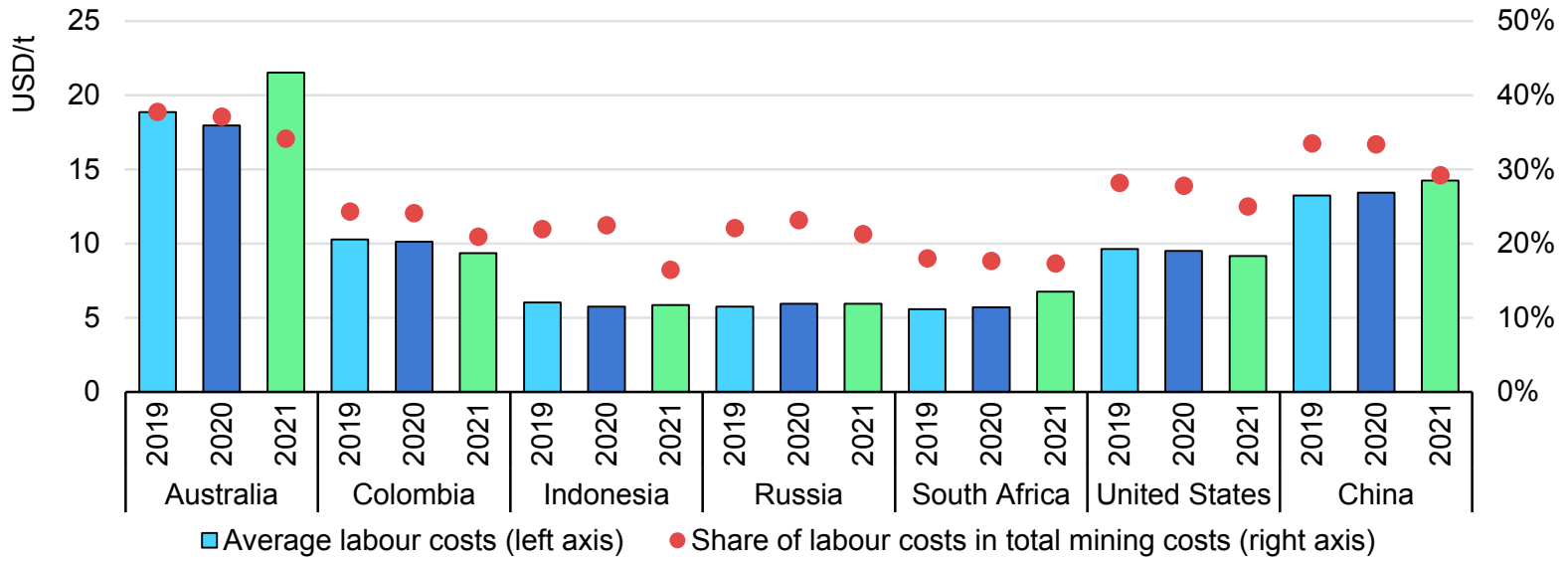


Source: Adapted from CRU (2021), Coal Cost Model (database).

Labour costs rise again in most countries

Labour cost levels and evolution vary among coal-producing countries and affect exporter competitiveness.[12] Movements in labour costs are largely explained by changes in currency exchange rates. In 2020, labour costs decreased in most countries other than the United States because of currency depreciation against the US dollar, while in 2021 they rose again – due mainly to currency appreciation against the US dollar. However, the share of labour costs in total expenses has declined in all countries, while other cost components have increased more strongly (e.g. diesel and steel product prices).

Average labour costs and their share in total coal mining costs in selected countries, 2019-2021



Source: Adapted from CRU (2021), Coal Cost Model (database).

[12] China is included because its domestic coastal coal trade of more than 700 Mt is comparable with global trade.

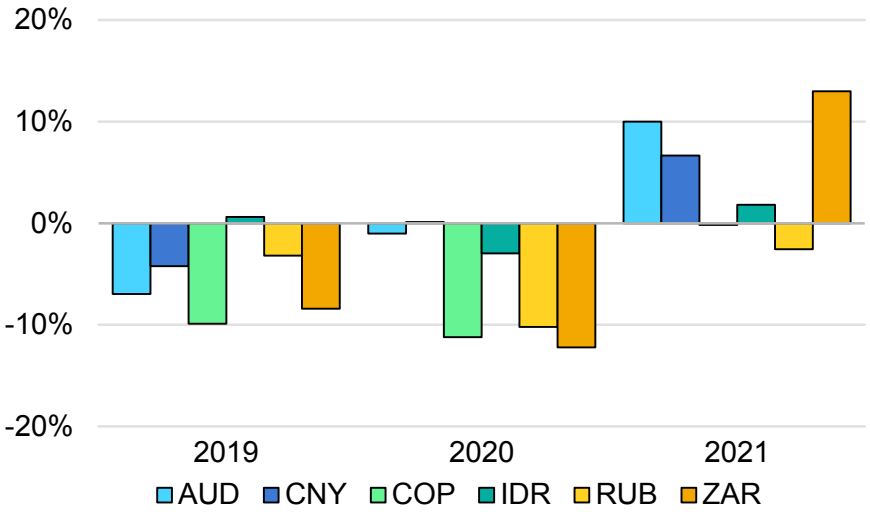
Loose US monetary policy causes exporting countries' currencies to appreciate

Currency exchange rates can significantly affect a coal exporter's competitiveness. While revenue streams from coal are largely negotiated in US dollars, operating expenses such as labour costs, railway tariffs, port charges and royalties are settled in local currencies. Therefore, a local currency depreciation against the US dollar implies a reduction in operating costs for the producer, increasing its competitiveness. Currency exchange rates also influence an importer's purchasing power and the relative competitiveness of imported coal against substitutes such as domestic lignite or natural gas.

In 2019 and 2020, most coal exporting countries' currencies depreciated against the US dollar due to relatively strong growth in the United States, weakened global growth and trade friction. Then, in the first half of 2021, the US federal government's loose monetary policy prompted the currencies of major coal exporting countries to appreciate against the US dollar. In particular, the currencies of South Africa, Australia and China appreciated as a result of trade surpluses, but less-competitive coal mining in these countries was made up for by soaring coal prices.

In the second half of 2021, the US dollar increased in value as the Federal Reserve signals caused interest rates to rise, and as economic struggles around the globe made investing in US currency more attractive. Inflation and economic risks could prompt investors to withdraw their money from developing countries, putting pressure on the currencies of countries such as Indonesia and Colombia.

Year-on-year development of selected currencies against the US dollar, 2019-2021



Notes: AUD = Australian dollar. CNY = Chinese yuan renminbi. ZAR = South African rand. RUB = Russian ruble. IDR = Indonesian rupiah. COP = Colombian peso. 2021 values represent average exchange rates to August 2021 for all currencies except the AUD, which is to September 2021.

Source: OECD (2021), Monthly Monetary and Financial Statistics (MEI) exchange rates (USD monthly averages).

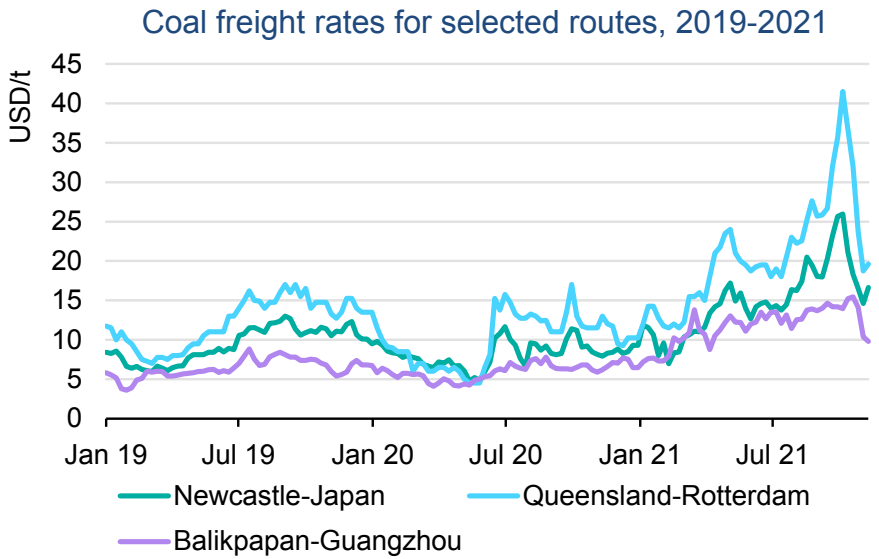
Freight rates are rising because global logistics are under pressure

More than 90% of the global coal trade is seaborne and shipped by dry bulk vessels, which are categorised according to their deadweight tonnage (dwt). The four main vessel types are Handysize; Handymax/Supramax; Panamax; and Capesize. The most-used vessels are the Panamax (60 000 – 80 000 dwt) and Capesize (over 80 000 dwt). Dry bulk shipping costs are based mainly on fuel prices, while final freight rates are further determined by supply and demand.

The drop in coal and iron ore demand triggered by the Covid-19 pandemic put pressure on freight rates in the first quarter of 2020. Particularly affected were freight rates for the Queensland-Rotterdam and Newcastle-Japan routes, plied mainly by Capesize vessels. Freight rates from Indonesia to China, where mainly Panamax vessels are used, were less impacted by the pandemic. This is partly because grain transport, which also uses mainly Panamax vessels, was less affected than iron ore shipments.

China's steel industry rebound caused freight rates to recover by mid-2020. Another factor, less important but still influential, was China's ban on Australian coal, as it redirected Australian coal to other countries, raising distances and travel times, decreasing shipping capacity supplies and ultimately increasing prices.

In 2021, freight rates rose sharply as global demand for goods and materials increased and supply chains came under pressure. Furthermore, as part of measures to contain the pandemic, some coal ports were partially or completely closed, forcing ships to wait to load and unload and reducing the overall supply of cargo capacity. Freight rates rose to more than USD 40/t on the Queensland-Rotterdam route, a level that has not been seen since 2008.



