

The risks of ignoring methane emissions in coal mining

Unreported coal mine methane emissions could increase coal sector risks and hinder Indonesian coal companies' decarbonisation efforts.

Published date: 29 July 2024

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About

This report analyses emission profiles of ten big coal mining companies in Indonesia. It also includes an assessment on emissions reduction actions and the decarbonisation pathway of selected coal companies. In addition, we also estimate coal mine methane (CMM) emissions from companies which currently exclude CMM in their emission inventories. The data is mainly collected from published annual and sustainability reports of coal mining companies.

Highlights

922 Mt

4

>2x

Approved total coal production quota for coal companies in 2024

Out of 10 companies reported coal mine methane in sustainability reports

Coal companies' total emissions could be more than double because of unreported coal mine methane

Executive summary

Coal mine methane: a key missing piece in coal mining decarbonisation

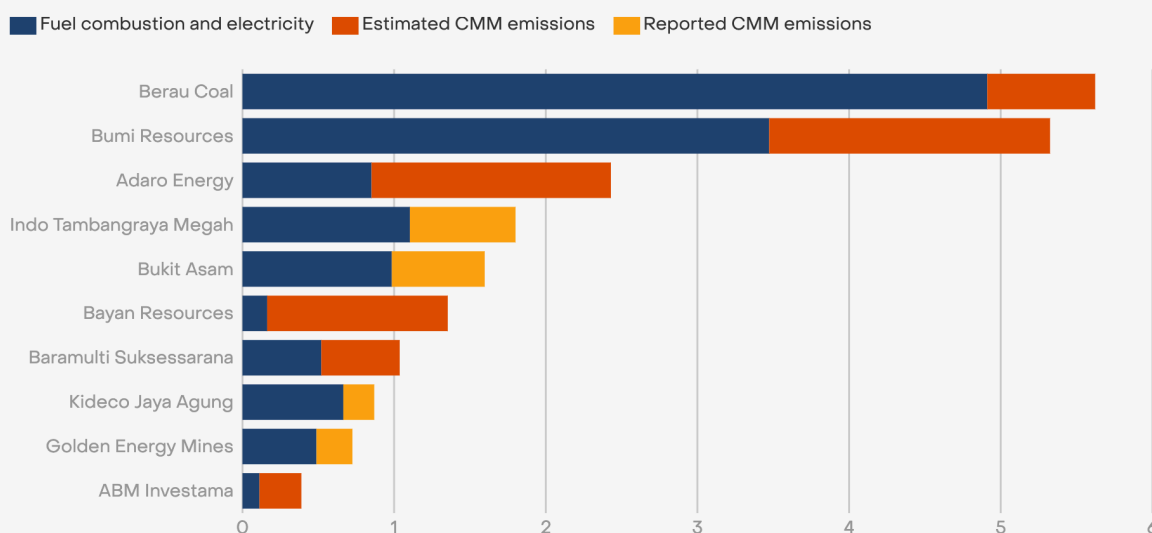
Coal mining companies will benefit from measuring and reporting methane emissions. The process helps companies understand the scale of the problem, assess environmental and investment risks and support the development of effective mitigation strategies.

Coal releases emissions not only during combustion, but also throughout the production process. Among all greenhouse gases released from the coal supply chain, coal mine methane is considered as the major emission as it has a [30x greater warming effect](#) than carbon dioxide.

Unfortunately, as is the case in many countries, Indonesian coal companies overlook the significance of methane emissions from the mining sector. Only four out of ten big companies included coal mine methane emissions in their emissions inventories. For the other six big companies, coal mine methane emissions are estimated to be as big as reported emissions from fossil fuel combustions and purchased electricity combined.

Six out of ten big coal companies did not report coal mine methane, a significant contributor to coal mining emissions

Indonesian coal company emissions in 2023 (million tonnes of carbon dioxide equivalent)



Source: Company's sustainability reports and Ember analysis - Coal mine methane (CMM) emissions are estimated using IPCC method for fugitive emission from surface coal mining with average emission factor of 1.2 m³ CH₄/t and methane's global warming potential of 29.8.



Currently, coal companies only focus on carbon dioxide reduction within their sustainability initiatives. This is reflected by the fact that several coal miners in Indonesia have initiated emissions reduction measures including large expansions of solar photovoltaic. In addition, many of Indonesia’s biggest coal mining companies are deeply engaged in renewable energy and electric vehicle development.

Nevertheless, coal mine methane remains the one emissions challenge that none of the companies we have assessed are planning to address.

The first step in reversing this trend is for coal mining companies to begin measuring and reporting their methane emissions. This will help them better understand the problem as well as align with national and international standards.

Moreover, coal mining companies need to consider methane emissions in re-assessing the environmental and investment risks amidst a broader energy transition. Business diversification will help them reduce these risks, and tap into rapidly expanding business opportunities in renewable energy.

Furthermore, proactively mitigating methane emissions is, and will remain, a critical element of reducing the environmental and social governance risks posed by coal mining.

01 The risks of increasing coal production in an uncertain market

The Indonesian government has recently approved a coal production quota of 922 million tonnes for 2024. It is 212 million tonnes higher than the current coal production target of 710 million tonnes. Meanwhile, domestic coal demand for electricity has declined and major coal importers, such as China and India, are expected to reduce coal imports.

02 Only four out of ten big coal mining companies reported CMM emissions

Among Indonesia's ten biggest coal mining companies, only Indo Tambangraya Megah, Bukit Asam, Golden Energy Mines and Indika Energy included coal mine methane in their emissions reporting. However, the methane intensity reported can be seven times greater between one company to another. And these companies did not provide enough information to properly understand the reason for this scale of variability.

