



# WHO'S DOING WHAT?

**A Closer Look at Methane Climate Impact and Commitments in Southeast Asia's Energy Sector**

Qiu Jiahui

# TRENDS IN SOUTHEAST ASIA

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# FOREWORD

The economic, political, strategic and cultural dynamism in Southeast Asia has gained added relevance in recent years with the spectacular rise of giant economies in East and South Asia. This has drawn greater attention to the region and to the enhanced role it now plays in international relations and global economics.

The sustained effort made by Southeast Asian nations since 1967 towards a peaceful and gradual integration of their economies has had indubitable success, and perhaps as a consequence of this, most of these countries are undergoing deep political and social changes domestically and are constructing innovative solutions to meet new international challenges. Big Power tensions continue to be played out in the neighbourhood despite the tradition of neutrality exercised by the Association of Southeast Asian Nations (ASEAN).

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# Who's Doing What? A Closer Look at Methane Climate Impact and Commitments in Southeast Asia's Energy Sector

By Qiu Jiahui

## EXECUTIVE SUMMARY

- This article draws from a database of asset-level emissions to identify key methane-emitting coal, oil and gas facilities in Southeast Asia while taking stock of the methane commitments of their owners.
- Coal mines account for around a third of fossil fuel methane emissions globally, but in Southeast Asia they make up more than half of tracked fossil fuel methane emissions.
- Over half of emissions from the coal mining subsector is traced to its top ten emitters, mostly in East Kalimantan, Indonesia; while some coal mines in North Vietnam have high emissions intensities.
- Though the global discourse on fossil methane focuses on oil and gas, coal mine methane remains crucial for Southeast Asia due to the region's lack of decisive coal phaseout plans.
- As countries begin to tackle coal emissions at the power generation stage, a gap still remains when it comes to coal mining emissions. Methane monitoring and abatement actions are urgently needed for coal mines that will continue to operate, as well as those slated for closure.
- More clarity is needed on how private sector commitments in the oil and gas sector will translate to action under complex and changing ownership arrangements.



- These gaps and uncertainties in methane abatement are ripe opportunities for closer partnership in the region, including within the private sector.

# Who's Doing What? A Closer Look at Methane Climate Impact and Commitments in Southeast Asia's Energy Sector

By Qiu Jiahui<sup>1</sup>

## INTRODUCTION

The momentum on methane reduction is picking up as governments and private sectors acknowledge its crucial role in meeting the Paris Agreement goals. The International Energy Agency (IEA) has called for fossil fuel methane emissions to be cut by 75 per cent by 2030 to keep the 1.5-degree goal in sight.<sup>2</sup> Compared to carbon dioxide, methane (the second most abundant greenhouse gas) has a much stronger impact on warming temperatures. Within a 100-year time horizon, a tonne of methane in the atmosphere could cause about twenty-five times the warming as the same amount of carbon dioxide.<sup>3</sup> So far, methane has accounted for about 30 per cent of global temperature rise since the Industrial Revolution.<sup>4</sup>

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<sup>1</sup> Qiu Jiahui is Research Officer in the Climate Change in Southeast Asia Programme at the ISEAS – Yusof Ishak Institute, Singapore.

<sup>2</sup> IEA, “Global Methane Tracker 2024” (Paris, 2024), <https://www.iea.org/reports/global-methane-tracker-2024>

<sup>3</sup> IPCC, “The Evidence Is Clear: The Time for Action Is Now. We Can Halve Emissions by 2030”, 2022, <https://www.ipcc.ch/2022/04/04/ipcc-ar6-wgiii-pressrelease/>

<sup>4</sup> IEA, “Global Methane Tracker 2022”, <https://www.iea.org/reports/global-methane-tracker-2022> (accessed 10 March 2022).

Methane is emitted in a wide variety of human activities, especially in the agricultural, energy and waste sectors. 40 per cent of anthropogenic methane emissions are traced to the energy sector, including coal mining as well as multiple stages in the oil and gas supply chain. Fossil fuel production and usage contributed 118 Mt<sup>5</sup> of global methane emissions (equivalent to 2,950 MtCO<sub>2</sub>e<sup>6</sup> of emissions<sup>7</sup>) in 2023.<sup>8</sup> Methane emissions in the coal sector come from leakages in coal mines, while emissions in the oil and gas sector mostly come from leakages or routine flaring (burning) and venting of gases.<sup>9</sup> Besides being the second-largest contributing sector to methane emissions, around 40 per cent of annual fossil fuel methane emissions can be avoided using current technologies at no net cost, giving it considerable methane abatement potential compared to other sectors like waste or agriculture.<sup>10</sup> This has led some to describe methane abatement in the energy sector as a “low-hanging fruit” for climate action.<sup>11</sup>

In Southeast Asia, the agriculture sector contributed the largest share of methane emissions (over 51 per cent) followed by the waste sector (25 per cent) and fugitive emissions from the coal mining, oil and gas sectors (18 per cent) in 219. Fugitive emissions make up a significant share of emissions for Brunei (88 per cent), Malaysia (31 per cent),

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<sup>5</sup> Mt refers to million tonnes.

<sup>6</sup> MtCO<sub>2</sub>e refers to million tonnes of CO<sub>2</sub> equivalent greenhouse gas emissions. For example, 1 Mt of methane emissions can be expressed as equivalent to 25 MtCO<sub>2</sub>e of greenhouse gas emissions.