Source: IHS Markit (2021), Coal Price Data and Indexes

Coal mining projects

Progress on export-oriented projects has been slow, with no response to high prices

Investments in export-oriented coal mining projects are under consideration in a number of countries. However, despite currently prevailing high coal prices, there are no signs of acceleration in projects either announced or under construction. Environmental, social and governance considerations, as well as difficulties finding financing (and even insurance recently) are halting new coal developments. To evaluate evolution in this sector, this report classifies projects as either “more advanced” or “less advanced”.[13]

All more-advanced projects together amount to an expected production capacity of ~95 Mtpa. The majority are metallurgical (met) coal projects (70%), even though met coal makes up less than 20% of global coal demand and around one-third of international trade. Most of the more-advanced projects are in Australia (41%), Russia (22%) and South Africa (13%). The 2021 pipeline of more-advanced projects is similar to that of 2020, with only a slight increase registered because some less-advanced projects have progressed while some more-advanced ones were delayed by Covid-19 pandemic circumstances.

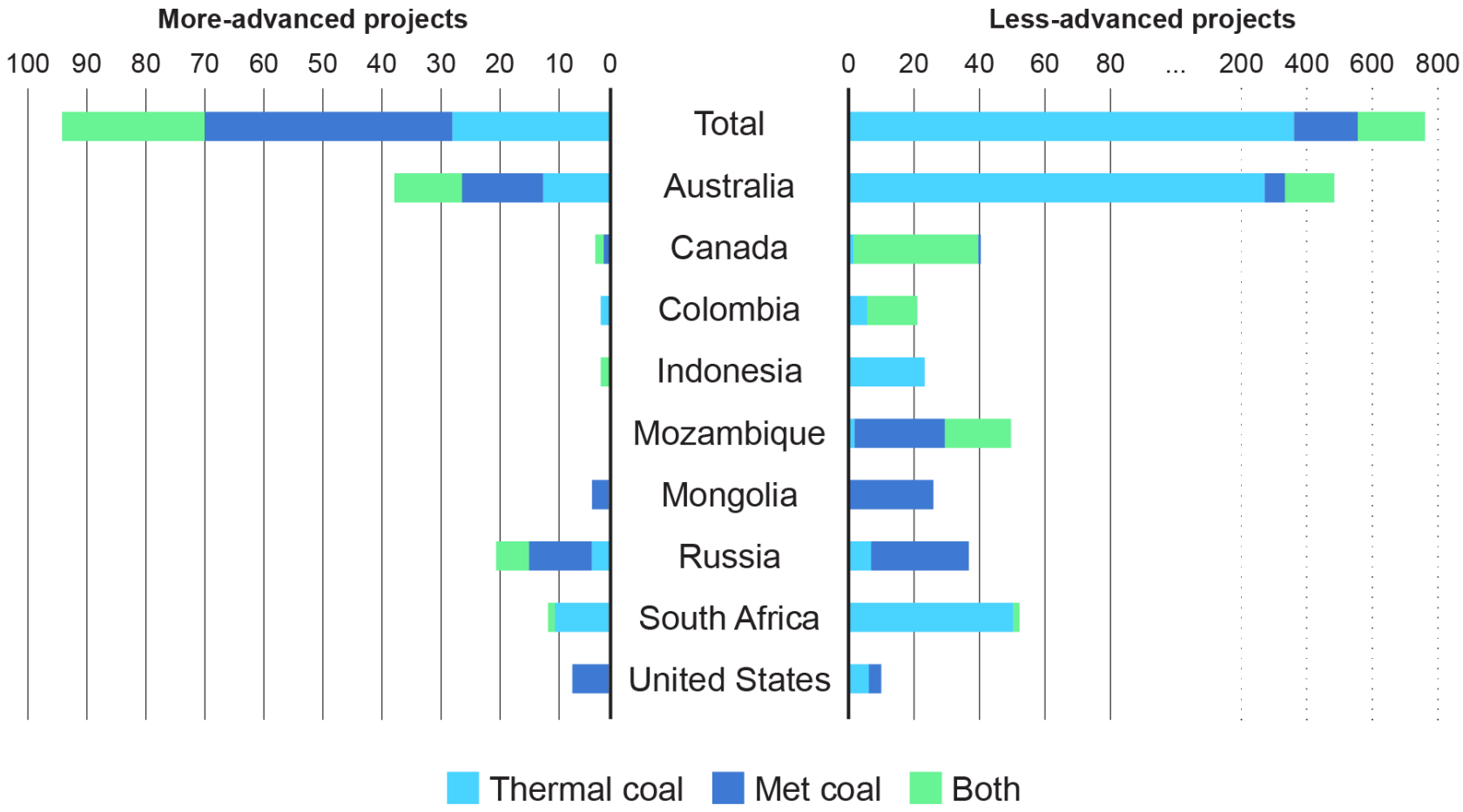
Less-advanced projects represent a total production capacity of 770 Mtpa. While official data indicate that roughly 64% of these projects are in Australia, this information should be treated with caution because Australia is more transparent in reporting proposed coal projects than other countries are, particularly Indonesia, which is the highest source of new production among major exporting countries. (Please see Annex for a non-exhaustive list of coal mining projects in the major exporting countries.)

Investments in coal-related infrastructure are commonly linked to mining developments. For example, Russia and Mongolia are investing in railways, ports and roads to increase their coal exports in the coming years. Russia – the world’s largest exporter of fossil fuels – is building new Arctic ports to develop the large, unexploited coal fields in the region. In Mongolia, a 415-km rail link is under construction from the country’s largest coal mine (Tavan Tolgoi) to the Chinese border. Meanwhile, the Indian company Bravus Mining and Resources (formerly Adani Mining) is finishing a 189-km railway in Australia to connect the Carmichael thermal coal mine with the existing rail network.

[13] More-advanced projects have been approved and obtained a final investment decision or are under construction, while less-advanced projects are at the feasibility or environmental assessment stage, or they are awaiting approval.

Australia and Russia lead the way in more-advanced coal mining projects

Capacity of hard coal export mining projects by country and coal grade (Mtpa)



Metallurgical coal is less affected by clean energy transitions in the short and medium term

Widespread non-coal-based steel production from iron ore is not expected in the near term, as hydrogen technologies, the most promising advancements, are not available at the scale and cost required. Therefore, met coal ventures represent almost half of more-advanced coal projects (total met coal production capacity of more-advanced projects is ~67 Mtpa).

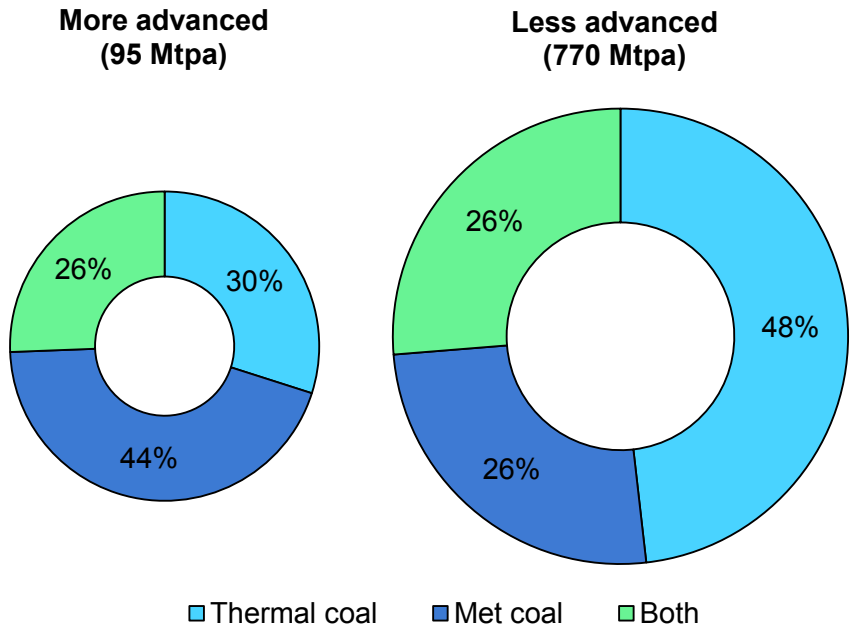
Even though the market share of thermal coal is triple that of met coal, investors appear to favour met coal endeavours. While pure thermal coal projects make up only 30% (28 Mtpa) of more-advanced projects, they account for almost half of the less-advanced ones.

Lower interest in thermal coal projects results from their higher risk and uncertainty linked to climate goals and public opposition. As substitutes for coal are available for power generation (i.e. renewables and natural gas), investors are increasingly pushing companies to reduce their carbon footprint.

Large coal companies such as BHP, Rio Tinto, Anglo American and Glencore have announced net zero emissions strategies and are selling their mines or demerging their coal operations. Rio Tinto sold its last coal mine in 2018, BHP has begun to divest itself of its thermal coal projects, and Anglo American spun-off its thermal coal operations in South Africa into a new company, Thungela Resources.

The transfer of assets from large, diversified multinational companies to smaller national companies is a double-edge sword for investment. While smaller companies do not receive the same pressure from shareholders to comply with environmental, social and governance standards, they also have less financial resources to proceed with new projects.

Coal grade shares in hard coal export mining projects



High coal prices have prompted mine reopenings rather than new investments

Several coal mining companies have reopened (or are planning to reopen) mines that were closed when coal prices were low. According to company announcements, total capacity of at least 22 Mtpa is to be reopened. This strategy of reopening closed mines rather than investing in new ones is another indication that the future of coal is not clear. Strong backwardation in the markets (see the Prices and Costs chapter) is another negative signal for investors.

At least two thermal coal mines are reopening in South Africa. One is the Liberty Coal mine, which went into business rescue after its owner declared bankruptcy in early 2018 and was thereafter bought and ramped up again to 3 Mtpa by Templar Capital. The second mine preparing to reopen is Koornfontain, which was closed at the end of 2019 and is now ready to restart with an expected production capacity of 3 Mtpa, according to owner Black Royalty Minerals.