03 Emissions from unreported CMM could be bigger than coal mines' energy generation

The coal mine methane emissions of the other six companies could be similar, or bigger than the currently reported mining emissions from fossil fuel combustion and purchased electricity. For companies with high strip ratios, which is the amount of waste material removed per unit of coal extracted, emissions from fossil fuel generation are much bigger than CMM emissions due to higher energy intensity.

04 Existing decarbonisation measures are insufficient

Indonesian coal mining companies have initiated emissions reduction measures and diversification toward more clean energy industries. Indika Energy and Adaro Energy have even committed to achieve net zero emissions by 2050 and 2060 respectively. However, coal mine methane is missing from any existing targets or mitigation plans. This is a key missing piece of the emissions reduction puzzle.

Big coal mining companies in Indonesia have started to reduce emissions through various decarbonisation measures, with some pledging to achieve net zero emissions and develop green energy businesses. However, most of them have overlooked the significant impacts of methane emissions within their coal businesses, and none have planned to address it. Measuring and reporting methane emissions will be crucial in coal mining decarbonisation efforts and ensuring compliance with national and international standards.

Dody Setiawan

Senior Analyst Climate and Energy - Indonesia, Ember



This report serves as an important basis in presenting the facts that the coal mining sector could potentially contribute to larger greenhouse gas emissions beyond their use for generating electricity.

The recommendations of this report can be used as the initial steps for the government and coal mining businesses to further contribute to net-zero. Furthermore, as an implementing member of the Extractive Industries Transparency Initiatives (EITI), Indonesia urges oil and gas as well as coal and mineral mining companies to publish their emissions data in accordance with the latest 2023 EITI Standard.

Aryanto Nugroho

National Coordinator - Indonesia, Publish What You Pay



Coal mining outlook

Indonesia's coal production and demand

The Indonesian government expects a long-term decline in coal demand. However, the recent quota approval of close to 1 billion tonnes of new coal brings into question the potential risks of this latest expansion.

Indonesia is the largest thermal coal exporter in the world by quantity, and coal is a critical element of the Indonesian economy. In 2023, the industry contributed to 80% of Indonesia's non-tax revenue from the mining sector, amounting to [5.7 billion](#) USD. The sector also directly employs approximately [150,000 people](#) for coal mining and mining services. Coal producing regions, such as East Kalimantan and South Sumatra are also [highly dependent](#) on the coal sector for economic growth.

At the same time, Indonesia's Enhanced Nationally Determined Contribution (NDC) has set a target to reduce emissions by [31.89%](#) and align with the 1.5 degree Celsius scenario. The country also signed the [Global Methane Pledge](#), which targets a 30% global reduction in anthropogenic methane by 2030. These commitments can only be achieved if Indonesia begins substantially increasing renewable energy share and reduces coal production.

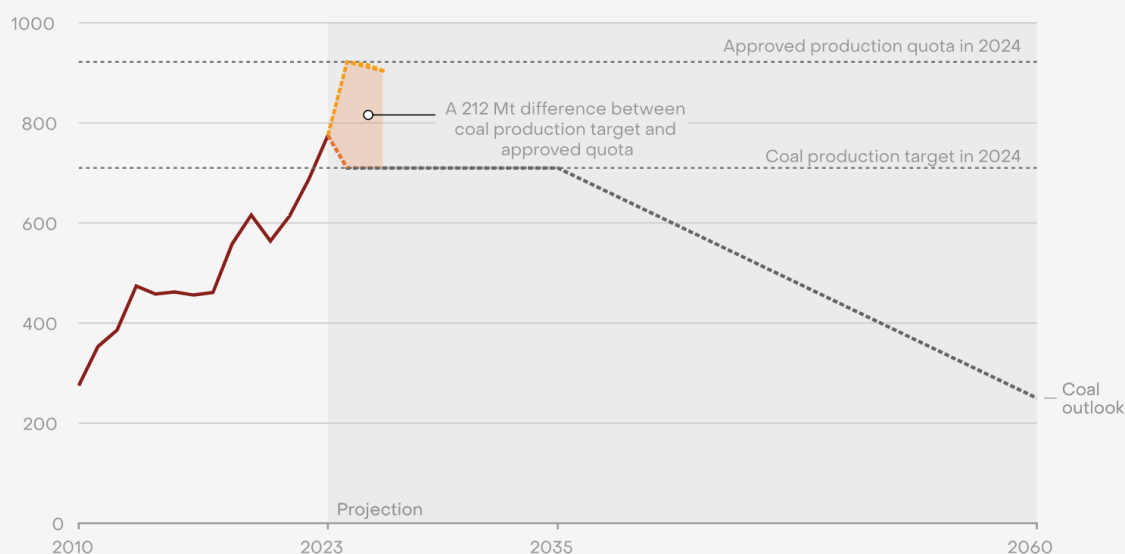
A mismatch of supply and demand

The Ministry of Energy and Mineral Resources (MEMR) has anticipated a long-term decline in global coal demand. Between now and 2035, domestic coal production is estimated to level out at around 700 million tonnes (Mt), before declining to about 250 Mt by 2060. This aligns with international projections from the [IEA](#) and the [Australian government](#), which have similarly predicted a precipitous decline in global coal demand, although their predictions suggest this decline may have already begun.

After breaking historical production records for the last two years in a row, the Ministry of Energy has set a new production target of [710 Mt](#) for 2024. This is 65 Mt lower than coal production in 2023, which reached 775 Mt.

Coal production might peak in 2024 before declining to pre-2010 levels by 2060

Coal production (million tonnes)



Source: Indonesian Ministry of Energy and Mineral Resources

However, the Ministry of Energy and Mineral Resources (MEMR) has recently announced new licensing approvals that run counter to these predictions.

According to the coal production [quota](#) presented in parliament in March 2024, there are 587 companies that have been granted approvals for a total annual coal production of more than [922 million tonnes](#) in 2024. This is 30% higher than the coal production target announced in January 2024 and may further increase as there are [175 more](#) coal production applications currently revising their proposals.