<sup>7</sup> Calculated based on a Global Warming Potential of 25, as reported for methane in a 100-year time horizon in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.

<sup>8</sup> IEA, “Global Methane Tracker 2024”.

<sup>9</sup> IEA, “Methane Tracker 2021”, <https://www.iea.org/reports/methane-tracker-2021> (accessed 11 March 2022).

<sup>10</sup> IEA, “Global Methane Tracker 2024”.

<sup>11</sup> Akshat Rathi and Oscar Boyd, “Methane Leaks Are the Low-Hanging Fruit of the Climate Crisis”, *Bloomberg*, 21 August 2023, <https://www.bloomberg.com/news/articles/2023-08-21/methane-leaks-are-the-low-hanging-fruit-of-the-climate-crisis> (accessed 14 March 2024).

Indonesia (25 per cent) and Singapore (23 per cent). While accounting for a smaller portion of Vietnam’s (15 per cent) and Thailand’s (16 per cent) overall methane emissions, they still amount to large quantities. For instance, Vietnam emitted 80.9 MtCO<sub>2e</sub> of methane overall, of which 48.1 MtCO<sub>2e</sub> were fugitive emissions—similar to that of Malaysia.<sup>12</sup> As such, methane is an area of concern for all six countries.

At the 2021 Conference of the Parties (COP) 26, methane was in the spotlight with the announcement of the Global Methane Pledge to “contribute to a collective effort to reduce global methane emissions by at least 30 per cent from 2020 levels by 2030”. Subsequently, the COP28 Global Methane Pledge Ministerial saw the announcement of over US\$1 billion in new grants for methane action since COP27, which is expected to help mobilize billions more in methane reduction investment.<sup>13</sup> The Pledge has 155 country participants so far, including six ASEAN member states (AMS): Cambodia, Indonesia, Malaysia, the Philippines, Singapore and Vietnam.<sup>14</sup> The Climate and Clean Air Coalition (CCAC) convened by the United Nations Environment Programme has worked to raise awareness on methane and other short-lived climate pollutants since 2012, also serving as the secretariat for the Global Methane Pledge. CCAC’s partner countries include Cambodia, the Philippines, Thailand and Vietnam. Most recently, the Oil and Gas Decarbonization Charter was launched at COP 28, with signatory companies representing over 40 per cent of global oil production committing to net zero operations by 2050, ending routine flaring by 2030 and minimizing upstream methane emissions.<sup>15</sup>

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<sup>12</sup> World Resources Institute, “Climate Watch Historical GHG Emissions”, 2022, <https://www.climatewatchdata.org/ghg-emissions>

<sup>13</sup> European Commission, “2023 Global Methane Pledge Ministerial: Decisive Action to Curb Emissions”, 4 December 2023, [https://energy.ec.europa.eu/news/2023-global-methane-pledge-ministerial-decisive-action-curb-emissions-2023-12-04\\_en](https://energy.ec.europa.eu/news/2023-global-methane-pledge-ministerial-decisive-action-curb-emissions-2023-12-04_en) (accessed 14 March 2024).

<sup>14</sup> Climate & Clean Air Coalition Secretariat, “Global Methane Pledge”, <https://www.globalmethanepledge.org/> (accessed 14 March 2024).

<sup>15</sup> COP28 UAE, “Oil & Gas Decarbonization Charter Launched to Accelerate Climate Action”, 2023, <https://www.cop28.com/en/news/2023/12/Oil-Gas-Decarbonization-Charter-launched-to-accelerate-climate-action>

While commitments towards methane abatement are growing in Southeast Asia, considerable uncertainties remain. In addition to the six countries that participate in the Global Methane Pledge, all AMS except Myanmar include methane in their greenhouse gas monitoring for their Nationally Determined Contributions (NDC) which outline their climate commitments, while some have also indicated methane-specific strategies. However, most are focused on methane in the waste or agricultural sectors rather than the energy sector.<sup>16</sup> There are also data and reporting gaps: recent research has cast some doubt on the accuracy of national reports<sup>17</sup> and the lack of granularity in emissions data makes it difficult to pinpoint subsectors or subnational jurisdictions where methane abatement efforts and engagement should be focused. Moreover, these commitments do not reflect the level of private sector cooperation on methane abatement, which will be essential for abatement solutions ranging from the monitoring and reporting of emissions to leakage prevention and modifying routine processes.

Globally, around US\$170 billion will be needed to achieve a 75 per cent reduction in fossil fuel methane by 2030, amounting to less than 5 per cent of the industry's annual income.<sup>18</sup> Many energy companies have made methane commitments, but without a clear picture of their methane footprint, their potential impact on the region remains unclear. Other barriers to methane abatement include underdeveloped

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<sup>16</sup> Qiu Jiahui and Ryan Wong, *Understanding and Reducing Methane Emissions in Southeast Asia*, Trends in Southeast Asia, no. 8/22 (Singapore: ISEAS – Yusof Ishak Institute, 2022).