In Colombia, Colombian Natural Resources plans to restart operations at the La Francia and El Hatillo coal mines with a potential production capacity of 2 Mtpa by 2022. The company stopped production and filed for bankruptcy in 2020 due to losses caused by low coal prices.

Meanwhile, thermal as well as coking coal mines are set to reopen in Canada. In the province of Alberta, Westmoreland plans to restart its Coal Valley Mine (it produced an average of 3 Mtpa before operations ceased last year) and CST Coal is awaiting approval to resume coking coal production at the Grand Cache No. 8 open-pit mine (before closing in March 2020, the mine produced ~1.3 Mtpa).

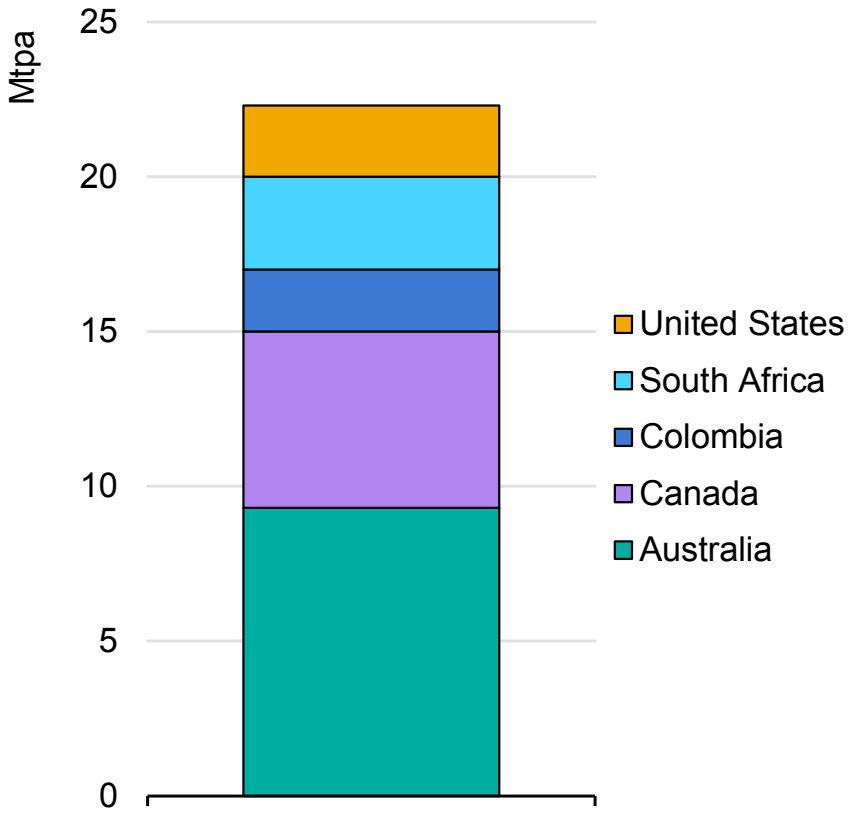
Most coking coal mine reopenings will be in Australia. In early May, Peabody reopened the 1.8-Mtpa Metropolitan mine after having closed it at the beginning of January due to low demand. Further reopenings include the Russell Vale mine and the Cook Colliery, which were approved to reopen this year. Having ceased production in 2016, Wollongong's Russell Vale mine is expected to produce 3.7 Mt of coking coal within five years. The Cook Colliery, owned by QCoal, has a production potential of 0.5 Mtpa and has been in care and maintenance since late 2019.

Meanwhile, MetRes aims to reopen the Millennium and Mavis Downs met coal mine in Queensland with a production capacity of 1.2 Mtpa in July 2022 (the mine was shut down in March 2020). The 2-Mtpa Burton coal mine, purchased along with the New Lenton coal deposit by Bowen Coking Coal when it acquired Lenton Joint Venture, is to be reopened in 2022. The mine was closed in 2016 by then-owner Peabody because of low coal prices. Most recently, Bowen Coking Coal announced its intention to reopen the Bluff PCI mine in Queensland in the first quarter of 2022. The 1.2-Mtpa mine started production in 2019 but was placed on care and maintenance in December 2020.

In the United States, at least two coking coal mines are reopening. Ramaco's Berwind coking coal mine (on the Virginia-West Virginia

border) was partially closed in July 2020 but restarted in 2021. Ongoing expansion should enable the mine to ramp up to production capacity of 0.75 Mtpa by the second quarter of 2022. The second project is Peabody's Shoal Creek coking coal mine in Alabama, which closed in October 2020 and is about to reopen. In 2019 the mine produced 2.1 Mt of coal.

Capacity of mine reopenings per country



Carmichael extracted its first coal this year after more than a decade's development

In June 2021, Bravus (formerly Adani Mining) announced that the 10-Mtpa Carmichael coal project had extracted its first coal, and in October it declared that the mine's first coal shipment would take place by the end of the year. Carmichael is the first operating mine in the Galilee Basin and the first large pure thermal coal project to be realised in Australia since commissioning of the Mount Pleasant mine in 2018. Since its launch in 2009, the project has obtained more than 100 licences, permits and approvals but has also faced strong opposition from environmental groups, leading to several legal disputes. Adani, which is the owner of Abbot Point coal terminal, also launched its own rail business in 2020. Carmichael mine's production will therefore be exported via a dedicated 189-km rail line connecting it with the Abbot Point coal terminal.

United Wambo – a joint venture between Glencore and Peabody – began mining coal in July 2020 while its construction activities continue. The project has an initial capacity of 6.5 Mtpa and plans to ramp up to 10 Mtpa of thermal and coking coal production. The New South Wales Independent Planning Commission approved the project in 2019 on condition that its coal be exported only to countries that have signed on to the Paris Agreement or are taking comparable measures to reduce GHG emissions.

More than one-third of the world's more-advanced coal mining projects are in Australia, mainly Queensland, with a total capacity of 40.7 Mtpa. A capacity of 17 Mtpa may be operational by 2022.

In 2021, the Australian government approved Whitehaven's Vickery Extension Project, Glencore's Mangoola mine expansion and Wollongong Coal's plan to reopen the Russell Vale Colliery. These were the first approvals after the Federal Court of Australia ruled in May that the environment minister must take damage caused by climate change into account when deciding whether to approve new coal mines or expansions. At the centre of the court's ruling was Whitehaven's Vickery mine extension, which could raise production by 5.5 Mtpa to 10 Mtpa. As for Russell Vale Colliery, which was put in care and maintenance in 2015, expansion will mean coking coal production of ~1 Mtpa.

Other projects in Australia were less successful. The Independent Planning Commission decided against Posco's Hume Coal Project, South32's Dendrobium Extension and Kepco's Bylong Project. While Posco will not appeal the court's decision and Kepco is undecided, South32 applied for a judicial review and the project has been classified as State Significant Infrastructure, which gives it a second chance. In August 2021, the New South Wales Court of Appeal confirmed its rejection of the 6.5-Mtpa Bylong Project, as the venture faces significant community opposition.

Russia looks eastwards as it invests in coal mines and infrastructure

Russia aims to expand its domestic coal production 50% and its exports from ~217 Mtpa in 2019 to 380 Mtpa by 2035. It adopted these objectives in June 2020 as part of its Energy Strategy to 2035. At least 21.3 Mtpa of capacity expansions are categorised as more advanced, and most of these projects are expected to produce coking coal.

As Russia's export expansion will require new rail lines and coal export terminals, several investments in both railway and port infrastructure have been announced in recent years.

Diminishing Arctic Ocean ice is allowing Russia to develop new resource extraction projects in the Arctic. For instance, in the Far East Arctic Krasnoyarsk region, the Russian company AEON is developing the Syradasayskoye coal field on the Taimyr Peninsula, with plans to invest RUB 45 billion by 2025. Construction of the new Yenisei port began in early 2021 and is expected to be completed within two years. It will handle vessels of over 100 000 dwt and allow the export of up to 7 Mtpa of coking coal from the Syradasays coal field to Asia. The project includes an open-pit coal mine with a production capacity of 5 Mtpa in the first phase and 10 Mtpa in the second phase.

Not far away, Port Dikson is being upgraded with a new coal terminal (10-Mtpa capacity), and the Lavna coal terminal is currently under construction at Kola Bay near Murmansk. This terminal is to start operating in 2024 once the 45-km rail link from Vykhodnoy is complete. The port will handle vessels of up to 150 000 dwt and operate year-round. Annual shipping capacity will be ~18 Mtpa.

To increase coal exports to China and other areas of Asia, Russia is expanding export capacity in its Far East region. Several expansion projects have been announced for the Port of Vanino, Russia's second-largest Pacific coal port. Kolmar is enlarging a new coal terminal from 12 Mtpa to 24 Mtpa by 2022, A-Property plans to build a new terminal with a capacity of 30 Mtpa by 2024, and SUEK wants to expand the capacity of its bulk terminal by 16 Mtpa to 40 Mtpa in the same period.

Russia is also investing in new rail lines to the east. In particular, the capacity of the main railway links, the Baikal-Amur Mainline (BAM) and the Trans-Siberian Railway network, is to be increased by 55 Mtpa to 180 Mtpa at a total cost of ~USD 9.8 billion. A second railway line on a 340-km segment of the BAM is already under construction. In addition, in March 2021 Russia also approved a USD 9.6-billion investment in a new 1 000-km railway from the Sakha Republic to China, but a timeline has not yet been announced.

South Africa is struggling to maintain production

South Africa

After several years of underinvestment, maintaining current capacity will be a challenge for South Africa, even though a handful of mining projects for export and domestic consumption are proceeding. In fact, long-term supply contracts have already been concluded for some mines intended to serve domestic consumption.