The gap between the newly announced production quota and the established production target might provide flexibility for coal companies to respond to a possibility of an increased demand globally.

However, if not monitored and managed properly, it could also lead to a risk of coal oversupply and put negative pressure on coal prices. This raises a short-term stranded asset risk and clearly unnecessary short term environmental impacts, including substantial methane emissions.

Demand for Indonesian coal is highly uncertain

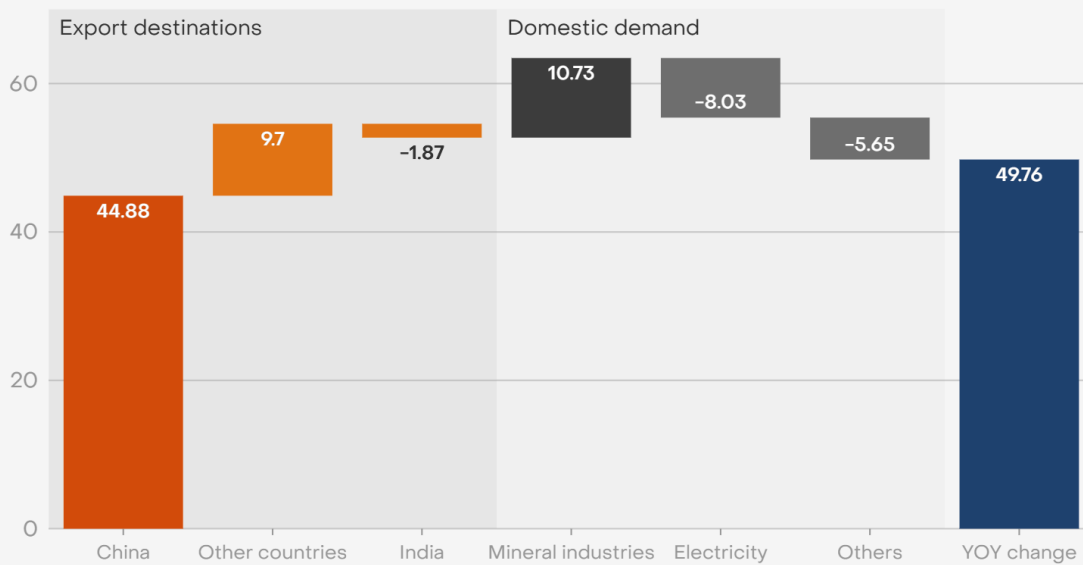
The coal production surge in 2023 was driven by significantly increased demand from China. Exports to China last year increased by [45 million tonnes](#) or 26%. However, this may only be a temporary strategy to cope with [hydropower shortages](#) in the first half of 2023. In general, with China's commitment to peaking carbon emissions by 2030, economic slow-down and record-breaking rollout of wind and solar, it is broadly estimated that China's coal demand is very likely to peak soon.

India, as the second largest Indonesian coal importer, could also be on track to reduce its coal imports. India's domestic coal production is currently [accelerating](#), in part due to a national policy effort to reduce reliance on energy imports. In 2023, India increased its production by [10%](#) and coal imports from Indonesia were already reduced by 2%. Between 2019 and 2029 this trend is expected to continue, with coal imports into India expected to drop by [102 million tonnes](#) or 52%.

Coal consumption within Indonesia has also started to decline after a significant increase in 2022. Last year coal consumption decreased by three million tonnes as power plants and industries such as pulp and paper have embarked on several decarbonisation measures that have more than offset the rise in consumption. In 2023, the only increase in coal consumption was observed in the expanding mineral processing industries.

Indonesia's recent coal mining surge was driven by increased domestic mineral industries and exports to China

Year on year change in coal demand 2022 - 2023 (million tonnes)