<sup>17</sup> Zhu Deng et al., “Comparing National Greenhouse Gas Budgets Reported in UNFCCC Inventories against Atmospheric Inversions”, *Earth System Science Data* 14, no. 4 (11 April 2022): 1639–75, <https://doi.org/10.5194/essd-14-1639-2022>; Sabina Assan and Eleanor Whittle, “In the Dark: Underreporting of Coal Mine Methane Is a Major Climate Risk”, *Ember*, 28 November 2023, <https://ember-climate.org/insights/research/in-the-dark-underreporting-of-coal-mine-methane-is-a-major-climate-risk/>; Dody Setiawan and Chris Wright, “Uncovering Indonesia’s Hidden Methane Problem”, *Ember*, 12 March 2024, <https://ember-climate.org/insights/research/uncovering-indonesias-hidden-methane-problem/>

<sup>18</sup> IEA, “Global Methane Tracker 2024”.

regulations, lack of awareness, capacity (including monitoring capacity) and infrastructure.<sup>19</sup> Experts have begun to generate regulatory and policy roadmaps for governments crafting their methane abatement strategies;<sup>20</sup> but energy companies are also crucial for implementation. A greater understanding of the fossil fuel industry’s emissions profile and ownership would aid in policy design.<sup>21</sup> Where resources are limited, the largest-emitting or most emissions-intensive assets can be identified for investments and collaboration in capacity-building and infrastructure development.

This article uses granular data on methane emissions from Climate TRACE, a publicly available database of greenhouse gas emissions to provide deeper context on the state of methane emissions in Southeast Asia’s fossil fuel energy sector. The analysis is guided by the following research questions.

1. What is the methane emissions profile of Southeast Asia’s oil, gas and coal subsectors?
  - 1.1 Which energy subsectors are the biggest contributors?
  - 1.2 Within each country, which facilities/assets are the biggest or highest-intensity emitters?
2. Who are the key private sector actors for methane abatement and what are the challenges in private sector engagement?

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<sup>19</sup> Caroline Alberti and Baysa Naran, “Spotlight: Financing Oil & Gas Methane Abatement in Southeast Asia” (Climate Policy Initiative, 2023), <https://www.climatepolicyinitiative.org/wp-content/uploads/2023/11/Spotlight-Financing-Oil-Gas-Methane-Abatement-in-Southeast-Asia.pdf>

<sup>20</sup> Adam Pacsi et al., “Methane Abatement for Oil and Gas: Handbook for Policymakers” (US Department of Commerce, 2023), <https://cldp.doc.gov/sites/default/files/2023-09/CLDP%20Methane%20Abatement%20Handbook.pdf>; Kristina Mohlin et al., “Policy Instrument Options for Addressing Methane Emissions from the Oil and Gas Sector”, *Environmental Defense Fund Economics Discussion Paper Series*, EDF EDP 22-01 (Rochester, NY, 14 June 2022), <https://doi.org/10.2139/ssrn.4136535>; IEA, “Driving Down Methane Leaks from the Oil and Gas Industry” (Paris: IEA, 2021), <https://www.iea.org/reports/driving-down-methane-leaks-from-the-oil-and-gas-industry>

<sup>21</sup> IEA, “Driving Down Methane Leaks from the Oil and Gas Industry”.

## METHOD

In this article, “assets” or “facilities” refer to coal mines, oil and gas fields and refineries. Data on asset-level methane emissions and ownership for coal mining, oil and gas production and transport and oil refining in 2015–21 for all AMS were obtained from Climate TRACE, a publicly available database of greenhouse gas emissions.<sup>22</sup>

In the Climate TRACE database, coal mining emissions include fugitive emissions and emissions from mining, logistics and handling, estimated using production statistics and facility-specific emission factors. Oil and gas production and transport and refinery emissions data include flaring, venting, fugitive losses, onsite fuel usage and transport to refineries and distribution among others; these were modelled using inputs such as field age and depth, refinery configuration and satellite imagery.

Climate TRACE obtained and processed ownership data from Rystad Energy for oil and gas production and transport, desk research for oil and gas refining and the GEM Wiki Global Coal Mine Tracker and the CoalSwarm project for coal mining. Owner names (lowest level shell company) and the direct parents of the owners (next parent level of ownership) were recorded. In this article, the author extracted data for the latter (“Owner Direct Parent/s”) as well as percentage ownership.

For more details on Climate TRACE methods and definitions, readers may refer to <https://climatetrace.org/data> (2022 edition).

Where possible, asset ownership data from Climate TRACE were validated against Global Energy Monitor datasets, such as the Global Oil and Gas Extraction Tracker 2022.<sup>23</sup> Any contradictions were resolved by referring to company websites and news articles.

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<sup>22</sup> Climate TRACE Emissions Inventory, “Climate TRACE—Tracking Real-Time Atmospheric Carbon Emissions”, 2022, <https://climatetrace.org>

<sup>23</sup> Global Energy Monitor, “Global Oil and Gas Extraction Tracker”, 2022, <https://globalenergymonitor.org/projects/global-oil-gas-extraction-tracker/>

# RESULTS

## 1. The Methane Emissions Profile of Southeast Asia’s Oil, Gas and Coal Subsectors

### *1.1 Which Energy Subsectors Are the Biggest Contributors?*

Figure 1 shows the top-emitting fossil fuel facilities in the region. In total, they accounted for an estimated 1.8Mt of methane emissions (around 45 MtCO<sub>2</sub>e). The largest share of the regional footprint is from the coal mining subsector, at 59 per cent, followed by oil and gas production and transport at 37 per cent, and oil and gas refining at 4 per cent. This contrasts with the global fossil fuel methane emissions profile, to which coal contributes only a third.<sup>24</sup>

The largest emitting coal facilities are concentrated in Indonesia, especially East Kalimantan, while oil and gas production/transport emissions are distributed across the region. Indonesia is the largest contributor of oil and gas production and transport emissions at 39 per cent, followed by Malaysia (23 per cent) and Thailand (16 per cent). Emissions from the oil and gas refining subsector are much lower and mainly attributed to Indonesia and Singapore (each 24 per cent), followed by Thailand (21 per cent). See Figure 2.