Wescoal's Moabsvelden coal mine, constructed to meet domestic demand, sold its first coal in March 2021 and is expected to produce up to 3 Mtpa at full capacity. Wescoal and Eskom (South Africa's public electricity utility) finalised a ten-year coal supply contract in July 2019. Meanwhile, construction of Seriti's New Largo coal mine began in 2020. At full capacity, it is expected to produce up to 12 Mtpa of thermal coal. It will initially supply Eskom's Kusile power station but could also become an export mine. While Exxaro originally planned to supply the Kusile power plant from a new 3.9-Mtpa coal mine, in February 2021 it announced that it will no longer be investing in thermal coal assets.

Regarding export-oriented mines, Exxaro, South Africa's largest coal mining firm, completed further expansion projects in 2020. The Grootegeluk 6 venture increased the Grootegeluk mine's production capacity by 1.7 Mtpa, and a new rapid-loadout station increased the site's logistical capabilities. Life extensions of the Leeuwpan and Mafube mines were completed.

The pipeline of projects for South Africa also includes 11.9 Mtpa of more-advanced projects, all of them to produce thermal coal. The only one targeting both met and thermal coal is the greenfield Makhado. Construction of Makhado can start promptly, with production of its first coal scheduled for 2022.

Regarding Boikarabelo, once a 30-Mtpa project, financing cannot be secured, even though it has been downsized to 6 Mtpa, reducing its chances to go ahead.

Botswana

In July 2020, Minergy exported the first coal from its Masama coal mine in Botswana to South Africa. Meanwhile, Maatla Resources, another private company, started construction of the 2.5-Mtpa Mmamabula coal project. In addition, MCM plans to open its new 1-Mtpa Motheo open-pit mine later this year. Botswana also announced plans to develop six new coal mines and a rail link for exports to South Africa. The railway line is essential for access to export markets, as the country is land-locked among South Africa, Zimbabwe and Namibia.

There is still some interest in coking coal in US, Canada and even in Europe

United States

Two new coking coal mines have started operations in West Virginia. The Lynn Branch, owned by Alpha Metallurgical Resources, began production in 2020 and could soon reach its full capacity of up to 1.2 Mtpa. Arch Coal's Leer South coking coal mine commenced production in August 2021, with full production capacity of 3.6 Mtpa to be reached by the beginning of 2022.

In the United States, projects with an aggregated production capacity of 7.7 Mtpa are categorised as more advanced. All of them are currently coking coal projects, including North Central Resources' Longview coal mine, which is supposed to start production at the end of 2022. Its annual production capacity is scheduled to be 4 Mtpa, making it one of the largest US coking coal mines.

On the infrastructure side, Norfolk Southern Co. announced that it is increasing its intermodal terminal capacity in Chicago.

Canada

Projects currently under development in Canada focus primarily on coking coal production. First production from its only more-advanced project, the Crown Mountain mine in British Columbia, has been postponed from 2020 to end of 2025. While the province of Alberta eased restrictions on open-pit coal mining in June 2020 to boost its economy, the federal government has rejected the 4.5-Mtpa Grassy Mountain coking coal project. Furthermore, the New Elan hard coking coal project (4.5 Mtpa) is on hold because provincial and federal policies do not offer strong enough guarantees. Canada's largest proposed new project is an extension of Teck's Fording River coking coal mine in British Columbia to maintain its 10-Mtpa production capacity.

Europe

While EU countries are committed to phasing out coal-fired power generation, they still consider coking coal a critical raw material. Some small, less-advanced projects are therefore under development, but no significant progress was made last year. The United Kingdom's most advanced project, the Woodhouse Colliery, was put under review this year by the UK Secretary of State for Housing, Communities and Local Government. Meanwhile, some other projects have been cancelled.

Unlike Colombia and Mozambique, Indonesia and Mongolia are expanding export capacities

Indonesia

Most of Indonesia's proposed coal mining projects are categorised as less advanced and focus on thermal coal production. Lack of transparency in most Indonesian projects makes comparison with other countries difficult. Cokal's Bumi Barito Mineral project is the only more-advanced project we identified. Cokal announced that the project has received full funding, and its first coal delivery is anticipated for December 2021. At full capacity, the mine is expected to produce 2 Mtpa of coking and PCI coal.

Mongolia

Mongolia is focusing on building new railway connections to improve its coal transport capabilities and eventually gain access to the Asia Pacific market through an intermediate country. Its most advanced project is a new 415-km rail link from Tavan Tolgoi's coal mine to the Chinese border. Tavan Tolgoi plans to raise a USD 700-million bond to finance its endeavours, and it obtained its first domestic bond tranche of USD 200 million in April 2021. In total, Tavan Tolgoi aims to invest USD 3.4 billion between 2021 and 2025.

Colombia

Reopening of the La Francia and El Hatillo mines are Colombia's only more-advanced coal mining projects, with all other proposed ventures classified as less advanced. Glencore's subsidiary Prodeco, which idled its mines in March 2020, has begun to surrender its three main mining licences now that Colombia's national mining agency has accepted its initially rejected request.

Mozambique

All Mozambique's proposed coal mining projects are categorised as less advanced.

Vale is currently preparing to sell the 11-Mtpa Moatize Coal Mine, but it is unclear how this will affect the proposal to expand the mine's capacity to 15 Mtpa. Other significant projects such as the 15-Mtpa Benga Mine expansion and the 12-Mtpa Zambeze Mine project, both owned by the Indian consortium ICVL, did not announce any progress in 2021.

Annexes

Tables

Total coal consumption (Mt), 2019-2024

Region/country	2019	2020	2021	2024	2019-2020	2020-2021	CAAGR 2021-2024
Asia Pacific	**5 878**	**5 807**	**6 110**	**6 430**	**-1.2%**	**5.2%**	**1.7%**
China	3 950	3 971	4 130	4 266	0.5%	4.0%	1.1%
India	1 014	931	1 056	1 185	-8.2%	13.4%	3.9%
Japan	187	185	184	171	-1.3%	-0.3%	-2.4%
Southeast Asia	355	357	370	420	0.5%	3.8%	4.3%
North America	**577**	**466**	**541**	**462**	**-19.2%**	**16.1%**	**-5.1%**
United States	529	434	508	431	-18.1%	17.2%	-5.3%
Central and South America	**54**	**48**	**55**	**46**	**-11.3%**	**13.6%**	**-5.5%**
Europe	**687**	**581**	**632**	**508**	**-15.3%**	**8.6%**	**-7.0%**
European Union	483	390	435	334	-19.3%	11.5%	-8.5%
Middle East	**13**	**12**	**12**	**8**	**-2.2%**	**-5.8%**	**-13.4%**
Eurasia	**372**	**343**	**347**	**363**	**-7.9%**	**1.4%**	**1.5%**
Russia	238	223	227	237	-6.3%	2.1%	1.5%
Africa	**220**	**198**	**209**	**214**	**-10.1%**	**5.7%**	**0.7%**
World	**7 801**	**7 456**	**7 906**	**8 031**	**-4.4%**	**6.0%**	**0.5%**

Notes: CAAGR = compound average annual growth rate. Data for 2019 and 2020 are from IEA statistics; 2020 are preliminary; 2021 are estimated; 2024 are forecasts. Differences in totals are due to rounding.

Thermal coal and lignite consumption (Mt), 2019-2024

Region/country	2019	2020	2021	2024	2019-2020	2020-2021	CAAGR 2021-2024
Asia Pacific	**4 954**	**4 894**	**5 206**	**5 483**	**-1.2%**	**6.4%**	**1.7%**
China	3 206	3 222	3 410	3 524	0.5%	5.8%	1.1%
India	942	875	990	1 105	-7.1%	13.2%	3.7%
Japan	141	142	138	123	1.3%	-3.4%	-3.6%
Southeast Asia	341	341	354	400	-0.1%	3.7%	4.2%
North America	**552**	**445**	**515**	**434**	**-19.3%**	**15.7%**	**-5.6%**
United States	511	420	491	413	-17.8%	16.7%	-5.6%
Central and South America	**39**	**35**	**40**	**30**	**-10.9%**	**14.4%**	**-9.1%**
Europe	**617**	**520**	**563**	**434**	**-15.8%**	**8.4%**	**-8.4%**
European Union	425	340	380	274	-20.1%	11.9%	-10.4%
Middle East	**9**	**9**	**8**	**4**	**-4.3%**	**-10.0%**	**-23.0%**
Eurasia	**279**	**258**	**260**	**271**	**-7.8%**	**1.0%**	**1.3%**
Russia	162	153	156	160	-5.3%	1.9%	0.9%
Africa	**216**	**196**	**207**	**212**	**-9.4%**	**5.6%**	**0.7%**
World	**6 667**	**6 356**	**6 800**	**6 867**	**-4.7%**	**7.0%**	**0.3%**

Notes: CAAGR = compound average annual growth rate. Data for 2019 and 2020 are from IEA statistics; 2020 are preliminary; 2021 are estimated; 2024 are forecasts. Differences in totals are due to rounding.

Metallurgical coal consumption (Mt), 2019-2024

Region/country	2019	2020	2021	2024	2019-2020	2020-2021	CAAGR 2021-2024
Asia Pacific	**924**	**913**	**904**	**947**	**-1.1%**	**-1.0%**	**1.6%**
China	744	749	720	742	0.7%	-3.9%	1.0%
India	72	56	66	80	-21.8%	16.7%	6.6%
Japan	47	42	47	48	-9.1%	10.2%	1.0%
Southeast Asia	13	15	17	19	15.3%	7.6%	5.4%
North America	**25**	**21**	**26**	**28**	**-16.5%**	**24.0%**	**2.6%**
United States	18	13	17	19	-25.1%	30.3%	2.7%
Central and South America	**15**	**13**	**15**	**16**	**-12.2%**	**11.5%**	**3.2%**
Europe	**70**	**62**	**68**	**74**	**-11.4%**	**10.2%**	**2.9%**
European Union	58	51	55	60	-13.4%	9.1%	2.9%
Middle East	**4**	**4**	**4**	**4**	**3.1%**	**4.3%**	**1.5%**
Eurasia	**93**	**85**	**87**	**92**	**-8.5%**	**2.4%**	**2.0%**
Russia	76	70	71	77	-8.2%	2.4%	2.7%
Africa	**4**	**2**	**2**	**3**	**-47.1%**	**9.8%**	**2.3%**
World	**1 134**	**1 100**	**1 106**	**1 164**	**-3.0%**	**0.5%**	**1.7%**

Notes: CAAGR = compound average annual growth rate. Data for 2019 and 2020 are from IEA statistics; 2020 are preliminary; 2021 are estimated; 2024 are forecasts. Differences in totals are due to rounding.