Source: Handbook of Energy and Economic Statistics of Indonesia

Coal mining sector emissions

Coal companies are not fully disclosing their emissions

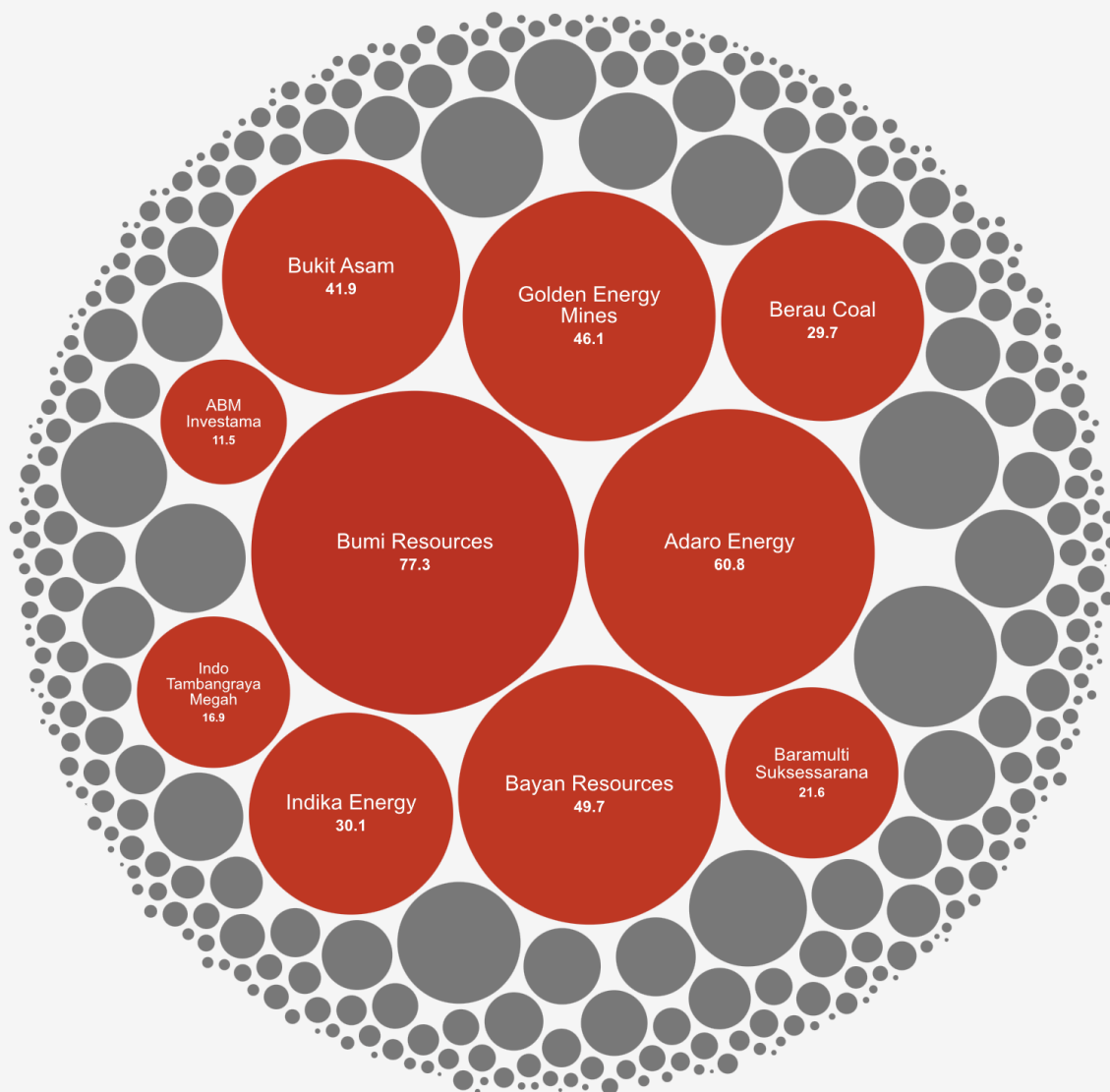
Coal mining also releases significant methane emissions which could be similar or greater than mining emissions from fossil fuel combustion and purchased electricity combined. However, most coal companies failed to measure and report these emissions.

There are currently 905 coal mining [concessions in Indonesia](#). However, around half of Indonesia's coal production comes from only ten coal mining companies. The biggest of which is Bumi Resources, with two main subsidiaries of Kaltim Prima Coal (KPC) and Arutmin Indonesia. Also among the top ten coal miners are companies such as Adaro Energy, Bayan Resources, Golden Energy Mines, Bukit Asam, Indika Energy with coal subsidiary of Kideco Jaya Agung, Berau Coal, Baramulti Suksessarana, Indo Tambang Megah and ABM Investama.

Except Berau Coal, nine of these ten companies are publicly-listed on the Indonesian stock exchange, and are required to prepare sustainability reports, according to [OJK Regulation No. 51/2017](#). This reporting framework includes requirements to report on the [breakdown of emissions by sources](#), and their intensity. However, most of Indonesia's biggest coal mining companies do not report the total extent of their emissions, and only four of Indonesia's ten major coal corporations currently include coal mine methane emissions in their emission inventories.

Ten large corporations are responsible for half of coal production in Indonesia

Major companies by coal production volume (million tonnes)



Source: Global Energy Monitor, company's annual report

Emission footprints of coal mining companies

Coal releases emissions not only when it is burned, but also during the mining process. Coal extraction and overburden removal release methane that is embedded within the coal seam. This is categorised as fugitive emissions, and the embedded methane released in this process is considered as the [major emission](#) source for the mining industry.

In addition, heavy equipment and machinery in coal mines are fueled by diesel which emits CO₂. This is recorded as emissions from fossil fuel combustion.

Both fossil fuel combustion and fugitive emissions occur and are controlled by the coal mining company, and are categorised as direct emissions (scope 1). The emissions intensity and profile of a particular mine varies from one company to another, mainly due to unique characteristics of each mine, such as the coal type, coal seam profile and mining techniques.

Scope of emissions reporting

The Global Reporting Initiative (GRI) developed a [sectoral standard](#) for the coal sector. The standard outlines direct emissions reporting to include fossil fuel combustions, process emissions and fugitive methane emissions. In addition, [MEMR regulation No. 22/ 2019](#) requires coal companies to include coal mine methane in their emission inventories and ensure that the methodology is aligned with international standards.

However, most companies analysed in this report did not include fugitive methane emissions and only reported CO₂ emissions from fossil fuel combustions and purchased electricity while claiming to align with GRI standards.

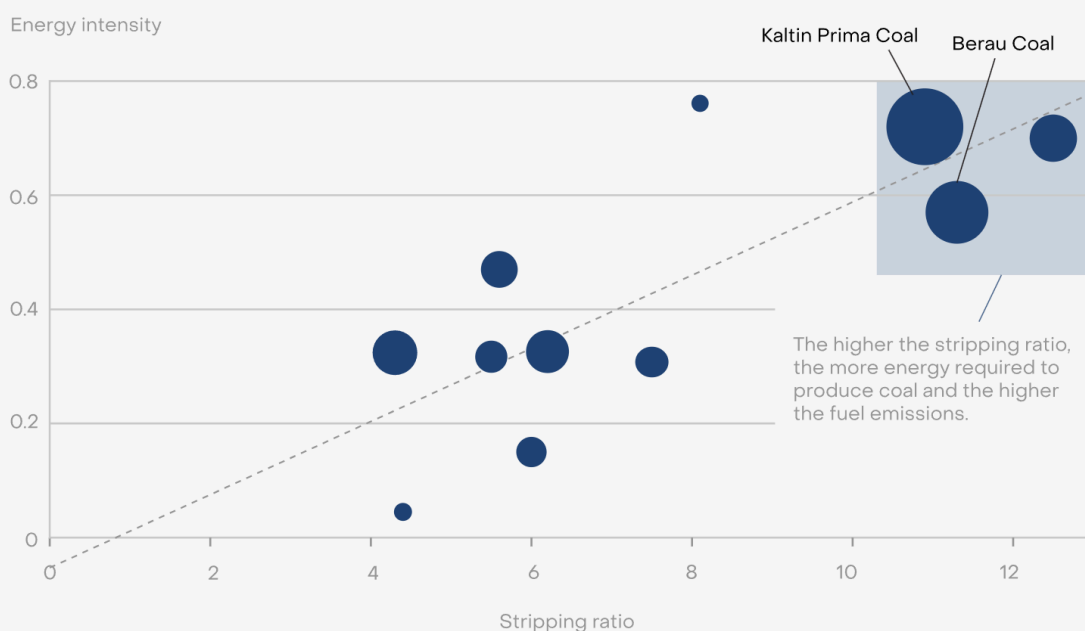
Coal mine methane could double coal companies' reported emissions