### *1.2 Within Each Country, Which Assets Are the Biggest or Highest-Intensity Emitters?*

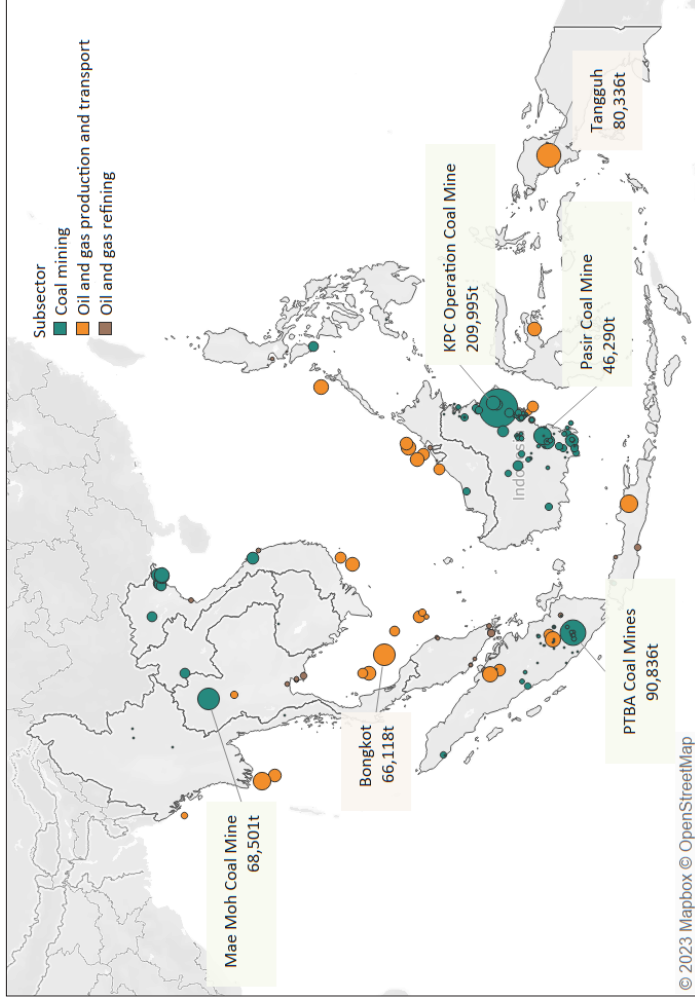
Figures 3 and 4 compare individual assets in the coal and oil and gas production/transport subsectors and identify facilities with a high emissions quantity (for 2021) and high emissions factor (which indicates emissions intensity). The horizontal and vertical dotted lines represent the median emissions quantity and emissions factor respectively such that assets in the top right quadrant are above the median for both emissions quantity and emissions factor. Emissions factor data were not available for oil and gas refining and are not covered in this section.

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<sup>24</sup> IEA, “Methane Abatement—Energy System”, <https://www.iea.org/energy-system/fossil-fuels/methane-abatement> (accessed 14 March 2024).