Total coal production (Mt), 2019-2024

Region/country	2019	2020	2021	2024	2019-2020	2020-2021	CAAGR 2021-2024
Asia Pacific	**5 760**	**5 729**	**5 939**	**6 182**	**-0.5%**	**3.7%**	**1.3%**
China	3 724	3 764	3 925	3 982	1.1%	4.3%	0.5%
India	756	764	793	955	1.0%	3.7%	6.4%
Australia	507	468	470	477	-7.7%	0.3%	0.5%
Indonesia	601	564	576	570	-6.1%	2.2%	-0.4%
North America	**706**	**540**	**584**	**536**	**-23.5%**	**8.2%**	**-2.8%**
United States	641	485	528	484	-24.4%	8.9%	-2.9%
Central and South America	**92**	**56**	**73**	**68**	**-39.4%**	**31.5%**	**-2.5%**
Europe	**531**	**446**	**475**	**378**	**-15.9%**	**6.4%**	**-7.3%**
European Union	374	301	329	247	-19.3%	9.2%	-9.1%
Middle East	**2**	**2**	**2**	**2**	**-0.2%**	**3.7%**	**0.0%**
Eurasia	**578**	**526**	**556**	**580**	**-9.0%**	**5.8%**	**1.4%**
Russia	439	398	429	445	-9.4%	7.7%	1.2%
Africa	**276**	**262**	**260**	**269**	**-5.2%**	**-0.5%**	**1.1%**
World	**7 944**	**7 560**	**7 889**	**8 014**	**-4.8%**	**4.3%**	**0.5%**

Notes: CAAGR = compound average annual growth rate. Data for 2019 and 2020 are from IEA statistics; 2020 are preliminary; 2021 are estimated; 2024 are forecasts. Differences in totals are due to rounding.

Thermal coal and lignite production (Mt), 2019-2024

Region/country	2019	2020	2021	2024	2019-2020	2020-2021	CAAGR 2021-2024
Asia Pacific	**4 875**	**4 831**	**5 049**	**5 221**	**-0.9%**	**4.5%**	**1.1%**
China	3 075	3 089	3 250	3 262	0.5%	5.2%	0.1%
India	745	753	781	943	1.1%	3.7%	6.5%
Australia	318	290	296	287	-8.8%	2.2%	-1.0%
Indonesia	595	558	570	562	-6.2%	2.2%	-0.5%
North America	**608**	**459**	**493**	**449**	**-24.4%**	**7.2%**	**-3.1%**
United States	576	435	469	430	-24.5%	7.8%	-2.8%
Central and South America	**86**	**52**	**69**	**63**	**-40.2%**	**33.4%**	**-2.9%**
Europe	**515**	**432**	**460**	**363**	**-16.2%**	**6.6%**	**-7.6%**
European Union	360	288	316	234	-19.8%	9.5%	-9.5%
Middle East	**0**	**0**	**0**	**0**	**-0.2%**	**0.7%**	**0.0%**
Eurasia	**460**	**416**	**437**	**449**	**-9.6%**	**5.2%**	**0.8%**
Russia	331	297	320	324	-10.3%	7.6%	0.4%
Africa	**267**	**254**	**255**	**260**	**-4.9%**	**0.6%**	**0.6%**
World	**6 811**	**6 443**	**6 763**	**6 805**	**-5.4%**	**5.0%**	**0.2%**

Notes: CAAGR = compound average annual growth rate. Data for 2019 and 2020 are from IEA statistics; 2020 are preliminary; 2021 are estimated; 2024 are forecasts. Differences in totals are due to rounding.

Metallurgical coal production (Mt), 2019-2024

Region/country	2019	2020	2021	2024	2019-2020	2020-2021	CAAGR 2021-2024
Asia Pacific	**885**	**899**	**890**	**961**	**1.5%**	**-1.0%**	**2.6%**
China	649	675	675	719	4.0%	0.0%	2.1%
India	11	11	11	12	-1.0%	3.3%	2.3%
Australia	189	179	174	189	-5.6%	-2.8%	2.9%
Indonesia	6	6	6	8	2.5%	5.8%	10.0%
North America	**98**	**80**	**91**	**87**	**-17.9%**	**13.4%**	**-1.6%**
United States	65	50	59	54	-22.9%	18.9%	-3.1%
Central and South America	**5**	**4**	**4**	**5**	**-26.8%**	**6.6%**	**2.9%**
Europe	**15**	**14**	**15**	**15**	**-7.0%**	**3.1%**	**0.5%**
European Union	14	13	14	14	-5.7%	3.0%	0.6%
Middle East	**1**	**1**	**1**	**1**	**-0.2%**	**4.0%**	**0.0%**
Eurasia	**118**	**111**	**119**	**131**	**-6.7%**	**7.7%**	**3.4%**
Russia	108	101	110	122	-6.5%	8.1%	3.5%
Africa	**9**	**8**	**5**	**9**	**-15.1%**	**-33.8%**	**19.2%**
World	**1 133**	**1 118**	**1 126**	**1 210**	**-1.4%**	**0.8%**	**2.4%**

Notes: CAAGR = compound average annual growth rate. Data for 2019 and 2020 are from IEA statistics; 2020 are preliminary; 2021 are estimated; 2024 are forecasts. Differences in totals are due to rounding.

Total coal imports (Mt), 2019-2024

Region/country	2019	2020	2021	2024	2019-2020	2020-2021	CAAGR 2021-2024
Europe	176	138	166	138	-21.7%	20.4%	-5.9%
Japan	186	184	183	171	-0.5%	-6.9%	-2.3%
Korea	137	123	128	122	4.0%	-4.9%	-1.7%
Chinese Taipei	67	63	64	67	1.3%	5.1%	1.7%
China	317	314	313	262	-0.6%	-16.1%	-5.7%
India	241	214	210	237	-1.8%	12.6%	4.0%
Southeast Asia	138	151	143	171	-5.0%	19.4%	6.1%
Rest of world	176	153	163	167	6.7%	2.3%	0.8%
World	**1 439**	**1 341**	**1 371**	**1 336**	**2.2%**	**-2.6%**	**-0.9%**

Notes: CAAGR = compound average annual growth rate. Data for 2019 and 2020 are from IEA statistics; 2020 are preliminary; 2021 are estimated; 2024 are forecasts. Differences in totals are due to rounding.

Thermal coal and lignite imports (Mt), 2019-2024

Region/country	2019	2020	2021	2024	2019-2020	2020-2021	CAAGR 2021-2024
Europe	115	86	108	76	-25.0%	25.7%	-11.1%
Japan	140	142	137	123	-3.7%	-10.4%	-3.6%
Korea	102	89	88	80	-1.2%	-9.0%	-3.1%
Chinese Taipei	58	55	55	57	-0.3%	3.7%	1.2%
China	234	239	260	199	8.4%	-23.2%	-8.4%
India	184	154	150	163	-3.0%	8.9%	2.9%
Southeast Asia	125	135	128	154	-5.6%	20.7%	6.5%
Rest of world	144	122	135	138	9.9%	2.4%	0.8%
World	**1 101**	**1 023**	**1 059**	**990**	**3.5%**	**-6.6%**	**-2.2%**

Notes: CAAGR = compound average annual growth rate. Data for 2019 and 2020 are from IEA statistics; 2020 are preliminary; 2021 are estimated; 2024 are forecasts. Differences in totals are due to rounding.

Metallurgical coal imports (Mt), 2019-2024

Region/country	2019	2020	2021	2024	2019-2020	2020-2021	CAAGR 2021-2024
Europe	61	52	58	62	11.6%	8.0%	2.6%
Japan	47	42	46	48	10.2%	3.5%	1.1%
Korea	35	35	41	42	17.4%	4.0%	1.3%
China	83	75	53	63	-29.2%	18.8%	5.9%
India	58	60	61	74	1.3%	21.8%	6.8%
Rest of world	54	54	53	56	-1.5%	5.8%	1.9%
World	**338**	**318**	**312**	**346**	**-1.8%**	**10.9%**	**3.5%**

Notes: CAAGR = compound average annual growth rate. Data for 2019 and 2020 are from IEA statistics; 2020 are preliminary; 2021 are estimated; 2024 are forecasts. Differences in totals are due to rounding.

Total coal exports (Mt), 2019-2024

Region/country	2019	2020	2021	2024	2019-2020	2020-2021	CAAGR 2021-2024
Australia	395	372	376	388	1.1%	3.3%	1.1%
Canada	35	32	31	32	-1.7%	2.6%	0.9%
Colombia	77	54	58	54	8.5%	-6.5%	-2.2%
Indonesia	462	405	440	415	8.7%	-5.8%	-2.0%
Russia	218	212	226	232	6.4%	2.7%	0.9%
South Africa	79	75	72	63	-4.6%	-12.7%	-4.4%
United States	85	63	80	57	27.9%	-28.9%	-10.7%
Rest of world	104	85	84	95	-0.7%	12.5%	4.0%
World	**1 455**	**1 298**	**1 368**	**1 336**	**5.4%**	**-2.3%**	**-0.8%**

Notes: CAAGR = compound average annual growth rate. Data for 2019 and 2020 are from IEA statistics; 2020 are preliminary; 2021 are estimated; 2024 are forecasts. Differences in totals are due to rounding.