We analysed energy use and emission profiles of 10 coal mining companies in Indonesia using data available in their respective sustainability reports. All companies reported energy consumption and energy intensity, which are generally considered as major emission sources in coal mining.

The amount of waste material removed per unit of coal extracted, known as a strip ratio, directly correlates with the energy consumption to mine coal. Companies with a high stripping ratio, such as Berau Coal and Kaltim Prima Coal, normally have higher energy intensities, and consequently generate higher emissions from fuel combustion. Conversely, companies with a low stripping ratio, such as Bayan Resources, have a lower energy intensity and release less emissions.

Emissions and energy intensity are higher in coal mines with a high stripping ratio

Relationship between stripping ratio (x axis), energy intensity (y axis) and fuel combustion emissions (size) of coal companies in Indonesia



Source: Coal companies' sustainability reports
 The data was collected from 2023 sustainability reports, except for Berau Coal, which was collected from the 2017 sustainability report. Energy intensity is the amount of energy (in GJ) required to produce 1 ton of coal. Stripping ratio refers to the amount of waste materials that needs to be removed to extract a given amount of coal

Unfortunately, six out of ten big coal companies did not include coal mine methane in their emission inventories. They also rarely report critical details such as coal mine depth and permeability. This lack of key data points limits the accuracy of an independent estimate of their potential coal mine methane.

However, the Intergovernmental Panel on Climate Change (IPCC) recommends that in a case

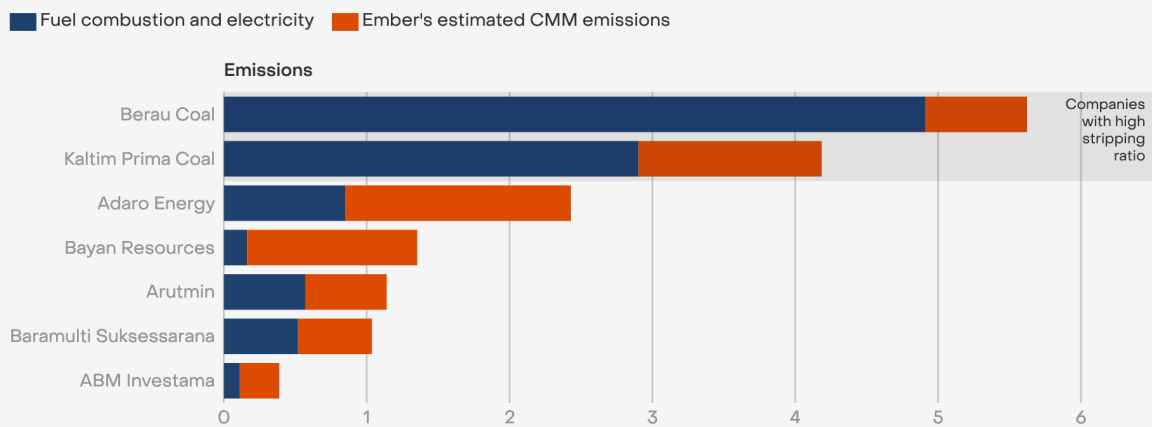
such as this, an estimate utilising the IPCC average emission factors is the best available approach. As such, we estimated the potential coal mine methane emissions of each of these companies using the [IPCC average emission factors](#) and converted it to carbon dioxide equivalence (CO2-e) using a 100-year global warming potential for methane (GWP) from [the latest IPCC assessment report](#).

Our analysis indicates that for most major coal companies, methane emissions from coal mining may be **on par or greater than the total emissions from fossil fuel combustion and purchased electricity**. Kaltim Prima Coal and Berau Coal are the only two exceptions, due to their high strip ratios and energy intensity, leading to higher emissions from fossil fuel combustion.

It should be noted though that coal mines with high stripping ratios may be emitting more methane per ton of coal, due to deeper mining in potentially gassier coal seams.

Coal mine methane could double existing emissions reporting for some of Indonesia's biggest companies

Coal company emissions in 2023 (million tonnes of carbon dioxide equivalent)



Source: Company's sustainability reports and Ember analysis - Coal mine methane (CMM) emissions are estimated using IPCC method for fugitive emission from surface coal mining with average emission factor of 1.2 m³ CH₄/t and methane's global warming potential of 29.8.

Reported coal mine methane emissions are unclear

Only four of the ten coal companies analysed disclosed their coal mine methane emissions. These include Indo Tambangraya Megah, Bukit Asam, Golden Energy Mines and Indika Energy. Even though not discussed in this report, [TBS Energi Utama](#), which produced 3.2 million tonnes of coal in 2023, also reported coal mine methane emissions.