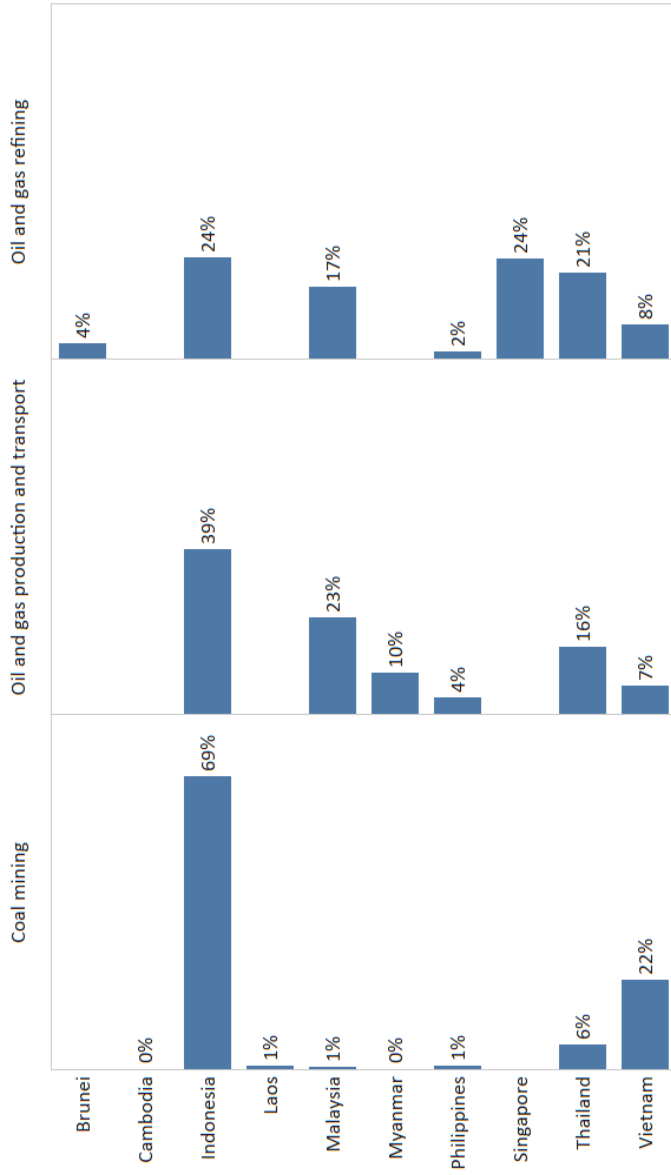


**Figure 1: Annual Facility-Level Methane Emissions from Coal Mining, Oil and Gas Production and Oil and Gas Refining, 2021**



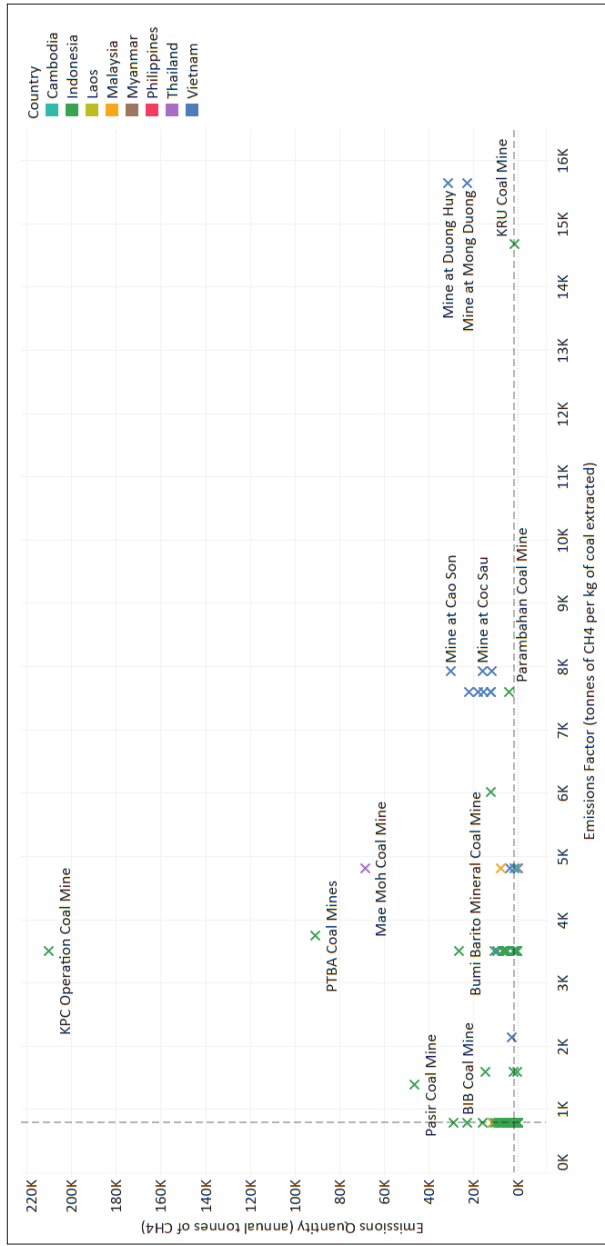
Source: Author's own analysis.

**Figure 2: Share of Methane Emissions Within Each Subsector, by Country, 2021**



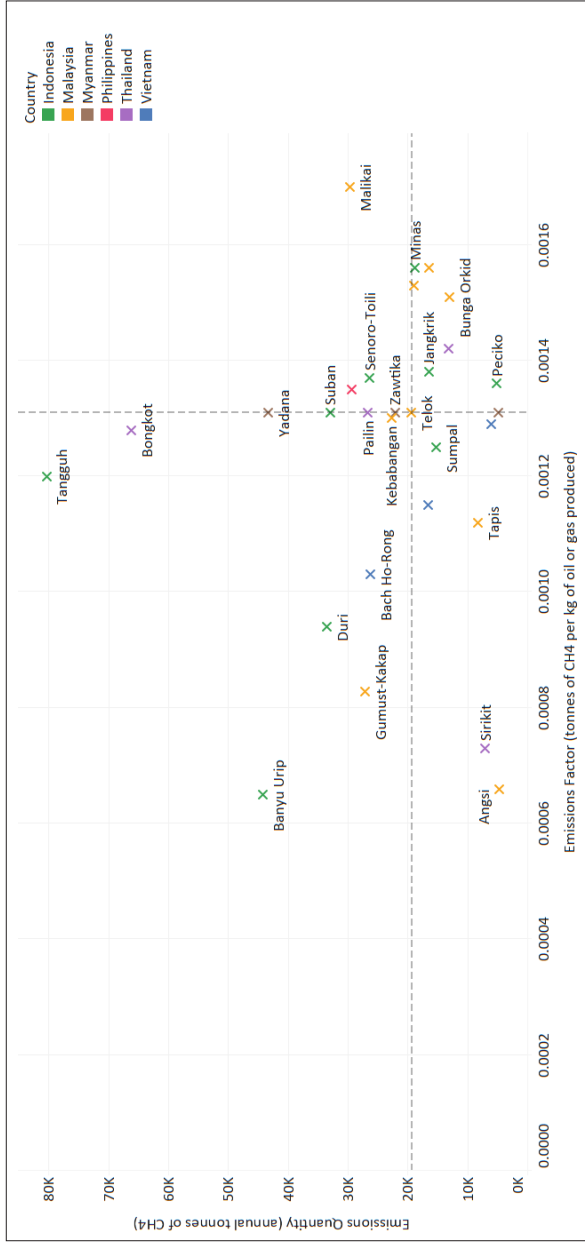
Source: Author's own analysis.