Thermal coal and lignite exports (Mt), 2019-2024

Region/country	2019	2020	2021	2024	2019-2020	2020-2021	CAAGR 2021-2024
Australia	212	199	207	204	3.8%	-1.5%	-0.5%
Colombia	75	52	57	53	8.8%	-6.9%	-2.4%
Indonesia	456	400	435	409	8.8%	-6.0%	-2.0%
Russia	182	173	187	187	8.1%	0.0%	0.0%
South Africa	78	75	72	62	-4.6%	-12.9%	-4.5%
United States	37	24	37	21	51.9%	-44.0%	-17.6%
Rest of world	62	55	56	55	1.2%	-1.6%	-0.5%
World	**1 103**	**978**	**1 050**	**990**	**7.3%**	**-5.7%**	**-1.9%**

Notes: CAAGR = compound average annual growth rate. Data for 2019 and 2020 are from IEA statistics; 2020 are preliminary; 2021 are estimated; 2024 are forecasts. Differences in totals are due to rounding.

Metallurgical coal exports (Mt), 2019-2024

Region/country	2019	2020	2021	2024	2019-2020	2020-2021	CAAGR 2021-2024
Australia	183	172	169	185	-1.9%	9.1%	3.0%
Canada	33	28	27	28	-2.8%	4.0%	1.3%
Mongolia	31	24	23	31	-3.8%	33.9%	10.2%
Mozambique	6	4	4	7	-3.8%	92.4%	24.4%
Russia	35	40	39	45	-1.3%	15.7%	5.0%
United States	48	38	43	36	12.5%	-15.9%	-5.6%
Rest of world	16	14	13	14	-1.5%	6.1%	2.0%
World	**352**	**319**	**318**	**346**	**-0.3%**	**8.7%**	**2.8%**

Notes: CAAGR = compound average annual growth rate. Data for 2019 and 2020 are from IEA statistics; 2020 are preliminary; 2021 are estimated; 2024 are forecasts. Differences in totals are due to rounding.

Total seaborne coal imports (Mt), 2019-2024

Region/country	2019	2020	2021	2024	2019-2020	2020-2021	CAAGR 2021-2024
Europe	151	113	139	117	22.9%	-15.9%	-5.6%
Japan	186	184	183	171	-0.5%	-6.9%	-2.3%
Korea	137	123	128	122	4.0%	-4.9%	-1.7%
Chinese Taipei	67	63	64	67	1.3%	5.1%	1.7%
China	282	285	284	226	-0.4%	-20.3%	-7.3%
India	241	214	210	237	-1.8%	12.6%	4.0%
Southeast Asia	138	151	143	171	-5.0%	19.4%	6.1%
Rest of world	122	105	119	123	12.7%	3.8%	1.2%
World	**1 325**	**1 240**	**1 271**	**1 235**	**2.6%**	**-2.9%**	**-1.0%**

Notes: CAAGR = compound average annual growth rate. Data for 2019 and 2020 are from IEA statistics; 2020 are preliminary; 2021 are estimated; 2024 are forecasts. Differences in totals are due to rounding.

Seaborne thermal coal and lignite imports (Mt), 2019-2024

Region/country	2019	2020	2021	2024	2019-2020	2020-2021	CAAGR 2021-2024
Europe	90	62	82	55	32.0%	-32.6%	-12.3%
Japan	140	142	137	123	-3.7%	-10.4%	-3.6%
Korea	102	89	88	80	-1.2%	-9.0%	-3.1%
Chinese Taipei	58	55	55	57	-0.3%	3.7%	1.2%
China	230	234	254	194	8.4%	-23.6%	-8.6%
India	184	154	150	163	-3.0%	8.9%	2.9%
Southeast Asia	125	135	128	154	-5.6%	20.7%	6.5%
Rest of world	105	88	101	104	15.6%	2.8%	0.9%
World	**1 033**	**959**	**994**	**930**	**3.6%**	**-6.4%**	**-2.2%**

Notes: CAAGR = compound average annual growth rate. Data for 2019 and 2020 are from IEA statistics; 2020 are preliminary; 2021 are estimated; 2024 are forecasts. Differences in totals are due to rounding.

Seaborne metallurgical coal imports (Mt), 2019-2024

Region/country	2019	2020	2021	2024	2019-2020	2020-2021	CAAGR 2021-2024
Europe	61	51	57	62	11.9%	7.9%	2.6%
Japan	47	42	46	48	10.2%	3.5%	1.1%
Korea	35	35	41	42	17.4%	4.0%	1.3%
China	52	51	30	32	-41.0%	7.3%	2.4%
India	58	60	61	74	1.3%	21.8%	6.8%
Rest of world	40	41	42	46	2.1%	10.0%	3.2%
World	**292**	**280**	**277**	**305**	**-1.0%**	**9.9%**	**3.2%**

Notes: CAAGR = compound average annual growth rate. Data for 2019 and 2020 are from IEA statistics; 2020 are preliminary; 2021 are estimated; 2024 are forecasts. Differences in totals are due to rounding.

Total seaborne coal exports (Mt), 2019-2024

Region/country	2019	2020	2021	2024	2019-2020	2020-2021	CAAGR 2021-2024
Australia	395	372	376	388	1.1%	3.3%	1.1%
Canada	34	31	31	32	-1.4%	2.6%	0.9%
Colombia	77	54	58	54	8.5%	-6.5%	-2.2%
Indonesia	462	405	440	415	8.7%	-5.8%	-2.0%
Russia	175	171	186	199	8.8%	6.9%	2.2%
South Africa	79	75	72	63	-4.6%	-12.7%	-4.4%
United States	75	58	75	51	30.1%	-32.1%	-12.1%
Rest of world	44	31	31	35	-0.4%	10.2%	3.3%
World	**1 341**	**1 197**	**1 269**	**1 236**	**6.0%**	**-2.6%**	**-0.9%**

Notes: CAAGR = compound average annual growth rate. Data for 2019 and 2020 are from IEA statistics; 2020 are preliminary; 2021 are estimated; 2024 are forecasts. Differences in totals are due to rounding.

Seaborne thermal coal and lignite exports (Mt), 2019-2024

Region/country	2019	2020	2021	2024	2019-2020	2020-2021	CAAGR 2021-2024
Australia	212	199	207	204	3.8%	-1.5%	-0.5%
Colombia	75	52	57	53	8.8%	-6.9%	-2.4%
Indonesia	456	400	435	409	8.8%	-6.0%	-2.0%
Russia	149	140	154	160	10.0%	3.7%	1.2%
South Africa	78	75	72	62	-4.6%	-12.9%	-4.5%
United States	32	23	35	18	54.8%	-48.9%	-20.0%
Rest of world	33	26	27	26	1.0%	-2.0%	-0.7%
World	**1 035**	**916**	**986**	**932**	**7.7%**	**-5.5%**	**-1.9%**

Notes: CAAGR = compound average annual growth rate. Data for 2019 and 2020 are from IEA statistics; 2020 are preliminary; 2021 are estimated; 2024 are forecasts. Differences in totals are due to rounding.

Seaborne metallurgical coal exports (Mt), 2019-2024

Region/country	2019	2020	2021	2024	2019-2020	2020-2021	CAAGR 2021-2024
Australia	183	172	169	185	-1.9%	9.1%	3.0%
Canada	32	28	27	28	-2.4%	4.1%	1.4%
Mozambique	6	4	4	7	-3.8%	92.4%	24.4%
Russia	26	31	32	39	3.7%	22.4%	7.0%
United States	43	35	40	33	13.9%	-17.1%	-6.1%
Rest of world	15	12	12	13	-1.6%	6.7%	2.2%
World	**306**	**282**	**283**	**304**	**0.6%**	**7.5%**	**2.4%**

Notes: CAAGR = compound average annual growth rate. Data for 2019 and 2020 are from IEA statistics; 2020 are preliminary; 2021 are estimated; 2024 are forecasts. Differences in totals are due to rounding.

Coal mining projects

Country	Project	Company	Type	Earliest proposed start-up	Proposed full capacity (Mtpa)	Resource	Status
Australia	Alpha Coal Project	GVK Hancock	N	..	27	TC	LA
Australia	Alpha North Coal Project	Waratah Coal	N	2030+	10	TC	LA
Australia	Alpha West Coal Project	GVK Hancock	N	..	24	TC	LA
Australia	Angus Place West	Centennial Coal	N	..	2	TC	LA
Australia	Aquila project	Anglo-American / Mitsui	E	2022	3.5	CC	MA
Australia	Ashton South East opencut	Yancoal Australia	E	2025+	2.4	TC, CC	LA
Australia	Belview	Stanmore Coal	N	2023+	2.6	TC, CC, PCI	LA
Australia	Bluff	Bowen Coking Coal	N	2022	1.2	PCI	MA
Australia	Broadmeadow East	Bowen Coking Coal	N	2024	1.2	CC	LA
Australia	Bulga (Mod 3 & Mod 7)	Glencore	E	2030+		TC	LA
Australia	Burton	Bowen Coking Coal	N	2022	2	TC, CC	MA
Australia	Byerwen Coal Project Stage 2	Qcoal/JFE Steel	E	2021	4	TC, CC	MA
Australia	Carmichael Coal Project	Adani	N	2021	10	TC	MA
Australia	Carmichael Coal Project Stage 2	Adani	E	..	18	TC	LA
Australia	Caval Ridge Extension	BHP Mitsubishi Alliance	E	2025	15	CC	LA
Australia	Chain Valley Colliery - Mod 4	Delta Coal	E	..	2.1	TC	MA
Australia	China Stone	MacMines Austasia	N	..	38	TC	LA
Australia	Clifford	Stanmore Coal	N	..	5	TC	LA
Australia	Clyde Park Project	Clyde Park Coal Pty Ltd	N	..	1.8	TC	LA
Australia	Columboola Project	SincoCoal And MetroMining	N	2023	5	TC	LA
Australia	Comet Ridge	Springsure Creek Coal	N	2025+	0.4	TC, CC	LA
Australia	Cooroorah	Bowen cokin coal	N	..		CC, PCI	LA
Australia	Curragh Extension	Coronado Global	E	2023	3	TC, CC	MA
Australia	Dawson West	Civil & Mining Resources	N	..	1.6	TC, CC	LA
Australia	Dendrobium Extension Project	South32	E	2026+	5.2	TC, CC	for domestic (LA)