These four companies use various methods and assumptions to calculate emissions. Bukit Asam uses [guidelines for GHG inventory](#) and methane's Global Warming Potential (GWP) of 21 from the IPCC's Second Assessment Report. Golden Energy Mines uses [MEMR Regulation No. 22/2019](#) with methane's GWP of 25 from the IPCC's Fourth Assessment Report. The other two companies use the [Greenhouse Gas Protocol](#) and methane's GWP of 28 from the IPCC's Fifth Assessment Report. However, the latter two methods only provide general frameworks of greenhouse gas (GHG) inventory and reporting that is not specific on coal mine methane.

The IPCC provides guidelines for estimating [fugitive emissions](#) from coal mining. For surface mines, methane emissions are calculated by multiplying coal production with emission factors.

Unfortunately, none of these companies provide any information on the emission factors being used, making it very difficult to determine whether the emissions have been reported accurately. This can be observed in the reported methane emissions that show a higher degree of variability between companies.

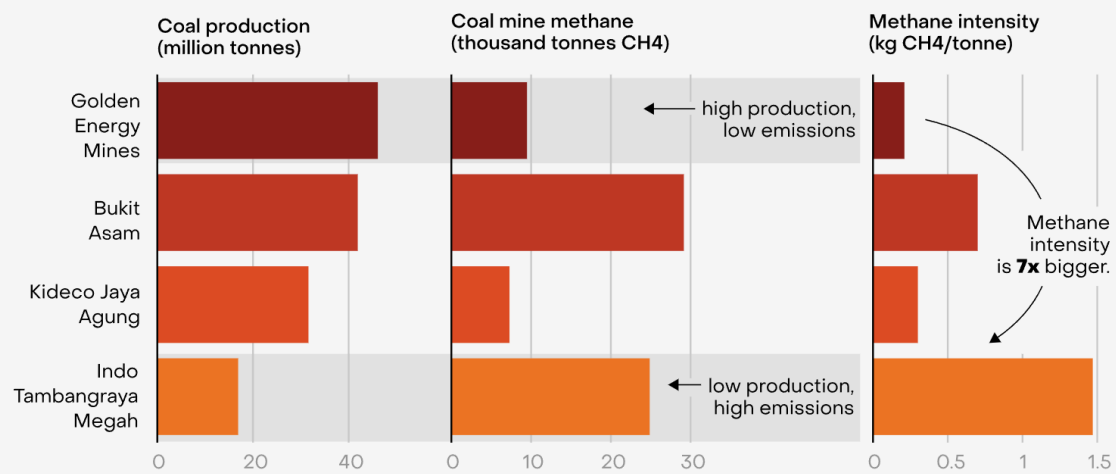
For example, Golden Energy Mines reported 162% less methane emissions than Indo Tambangraya Megah, while producing 173% more coal. There may be a number of reasons for this level of difference. However, without further clarity and transparency of how these estimates were developed, it is very hard to assess them independently.

The methane intensity of Golden Energy Mines could be lower for example, due to mining in a lower-grade coal seam. The depth and geology of the mine may also result in significantly reduced stripping ratios. Without greater transparency, it is very challenging to make a clear comparison. If either company were to transparently publish their methane emission factors alongside their coal mine methane assumptions, it would significantly improve the integrity of these estimates.

However, these types of methane accounting practices do not only occur in Indonesia. Ember recently published an in-depth analysis which highlights how emission accounting [loopholes](#) also undermine methane reporting integrity in Australian coal mines.

Four companies reported coal mine methane emissions; however, with high uncertainty

Coal production, reported coal mine methane emissions and methane intensity



Source: Golden Energy Mines, Bukit Asam, Kideco Jaya Agung, Indo Tambangraya Megah

Decarbonisation pathways

Decarbonisation measures have been initiated but highly insufficient

Coal companies have implemented measures to reduce emissions and have started business diversification into the clean energy sector. However, none has addressed coal mine methane emissions.

The energy transition is progressing in Indonesia and many of its major export markets. This has already increased business uncertainty in the coal sector. Accordingly, coal mining companies need to assess this transition risk and prepare mitigation strategies, which may include emissions reduction and business diversification.

We analysed emissions reduction activities that have been carried out by coal mining companies in Indonesia, such as utilising renewable energy, electric vehicles and carbon offsets. In addition, we also assessed their plans to diversify their businesses into clean energy.

[Indika Energy](#) and [Adaro Energy](#) stated their commitments to achieve net zero emissions (NZE) by 2050 and 2060 respectively. Both companies have developed roadmaps outlining strategies and steps to achieve NZE. Furthermore, Indika Energy is the [first](#) Indonesian company to join the Powering Past Coal Alliance (PPCA). However, neither of these two companies have included a specific methane mitigation goal in their sustainability plans.

Existing measures to reduce emissions

Indonesian coal companies have started to utilise renewable energy to reduce emissions from coal mining operations.

For example, two companies installed large-scale solar photovoltaic projects to power coal mining facilities. This includes a [3 MWp solar hybrid system](#) at Indominco Mandiri (subsidiary of Indo Tambangraya Megah) and a [1.5 MWp solar photovoltaic project](#) at Senyur Barge Loading Facility of Bayan Resources.

Three other companies developed smaller solar projects. Adaro Energy installed [solar rooftop and floating solar](#) with a total capacity of 598 kWp at Kelanis coal processing facility. [Kideco Jaya Agung](#) and [Golden Energy Mines](#) also utilised solar photovoltaic for employee housings with a total capacity of 409 kWp and 232.2 kWp respectively. Additionally, Golden Energy Mines have also purchased 2,368 MWh of renewable energy certificates (REC) from PLN.

Besides installing solar photovoltaic projects, Adaro Energy and Kideco Jaya Agung have also tried to reduce fossil fuel consumption by utilising electric vehicles. However, this has only led to minor emissions reductions.

Last year, Adaro Energy purchased and utilised two electric vehicles for employee transportations and saved 1,095 litres or reduced three tonnes of CO₂. Kideco Jaya Agung also provided an electric bus for shuttle transportation for 400 employees which saved 3,996 litres per year, or reduced seven tonnes of CO₂.