**Figure 3: Emissions Quantity (for the Year 2021) over Emissions Factor in the Coal Subsector**



Source: Author's own analysis.

**Figure 4: Emissions Quantity (for the Year 2021) over Emissions Factor in the Oil and Gas Production/Transport Subsector**



Source: Author's own analysis.

The coal subsector contains a large number of small mines that are lower in both emissions quantity and emissions factor (bottom left corner), which puts the median annual emissions quantity at around 800t of methane (20,000tCO<sub>2</sub>e) and the median emissions factor at around 1,611t/kg of coal produced (over 40,000tCO<sub>2</sub>e/kg) (Figure 3). The methane footprint is dominated by a few facilities with very high emissions (over 20,000t). Those in the top right quadrant are mainly from Vietnam and Indonesia. The highest emitting asset is KPC Operation Coal Mine (Indonesia), which is a network of mines; the most emission-intensive assets are KRU Coal Mine (Indonesia) and the Mines at Duong Huy and Mong Duong (Vietnam). The mines at Cao Son, Vang Danh and Coc Sau (North Vietnam) are also high in both emissions quantity and emissions factor.

Within the oil and gas production/transport subsector, the median emissions quantity is over 19,000t (475,000tCO<sub>2</sub>e) while the median emissions factor is at 0.00131t/kg (0.0328tCO<sub>2</sub>/kg of greenhouse gas) of oil or gas produced. Relatively high-emitting and emissions-intensive facilities (in the upper right quadrant) include Malikai (Malaysia), Senoro-Toili (Indonesia) and Malampaya (Philippines). In addition, Tanguh (Indonesia) Bongkot and Yadana (Myanmar) have the highest emissions quantities, with emissions factors being close to the median.

## **2. Who Are the Key Private Sector Actors to Engage on Methane Abatement and What Are the Challenges in Private Sector Engagement?**

The top ten emitting assets within the coal, oil and gas refining and oil and gas production sectors are identified, together with their direct owners (as summarized in Tables 1 to 3). The majority of the largest emitting assets can be traced to major state-owned or multinational corporations, some of whom have previously made methane-related pledges.

### *Coal*

While coal mining appears responsible for more annual methane emissions than the oil and gas sector, coal asset owners are the least likely to have climate or methane abatement commitments. The ten largest methane-emitting coal assets in Table 1 account for just over half of all coal mine methane emissions tracked by Climate TRACE in the

region. Owners of the highest-emitting coal assets are mostly based in the region, including state-owned energy/mining companies, namely Indonesia Asahan Aluminium, the Electricity Generating Authority of Thailand (EGAT), and Vietnam National Coal (Vinacomin); and a few private companies (Table 1).

Indonesia is home to the highest emitting coal asset in the region: KPC Operation Coal Mine, a coal complex of multiple mines operated by KPC<sup>25</sup> and owned by Bumi Resources, which is the largest coal mine owner in Indonesia (controlled by the Bakrie Group and the billionaire Anthoni Salim).<sup>26</sup> At over 200,000 tonnes, KPC Operation Coal Mine’s methane emissions in 2021 were more than double the emissions of the next highest-emitting coal asset in the region—PTBA Coal Mines (a network of coal mines). The latter is owned by Indonesia Asahan Aluminium, which was declared a state-owned mining holding company in 2017.<sup>27</sup> Pasir Coal Mine is owned by Indika Energy, a diversified energy company which aims to achieve at least 50 per cent of revenue from non-coal streams by 2025 and close its last coal power plant by 2047.<sup>28</sup> It was the first Indonesian entity to join the Powering Past Coal Alliance in 2021 (thus committing to phase out coal usage in its operations and support clean power generation) and has intentions to explore methane leakage prevention.<sup>29</sup> It is the only coal asset owner in this list with climate/energy-transition-related ambitions.

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<sup>25</sup> Global Energy Monitor, “KPC Operation”, 14 November 2022, [https://www.gem.wiki/KPC\\_Operation](https://www.gem.wiki/KPC_Operation)

<sup>26</sup> Fransiska Nangoy, “Coal Miner Bumi Resources to Receive \$1.6 Bln Capital to Pay off Debt”, *Reuters*, 11 October 2022, <https://www.reuters.com/markets/asia/coal-miner-bumi-resources-receive-16-bln-capital-pay-off-debt-2022-10-11/>

<sup>27</sup> *Jakarta Post*, “Analysis: Inalum to Focus on Aluminum Smelting after MIND ID Spin-off”, 5 April 2023, <https://www.thejakartapost.com/opinion/2023/04/05/analysis-inalum-to-focus-on-aluminum-smelting-after-mind-id-spin-off.html>

<sup>28</sup> DBS, “Financing the Energy Transition in Indonesia”, 2022, <https://www.dbs.com.sg/corporate/insights/financing-the-energy-transition-in-indonesia>