Country	Project	Company	Type	Earliest proposed start-up	Proposed full capacity (Mtpa)	Resource	Status
Australia	Dysart East	Bengal Energy	N	2023	1.9	TC, CC	LA
Australia	Eagle Downs	South32 / Aquila Resources	N	2025	4.5	TC, CC	LA
Australia	Elimatta	New Hope	N	2025+	5	TC, CC	LA
Australia	Galilee Coal Project	Waratah Coal	N	..	40	TC, CC	LA
Australia	Gregory Crinum	Sojitz	N	2022	1	CC	LA
Australia	Grosvenor Phase 2	Anglo American	E	2025+	6	TC, CC	LA
Australia	Grosvenor West	Qinghai Kingho Group	N	2025+	5	TC, CC	LA
Australia	Hillalong	Shandong Energy Group	N	2025+	4.2	TC, CC	LA
Australia	Ironbark No. 1 (Ellensfield)	Fitzroy Australia Resources	N	2033	6	TC, CC	LA
Australia	Isaac Plains Complex - Isaac Downs Project	Stanmore Coal	N	2024+	2.4	TC, CC	MA
Australia	Isaac Plains Complex - Underground extension	Stanmore Coal	E	2029	1.2	TC, CC	LA
Australia	Karin	Vitrinite / Itochu Corporation	N	..	1.7	CC	LA
Australia	Kevin's Corner	GVK	N	..	30	TC	LA
Australia	Mandalong Southern Extension Project	Centennial Coal	E	2022+		TC	MA
Australia	Mangoola Coal Continued Operations Project	Glencore	E	..	13.5	TC	LA
Australia	Maxwell Project	Malabar Coal	N	2026+	5.7	TC, CC	LA
Australia	Mavis Downs - Millenium	MetRes	E	2022	1.2	CC, PCI	MA
Australia	Metropolitan Mine	Peabody	E	2021	1.8	CC	operating
Australia	Minyango	Qcoal	N	2025+	6	TC, CC	LA
Australia	Moorlands	Cuesta Coal	N	2023+	1.9	TC	LA
Australia	Mount Owen (Glendell Mine) Continued Operations Project	Glencore	E	2021	10	TC, CC	LA
Australia	Mt Pleasant Optimisation Project	MACH Energy Australia	E	..	10.5	TC	LA
Australia	Narrabri Stage 3	Whitehaven Coal	E	2024+	5.3	TC	LA
Australia	Neubeck Coal Project	Centennial Coal	N	..	1.2	TC	for domestic (LA)
Australia	New Acland (Stage 3)	New Hope	E	2025	7.5	TC	LA
Australia	New Lenton	Bowen Coking Coal	N	2029	1.5	TC, CC, PCI	LA

Country	Project	Company	Type	Earliest proposed start-up	Proposed full capacity (Mtpa)	Resource	Status
Australia	Newstan Mine Extension Project	Centennial Coal	E	2024	1.6	TC, CC	LA
Australia	North Surat - Collingwood Project	New Hope Coal	N	2023+	6	TC	LA
Australia	North Surat - Taroom Project	New Hope Coal	N	2024+	8	TC	LA
Australia	North Surat - Woori Project	New Hope Coal	N	2024+	3.5	TC	LA
Australia	Olive Downs	Pembroke Resources	N	..	10.5	CC	LA
Australia	Olive Downs Stage 1	Pembroke Resources	N	2023	4.5	CC	MA
Australia	Red Hill Mine	BHP Billiton / Mitsubishi Alliance	N	2024	14	CC	LA
Australia	Rolleston Expansion Project	Glencore	E	2024+	5	TC	LA
Australia	Russell Vale Underground Expansion Revised Project	Wollongong Coal	E	2021	1	CC	MA
Australia	Saraji East	BHP Billiton / Mitsubishi Alliance	N	2025	7	CC	LA
Australia	South Galilee Coal Project	Alpha Coal Pty Ltd and AMCI (Alpha) Pty Ltd	N	..	3	TC	LA
Australia	Springsure Creek	Adamelia Group	N	..	11	TC	LA
Australia	Spur Hill Underground Coal Project	Malabar Coal	N	2023	8	TC, CC	LA
Australia	Styx (Central Queensland Coal Project)	Central Queensland Coal Pty Ltd	N	..	2	TC, CC	LA
Australia	Tahmoor South Coal Project	SIMEC Group	E	2022	2	CC	MA
Australia	Talwood	Aquila Resources	N	2025+	3.6	CC	LA
Australia	Taroborah	Shenhua Energy	N	2020+	5.73	TC	LA
Australia	Teresa	United Mining Group	N	2023+	6.4	TC, PCI	LA
Australia	The Range Project	Stanmore Coal	N	2026+	5	TC	LA
Australia	Togara North	Glencore	N	..	6	TC	LA
Australia	Valeria Coal Project	Glencore	N	2026+	20	TC, CC	LA
Australia	Vermont East/Willunga	Pembroke Resources	E	2029	4	TC, CC, PCI	LA
Australia	Vickery Extension Project	Whitehaven	N	2024	5.5	TC, CC	LA
Australia	Vulkan Mine Complex	Vitrinite	N	..		CC	LA
Australia	Wallarah 2 Coal Project	Korea Resources Corp	N	2025+	5	TC	LA
Australia	Walton	Aquila Resources	N	2023+	1.6	PCI	LA

Country	Project	Company	Type	Earliest proposed start-up	Proposed full capacity (Mtpa)	Resource	Status
Australia	Wandoan	Glencore	N	2025+	22	TC	LA
Australia	Wards Well	BHP Billiton / Mitsubishi Alliance	N	2024	6	CC	LA
Australia	Wilton-Fairhill	Futura Resources	N	2023+	3	CC	MA
Australia	Winchester South	Whitehaven Coal	N	2028	11	TC, CC	LA
Canada	Aries Project	Ramcoal	N	..	4	CC	LA
Canada	Bingay Coal Project	Centermount	N		1	CC	LA
Canada	Carbon Creek	Cardero Coal	N	2022	4.1	CC	LA
Canada	Crown Mountain	Jameson Resources	N	2025	1.9	CC, PCI	MA
Canada	Elan	Atrum Coal	N	..	4.5	CC	LA
Canada	Elko	Pacific American Coal	N	..		CC	LA
Canada	Fording River Extension Project	Teck Coal	E	2030+	10	CC	LA
Canada	Gething	CKD Mines	N	2024	2	CC	LA
Canada	Chinook	Montem Resources	N	..		CC	LA
Canada	Grande Cache	CST	N	2022	1.7	CC	MA
Canada	Groundhog	Atrum Coal	N	..	0.9	A	LA
Canada	Murray River	HD Mining	N	..	6	CC	LA
Canada	Michel Coal Project	North Coal	N	2024	2	CC	LA
Canada	Sukunka	Glencore	N	..	3	CC	LA
Canada	Tenas	Allegiance Coal / Itochu	N	2024	0.75	CC	LA
Canada	Tent Mountain	Montem	E	2023	1.1	TC	LA
Canada	Wolverine-Hermann Amendment Project	Conuma Coal Resources Ltd.	N	2022	1	CC	LA
Colombia	Canaverales	Yildirim Holding	N	2022	2.5	TC	LA
Colombia	Papayal	Yildirim Holding	N	2022	2.4	TC	LA
Colombia	San Juan	Yildirim Holding	N	2023	16	TC, PCI	LA
Colombia	La Francia and El Hatillo	Colombian Natural Resources (CNR)	E	2021	2	TC	MA
Indonesia	Adaro MetCoal Companies (AMC) Concessions	Adaro	N	..		CC	LA

Country	Project	Company	Type	Earliest proposed start-up	Proposed full capacity (Mtpa)	Resource	Status
Indonesia	Bukit Enim Energi	Adaro	N	..		TC	LA
Indonesia	Bumi Barito Mineral	Cokal	N	2021	2	CC, PCI	MA
Indonesia	Graha Panca Karsa	ITM	N		2	TC	LA
Indonesia	Pakar North	Kangaroo Resources	N	2021	16	TC	LA
Indonesia	Tekno Orbit Persada	MEC Coal	N	..	5	TC	LA
Mongolia	Nuurstei	Aspire Mining	N	2022	1	CC	LA
Mongolia	Ovoot	Aspire Mining	N	2021	10	CC	LA
Mongolia	Shinejinst	Gobi Coal and Energy	N	2021	3	CC	MA
Mongolia	Tavan Tolgoi Extension	Erdenes Tavan Tolgoi	E	2021	19	CC	LA
Mozambique	Benga Extension	ICVL	E	2021	15	CC	LA
Mozambique	Moatize Coal Mine	Vale/Mitsui	E	2021	15	TC, CC	LA
Mozambique	Ncondezi	Ncondezi Energy	N	2022	1.5	TC	LA
Mozambique	Revuboe	Talbot Group, Nippon Steel and POSCO	N	..	7	TC, CC	LA
Mozambique	Zambeze	ICVL	N	2023	12	CC	LA
New Zealand	Escarpment	Bathurst Resources	R	..	0.9	CC	
Russia	Amaam	Tiger Realm Coal	E	2022	6.5	CC	LA
Russia	Butovskaya (Stage 2)	Industrial Metallurgical Holding	E	2021	0.8	CC	MA
Russia	Chernogorsky	SUEK	E	2022	3.5	TC	MA
Russia	Elegest Expansion	Tuva Energy Industry Corporation (TEPK)	E	..	10	CC	LA
Russia	Elga	A-Property	E	..	6.7	TC, CC	MA
Russia	Inaglinsky-1	Kolmar	E	2021	4	CC	MA
Russia	Inaglinsky-2	Kolmar	E	..	8	CC	LA
Russia	Karakansky (Stage III)	Karakan Invest	E	2021	3	TC	LA
Russia	Pravoberezhny	SUEK	E	2024	3	TC	LA
Russia	Sibirskaya	UglePromInvest	N	2022	3	TC	LA
Russia	Taymyr Stage 1	AEON	N	2023	5	CC	MA