While not insignificant, all of these measures account for only small reductions in carbon dioxide emissions compared to the millions of tonnes per year emitted in electricity and diesel emissions. They also only act to reduce carbon dioxide emissions alone. Currently, none of the analysed companies have implemented or plans to reduce, or mitigate their significant methane emissions.

Diversification to clean energy business

In the long-term, most companies, directly or through affiliates, have planned to increase non-coal revenue by pursuing non-coal business opportunities, such as renewable energy, electric vehicles and critical minerals.

Companies expanding their businesses into renewable energy might be able to tap into business opportunities from the emerging Just Energy Transition Partnership (JETP). This partnership is between the Indonesian government and the International Partners Group (IPG), and aims to increase Indonesia's renewable energy share by 44%. The agreement has already generated a project pipeline amounting to [US\\$ 97.3 billion](#) between 2023 to 2030. In addition, companies involved will benefit from [better funding access](#), as the Indonesian Financial Service Authority (OJK) has developed a [sustainable taxonomy](#) to encourage investment in sustainability initiatives.




Almost all of the analysed companies, except Bayan Resources and Baramulti Suksessarana, have developed renewable energy businesses. Adaro Energy and its consortium partners are developing [large-scale hydropower](#) in North Kalimantan and wind projects in South Kalimantan. Dian Swastatika Sentosa, a parent company of Golden Energy Mines and an affiliate of Berau Coal, developed the first integrated [solar manufacturing plant in Indonesia](#) with Trina Solar. Indika Energy's subsidiary, EMITS, will also develop a 102 MWp solar hybrid system for PLN's [diesel substitution](#) program. Finally, ABM Investama owns and operates a [biogas power plant](#) in South Kalimantan through its subsidiary, PT Anzara Janitra Nusantara.

Two companies have also started an electric vehicle business. [VKTR](#), a subsidiary of Bakrie and Brothers and is affiliated with Bumi Resources, manufactures electric buses, electric two-wheelers and charging stations. Ilectra Motor Group (IMG), a subsidiary of Indika Energy, develops [electric two-wheelers](#).

Unlike the aforementioned companies, Bayan Resources and Baramulti Suksessarana have not shown a commitment to diversify their businesses into clean energy. In 2023, these two companies significantly increased their coal production by 28% and 39% accordingly. This trend looks to continue in 2024 as [Bayan Resources](#) aims to further increase the production to 57 million tonnes this year, which could result in a 15% increase.

Renewable energy has become a critical avenue of decarbonisation for Indonesia's biggest coal miners

Business diversification of major coal mining companies

	Renewable energy 	Electric vehicles 	Critical materials 
ABM Investama	✓		
Adaro Energy	✓		✓
Baramulti Suksessarana			
Bayan Resources			
Berau Coal	✓ *		
Bukit Asam	✓		
Bumi Resources	✓ *	✓ *	✓
Golden Energy Mines	✓ *		
Indika Energy	✓	✓	✓
Indo Tambangraya Megah	✓		

*Business diversification through affiliate company

Recommendations

Measuring methane for effective mitigation measures

Developing a comprehensive GHG emissions inventory and including fugitive coal mine methane will help coal companies understand their emission profiles and be able to devise effective mitigation strategies.

Indonesia's biggest coal mining companies have shown varying degrees of commitment to developing an emission inventory and reducing their respective CO2 emissions. However, many of these actions have yet to lead to substantial emissions cuts, and most of these companies currently do not measure or report their coal mine methane emissions. As a result, methane mitigation measures have yet to be considered in any of the coal mining decarbonisation plans analysed in this report.

Ember has developed three key recommendations for coal mining companies to understand the scale of coal mining emissions, manage risks and tap mitigation opportunities.

1. Understanding emissions and align with standards

Developing comprehensive greenhouse gases inventory is important for coal companies to fully understand their process and emissions. The inventory should cover all greenhouse gases, including coal mine methane (CMM) which represents a considerable portion of a coal company's overall emissions. By understanding their emissions, they can adopt strategies to improve efficiency and reduce emissions, as well as adhere to sustainability compliance.

Coal companies need to comply with regulations and standards. Nationally, the [MEMR Regulation No. 22/ 2019](#) requires energy sector businesses to develop a greenhouse gas

inventory, which includes fugitive methane emissions. Internationally, [GRI 12: coal sector 2022](#) and [IFRS climate-related disclosure](#) provide comprehensive guidelines for coal companies in preparing their sustainability reports.

For estimating coal mine methane emissions, companies could refer to the [IPCC's guidelines on fugitive emissions](#), which have also been adopted by [the Ministry of Environment and Forestry](#). It is also recommended to use suitable emission factors and the latest methane's global warming potential.

Finally, publishing emissions will help companies increase transparency and credibility for maintaining public trust. Indonesia, as a member of Extractive Industry Transparency Initiative (EITI), needs to promote openness and transparency, including publishing emission data as outlined in the latest [EITI standard](#).

2. Re-assessing the risks

There is a growing concern internationally that methane emissions from coal mining need to be better reported and mitigated. This analysis indicates that coal mine methane emissions from Indonesia's biggest companies could be similar or higher than their emissions from fossil fuel combustion and purchased electricity. Failing to understand or report on these emissions appropriately undermines a company's overall sustainability reporting. It also overlooks a potentially significant missed opportunity for emissions reductions.

As the world is transitioning away from coal, it is also important to comprehensively assess all sources of a company's emissions to better understand investment and operational risks. Indonesia has enacted a regulation on [Carbon Pricing](#) within the energy sector (coal fired power plant) as the frontrunner. As an integrated element of the energy sector, there is a high possibility that coal mining will also participate in future carbon pricing regulation.