<sup>29</sup> IESR, “Indonesia Energy Transition Outlook 2022. Tracking Progress of Energy Transition in Indonesia: Aiming for Net-Zero Emissions by 2050” (Jakarta: Institute for Essential Services Reform, 2021), <https://iesr.or.id/wp-content/uploads/2022/01/Indonesia-Energy-Transition-Outlook-2022-IESR-Digital-Version-.pdf>

**Table 1: Ten Largest Methane-Emitting Coal Assets**

<b>Asset Name</b>	<b>Country</b>	<b>Owner Direct Parent/s (as of 2021)</b>	<b>Emissions Quantity (tonnes) (2021)</b>
KPC Operation Coal Mine	Indonesia	Bumi Resources	209,995
PTBA Coal Mines	Indonesia	Indonesia Asahan Aluminium	90,836
Mae Moh Coal Mine	Thailand	Electricity Generating Authority of Thailand (EGAT)	68,501
Pasir Coal Mine	Indonesia	Indika Energy	46,290
Mine at Duong Huy	Vietnam	Vietnam National Coal (Vinacomin)	31,302
Mine at Cao Son	Vietnam	Vietnam National Coal (Vinacomin)	30,170
Tutupan Coal Mine	Indonesia	Adaro Energy	28,622
GAM Coal Mine	Indonesia	LG International (50%) Titan Infra Energy (50%)	26,478
Mine at Mong Duong	Vietnam	Vietnam National Coal (Vinacomin)	22,569
BIB Coal Mine	Indonesia	Golden Energy Mines	22,512

*Source: Author's own analysis.*

Thailand's only coal asset in the top ten list is Mae Moh Coal Mine which is owned by EGAT. In 2019, EGAT announced and began preparations to shut down the mine, though the timeline for closure is unclear. EGAT also announced that it was studying options for job creation for locals and environmental restoration around the mine.<sup>30</sup> Abandoned coal mines, often left unmonitored, may still for decades yet, be sources of fugitive methane and other hazards.<sup>31</sup> Extensive forward planning and risk management are needed to minimize such impacts to the local community and environment. All of the top-emitting coal mines in Vietnam (including the two coal mines with the highest emission factors in the region—Duong Huy and Mong Duong [Figure 3]) are owned by Vinacomin, which covers 95 per cent of mine production in the country.<sup>32</sup> Vinacomin has shown some interest in coal mine methane recovery and has also undertaken exploratory projects to improve systems for mine safety, which may have the added benefit of facilitating methane recovery. However, it reported a lack of technological and infrastructure resources necessary for large-scale implementation.<sup>33</sup>

### *Oil and Gas Production and Transport*

Compared to other energy subsectors, the top-emitting oil and gas production assets tend to be joint ventures involving state-owned and

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<sup>30</sup> *Bangkok Post*, “Egat Prepares to Shut down Mae Moh Mine”, 26 October 2019, <https://www.bangkokpost.com/business/general/1780344/egat-prepares-to-shut-down-mae-moh-mine> (accessed 14 March 2024),

<sup>31</sup> United Nations, *Best Practice Guidance for Effective Methane Recovery and Use from Abandoned Coal Mines*, ECE Energy Series (UN, 2020), <https://doi.org/10.18356/cac3a157-en>

<sup>32</sup> US Environmental Protection Agency Coalbed Methane Outreach Program, “Vietnam”, Coal Mine Methane Country Profiles (Global Methane Initiative, 2020), [https://www.globalmethane.org/documents/toolsres\\_coal\\_overview\\_ch37\\_updated2020.pdf](https://www.globalmethane.org/documents/toolsres_coal_overview_ch37_updated2020.pdf)

<sup>33</sup> Le Trung Tuyen, “Methane Gas Drainage in Khe Cham Coal Mine and Forecast of Developing Potential of Gas Drainage at Underground Coal Mines in Quang Ninh Coal Basin Vietnam” (Hanoi: Vinacomin - Institute of Mining Science and Technology, 2013), <https://www.globalmethane.org/resources/details.aspx?resourceid=2373>



multinational energy companies (Table 2). The Tangguh gas field in Indonesia was owned by BP (also the operator), Inpex, Mitsubishi Group, China National Offshore Oil, Mitsui Group, Sojitz and Pertamina, with the largest share being owned by BP as of 2021.

Most of the companies with a significant regional presence (in terms of the number of assets, their methane footprint and share of ownership), namely PTTEP, Pertamina, BP, Udenna, Shell and ExxonMobil, have existing climate targets.