Country	Project	Company	Type	Earliest proposed start-up	Proposed full capacity (Mtpa)	Resource	Status
Russia	Taymyr Stage 1	AEON	N	..	5	CC	LA
Russia	Tikhova Stage 2	Industrial Metallurgical Holding	E	2022	1.3	CC	MA
Russia	Usinsky-3	NLMK	N	2021	2.7	CC	LA
South Africa	Birmingham underground project	Canyon Coal	N	2021	3.6	TC	MA
South Africa	Boikarabelo	Resource Generation	N	2021	6	TC	LA
South Africa	Boikarabelo Stage 2	Resource Generation	E	2025+	6	TC	LA
South Africa	De Wittekrans	Canyon Coal	N	2021	3.6	TC	MA
South Africa	Driefonten	Canyon Coal	N	..	0.6	TC	LA
South Africa	Klipspruit life extension project	Seriti	E	2021		TC	MA
South Africa	Koornfontein OC	Black Royalty Minerals	E	2021	3	TC	MA
South Africa	Koppie	Canyon Coal	N	..	1.8	TC	LA
South Africa	Makhado Phase 1	MC Mining	N	2022	1.1	TC, CC	MA
South Africa	Makhado Phase 2	MC Mining	E	2022	1.7	TC, CC	LA
South Africa	New Largo	Seriti	N	..	12	TC	LA
South Africa	Palmietkuilen	Canyon Coal	N	2022	2.4	TC	LA
South Africa	Springfield	Canyon Coal	N	2022	7	TC	LA
South Africa	Witfontein	Canyon Coal	N	2021	1.2	TC	LA
Ukraine	Lubel	Lubel Coal Company	N	2021	5.2	CC	LA
United States	Berwind Expansion	Ramaco Resources, Inc.	E	2022	0.8	CC	MA
United States	Big Creek mine	Ramaco Resources, Inc.	N	2021	0.2	CC	MA
United States	Blue Creek No. 1	Warrior Met Coal	E	2023	4.3	CC	LA
United States	Brook Mine	Ramaco Carbon LCC	N	2021	0.25	TC	LA
United States	Bulldog Mine	Sunrise Coal	N	..	3	TC	LA
United States	Cypress Mine	Paringa Resources Ltd.	N	2022	3.8	TC	LA
United States	Itmann	Consol Energy	N	2022	0.6	CC	MA
United States	Knox Creek	Ramaco Resources, Inc.	N	2022	0.7	CC	LA

Country	Project	Company	Type	Earliest proposed start-up	Proposed full capacity (Mtpa)	Resource	Status
United States	Longview	North Central Resources, LLC	N	2022	4	CC	MA
United States	Shoal Creek	Peabody	E	2021	2.1	CC	MA

Definitions

Coal: A solid, combustible fossil sedimentary rock. Coal comes from buried vegetation transformed by the action of strong pressure and high temperatures over millions of years.

Coal rank: The degree of transformation from the original plant source. It is loosely related to the age of the coal and is mainly determined from random reflectance of the vitrinite, one of coal's organic components. The ranks of coal, in decreasing order of transformation from high to low, are: anthracite, bituminous coal, sub-bituminous coal, lignite and peat. This report distinguishes between hard coal (anthracite, bituminous and sub-bituminous coal) and lignite, while peat is not considered.

Coal classification: Refers to a range of coal age, composition and other properties. Many classifications are used around the world with the main parameter being the coal rank, supplemented by its intended use, i.e. thermal or metallurgical applications.

Coal quality: Represents a variety of properties exhibited by coal when it is used. Calorific value and impurity content are the main parameters defining the quality of thermal coal, whereas caking properties, resistance and impurity content are the distinguishing characteristics for coking coal.

Thermal (or steam) **coal:** Refers to hard coal used for purposes other than metallurgy in this report.

Coking coal: High-quality coal to produce coke used in blast furnaces to make pig iron. Coking coal and metallurgical coal are terms sometimes used interchangeably.

Semi-soft coal: High-quality steam coal mixed with coking coal to produce coke for blast furnaces.

Pulverised coal injection (PCI) **coal:** A high-quality steam coal injected into a blast furnace to reduce coke consumption.

Metallurgical coal: Refers to coking coal, semi-soft coal and pulverised coal injection coal in this report. Although anthracite is often used for metallurgical purposes, it is classified as thermal coal in this report.

Run-of-mine coal: Raw coal as it is mined previous to any processing.

Tonne of coal equivalent (tce)**:** A unit of energy widely used in the international coal industry. It is defined as 7 million kilocalories (kcal). Therefore, the relationship between tce and physical tonnes depends on the net calorific value of the coal. One tonne of coal with a net calorific value of 7 000 kcal per kilogramme (kcal/kg) represents 1 tce.

Coal mining: A technique used to remove coal from a natural deposit. Coal deposits in the Earth's crust occur at various depths and seam configurations, which determine the mining method used. Generally, deep deposits are mined underground and shallow deposits are exploited through opencast mines. The strip ratio largely determines whether an opencast mine is profitable or not.

Strip ratio: The overburden or waste material removed, usually expressed as cubic metres per tonne of coal extracted. High strip ratios make opencast mining unprofitable.

Opencast mining: A method in which the overburden is first drilled, then blasted, and when the deposit is accessible, coal is removed in a similar way to the overburden. To remove the coal, power shovels, conveyor belts and trucks may be used, as well as some extremely large machinery such as draglines and bucket wheels. Opencast mining is usually less labour-intensive than underground mining, but has higher consumable costs, e.g. for tyres, diesel and explosives. Generally, opencast methods imply greater environmental impact than underground mining.

Underground mining: A method in which access to coal seams is gained through underground shafts, galleries and tunnels. Although there are many ways to mine an underground deposit, coal is usually stripped by automatic shearers or continuous mechanical miners using either short/long walls or room-and-pillar exploitations. Underground mining is generally more labour-intensive and requires higher capital investments than opencast mining.

Coal washing/upgrading: A process in which impurities (i.e. ash, moisture) are partially removed from raw coal to produce a higher-quality coal.

Regional groupings

Africa: Algeria, Angola, Benin, Botswana, Cameroon, Republic of the Congo (Congo), Côte d'Ivoire, Democratic Republic of the Congo, Egypt, Eritrea, Ethiopia, Gabon, Ghana, Kenya, Libya, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Senegal, South Africa, South Sudan, Sudan, United Republic of Tanzania (Tanzania), Togo, Tunisia, Zambia, Zimbabwe and other African countries and territories.

Asia Pacific: Southeast Asia regional grouping and Australia, Bangladesh, the People's Republic of China and Hong Kong (China), Chinese Taipei, India, Japan, Korea, Democratic People's Republic of Korea (North Korea), Mongolia, Nepal, New Zealand, Pakistan, Sri Lanka, and other Asian countries and territories.

Central and South America: Argentina, Plurinational State of Bolivia (Bolivia), Brazil, Chile, Colombia, Costa Rica, Cuba, Curaçao, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Nicaragua, Panama, Paraguay, Peru, Suriname, Trinidad and Tobago, Uruguay, Bolivarian Republic of Venezuela (Venezuela), and other Central and South American countries and territories.

China: The People's Republic of China and Hong Kong.

Eurasia: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Republic of Moldova, Russian Federation (Russia), Tajikistan, Turkmenistan, Ukraine and Uzbekistan

Europe: European Union regional grouping and Albania, Bosnia and Herzegovina, Iceland, Gibraltar, Kosovo, Montenegro, Norway, Republic of North Macedonia, Serbia, Switzerland, Turkey and the United Kingdom.

European Union (EU)**:** Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain and Sweden.

Middle East: Bahrain, Islamic Republic of Iran (Iran), Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syrian Arab Republic (Syria), the United Arab Emirates and Yemen.

North America: Canada, Mexico and United States.

Southeast Asia: Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic (Lao PDR), Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam. These countries are all members of the Association of Southeast Asian Nations (ASEAN).

Abbreviations and acronyms

API	Argus/McCloskey's Coal Price Index
CCGT	combined-cycle gas turbine
CFR	cost and freight
CIF	cost, insurance and freight
CIL	Coal India Limited
CO_2	carbon dioxide
CV	calorific value
EIA	Energy Information Administration (United States)
EU	European Union
EUA	European Union Allowance
FOB	free on board
GDP	gross domestic product
HCC	hard coking coal
ICVL	International Coal Ventures Private Limited
IEA	International Energy Agency
JCC	Japanese Crude Cocktail
LNG	liquefied natural gas
MDO	mine developer operator
met	metallurgical
NCI	National Coal Index (India)
NLC	Neyveli Lignite Company India Limited
NTPC	National Thermal Power Corporation Limited (India)
OECD	Organisation for Economic Co-operation and Development
PCI	pulverised coal injection
SCCL	Singareni Collieries Company Limited (India)
SUEK	Siberian Coal Energy Company
TTF	Title Transfer Facility (Netherlands)
US	United States
USC	ultra-supercritical
y-o-y	year-on-year

Currency codes

AUD	Australian dollar
CNY	Chinese yuan renminbi
COP	Colombian peso
IDR	Indonesian rupiah
RUB	Russian ruble
USD	United States dollar
ZAR	South African rand

Units of measure

bt	billion tonnes
dwt	deadweight tonnage
GW	gigawatt
kcal	kilocalorie
kg	kilogramme
km	kilometre
kt	kilotonnes
Mt	million tonnes
Mtpa	million tonnes per annum
MW	megawatt
t	tonne
TWh	terawatt hours

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