Methane pricing is also gradually being implemented in other countries. The United States developed a [methane pricing](#) scheme within the Inflation Reduction Act (IRA). The cost of methane emissions for oil and gas is set at USD 900 per tonne in 2024 and will increase to USD 1,500 in 2026. This is largely aligned with the social costs of methane pollution recognised by Australia's Energy Regulator as well. Furthermore, the European Union (EU) Methane Regulation also outlines a [penalty scheme](#) with a recommended fine of EUR 6,000 per tonne of methane.

3. Reducing methane emissions

There are two steps for coal companies to reduce methane emissions. In the long-term, coal companies should diversify their business and gradually reduce coal production. This is inline with broader global demand projections, coal investment risks and business opportunities in the clean energy sector. In the short-term, coal companies should start implementing mitigation measures to cut methane emissions.

The International Energy Agency (IEA) estimated that [26%](#) of Indonesian coal mine methane emissions could be technically abated using existing technologies. This includes pre-mine drainage and ventilation air methane (VAM) mitigation. Pre-mine drainage is implemented by drilling boreholes into the coal seam to extract methane prior to mining. VAM refers to extracted methane from a ventilation system to reduce methane concentrations in underground coal mines. The extracted methane will then be captured and either utilised or destroyed through oxidation.

Coal companies should be actively investigating opportunities to implement pre-mine drainage across their surface mining assets. Such technologies have become widespread in China, the US and Australia, with early investment support from the Clean Development Mechanism (CDM) in the late 2000's, and through government support and carbon market regulations.

This is also not limited to underground mines. In Australia, the Conorado's Curragh mine has implemented a [pre-mine drainage](#) system that is able to profitably capture its waste gas and sell it for electricity generation. The company has also successfully trialled substituting diesel fuel in its truck fleet with gas, leading to substantial onsite emissions reductions and fuel cost savings.

However, underground coal mines have even more opportunities to mitigate their emissions. While these mines have similar opportunities to explore pre-mine drainage, they also have the opportunity to partner this mitigation approach with VAM mitigation.

In 2012, a consortium involving Bayan Resources and Enel Trade SpA submitted a CDM project design for pre-mining drainage and VAM mitigation projects at the [Wahana Baratama mine](#) in South Kalimantan. Unfortunately, there is no further information whether the project has moved forward or halted. However, the technical feasibility of VAM mitigation technology has been proven in a variety of mine settings around the world over the last 25 years.

Supporting Materials

Methodology

Disclaimer

We have identified instances where reported emissions or estimates may significantly underestimate the actual amount of emissions released. It is important to note that this information is intended for informational or educational purposes only and should not be construed as financial, legal, or other professional advice.

The data presented in this report is based on materials outlined below. While the findings are derived from an analysis of this material, we cannot guarantee the completeness, accuracy, or reliability of the statements or representations arising from it. There may also be additional reporting that may not be publicly available or that we are not aware of. We have contacted all coal mining companies mentioned in the reports on two separate occasions and requested clarification if this is the case. The companies are Bumi Resources, Adaro Energy, Golden Energy Mines, Bayan Resources, Bukit Asam, Indika Energy, Kideco Jaya Agung, Berau Coal, ABM Investama, Indo Tambangraya Megah and Baramulti Suksessarana.

Data sources

Information on Indonesian coal production outlook was gathered based on a [press conference](#) by the Ministry of Energy and Mineral Resources (MEMR). Coal production quota was collected from MEMR during a [public hearing](#) with parliament. Coal export and domestic consumption data was collected from the [Handbook of Energy and Economic Statistics of Indonesia](#).

Coal production, energy intensity and emission data of 10 big coal companies were collected from annual and sustainability reports of coal mining companies. In addition, coal production data of other companies were collected from [Global Energy Monitor](#). For companies with multiple business lines, such as Bukit Asam, Adaro Energy and Indika Energy, we only selected specific information (including energy consumption and emissions) related to the coal mining business.

Coal mine methane (CMM) estimates

Ember estimated CMM emissions of six coal companies which did not include it in emissions reporting. The CMM emissions were calculated by multiplying annual coal

production data with methane emission factors for surface coal mines following [national standard](#) and [IPCC guidelines](#).

Indonesia currently does not have country-specific or basin-specific methane emission factors for coal mining. Consequently, coal companies could use global emission factors from [IPCC guidelines](#) or use [Kholod et al's method](#). In general, both methods agree that methane emissions will increase following the mining depth. And since we did not have information on each company's mine depth, we utilised average emission factors for surface coal mines from IPCC guidelines. In addition, we used methane's global warming potential of 29.8 from [the Sixth Assessment Report](#).

Reporting standards and guidelines

At national level, [MEMR Regulation No. 22/2019](#) provides general guidelines on emissions inventory for the energy sector. Emission sources include fuel combustion, fugitive emissions from coal mining and gas infrastructures, leakage in CO2 injection and venting and flaring in oil and gas.

Specifically for the coal sector, [GRI sector standard for coal](#), [IFRS climate-related disclosure](#) and [CDP](#) provide specific guidelines. GRI provides specific recommendations for GHG emissions reporting. This includes reporting GHG emissions from CH4 and the breakdown of scope 1 GHG emissions by type of source (stationary combustion, process, fugitive). Similar to GRI, IFRS and CDP also require companies to disclose GHG emissions and the breakdown. In addition, the company needs to outline a strategy to manage emissions and set emissions reduction targets.

These standards are also closely aligned with [GRI 305](#), [GHG protocol](#) and [ISO 14064](#) on emission inventory.

Acknowledgements

Contributors

Reynaldo Dizon and Jivan Thiru for all the data visualisation. Rini Sucahyo and Ardhi Arsala Rahmani who contributed through text editing. Eleanor Whittle who reviewed the report.

Our appreciation also goes to Publish What You Pay (PWYP) Indonesia who provides valuable inputs during the writing of this report.

Cover image

Open pit coal mining in Borneo, Indonesia.

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