PTTEP has a 2050 net zero target and joined the Oil and Gas Methane Partnership 2.0 (OGMP 2.0) in 2023.<sup>34</sup> PTTEP and Pertamina are signatories of the Oil and Gas Decarbonization Charter launched at COP28, which aims for net zero operations by 2050, near-zero upstream methane emissions and zero routine flaring by 2030. PTTEP reported a reduction of 1.91 MtCO<sub>2</sub>e from flare gas recovery and utilization, and a 34,400 tCO<sub>2</sub>e reduction in methane leakages from 2013 to 2022. Pertamina targets a 7.6 per cent reduction in methane emissions, a 5.5 per cent reduction in carbon dioxide and a 16.7 per cent reduction in flare utilization. It has reported implementing the reduction and utilization of flare gas and methane capture.<sup>35</sup>

Medco Daya's stake in the Suban field (which it also operates) grew from 45.76 per cent in 2021 to 54 per cent in 2022.<sup>36</sup> In 2022, MedcoEnergi set targets to reduce Scope 1 and 2 greenhouse gas emissions<sup>37</sup> by 20 per cent by 2025 and 30 per cent by 2030 from 2019 levels, and to reduce

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<sup>34</sup> PTTEP, "PTTEP Joins UNEP's Methane Partnership, Supporting Greenhouse Gas Emissions Reduction", 2023, <https://www.pttep.com/en/Newsandnmedia/News/Pttep-Joins-Unep-S-Methane-Partnership-Supporting-Greenhouse-Gas-Emissions-Reduction.aspx>

<sup>35</sup> P.T. Pertamina (Persero), "Pertamina Highlights Climate Targets Achievement at COP28 Event | Pertamina", 2023, <https://www.pertamina.com/en/news-room/news-release/www.pertamina.com>

<sup>36</sup> Russell Searancke, "Indonesian Assets Change Hands in \$1.35 Billion Deal", *Upstream Online*, 2022, <https://www.upstreamonline.com/finance/indonesian-assets-change-hands-in-1-35-billion-deal/2-1-1177906>

<sup>37</sup> Scope 1 emissions are direct greenhouse gas emissions from sources controlled by an organization. Scope 2 emissions are indirect greenhouse gas emissions resulting from the generation of energy that is bought and used by an organization.

**Table 2: Ten Largest Methane-Emitting Oil and Gas Production Assets**

Asset Name	Country	Owner Direct Parent/s (as of 2021)	Emissions Quantity (tonnes) (2017–21 Average)
Tangguh	Indonesia	BP (40.22%) Inpex (Japan) (18.86%) Mitsubishi Group (17.38%) China National Offshore Oil (China) (13.90%) Mitsui Group (5.96%) Sojitz (3.67%) Pertamina (Indonesia) (0.0024%)	80,336
Bongkot	Thailand	PTTEP (Thailand)	66,118
Banyu Urip	Indonesia	Pertamina (Indonesia) (55%), ExxonMobil (45%)	44,164
Yadana	Myanmar	TotalEnergies (31.24%), Chevron (28.26%), PTTEP (Thailand) (25.5%), MOGE (Myanmar) (15%)	43,250
Duri	Indonesia	Pertamina (Indonesia)	33,470
Suban	Indonesia	Medco Daya (45.76%), Repsol (30.50%), Pertamina (Indonesia) (23.74%)	30,645
Malikai	Malaysia	ConocoPhillips (35%), Shell (35%), PETRONAS (Malaysia) (30%)	29,667

*continued on next page*

**Table 2 — cont'd**

<b>Asset Name</b>	<b>Country</b>	<b>Owner Direct Parent/s (as of 2021)</b>	<b>Emissions Quantity (tonnes) (2017–21 Average)</b>
Malampaya	Philippines	Udenna Corporation (90%), Philippine National Oil Company (Philippines) (10%)	34,670
Gumust-Kakap	Malaysia	ConocoPhillips (29.05%), Shell (29.05%), PETRONAS (Malaysia) (16.8%), Brunei (16%), PTTEP (Thailand) (6.4%), Pertamina (Indonesia) (2.7%)	35,574
Bach Ho-Rong	Vietnam	PetroVietnam (Vietnam) (47.21%), OPTIMA Group (41.86%), Korea National Oil (South Korea) (5.79%), LG Group (1.63%), Daesung Group (1.01%), Hyundai Group (0.71%), POSCO (0.71%), SM Group (0.71%), Seoul City Gas (0.36%),	35,750

Source: Author's own analysis.

methane emissions by 25 per cent by 2025 and 37 per cent by 2030 from 2019 levels from oil and gas operations.<sup>38</sup>

BP is a member of the Oil and Gas Climate Initiative and the Zero Routine Flaring Initiative and has a 2050 net zero target. It aims to reach net zero across entire operations (Scope 1 and 2 emissions), across upstream oil and gas production, and in the carbon intensity of energy products sold (Scope 3 emissions). It also committed to begin methane measurements at all major oil and gas processing sites by 2023, publish the data, and reach a 50 per cent reduction in methane intensity.<sup>39</sup> As of 2022, it reported a methane intensity of 0.05 per cent, down from 0.14 per cent in 2019.<sup>40</sup> However, its abatement efforts are strongly focused on gas production assets in the United States.<sup>41</sup>

Udenna (which has no climate targets at the time of writing) acquired its stakes in 2020 and 2021 from Chevron and Shell, who sold their stakes (totalling 90 per cent) in the Malampaya gas field, a major source for gas-fired power plants in Luzon, the Philippines. Malampaya's operating licence will expire in 2024 and the gas field is estimated to be depleted by 2027. In 2022, Udenna sold a 45 per cent stake to Prime Infrastructure Capital, the current operator.<sup>42</sup> While it does not appear to have explicit emissions targets, Prime Infrastructure's energy portfolio is mainly dedicated to hydropower and solar projects.<sup>43</sup>

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<sup>38</sup> MedcoEnergi 2022 Sustainability Report Team, "2022 MedcoEnergi Sustainability Report" (MedcoEnergi, 2023), [https://www.medcoenergi.com/download/download\\_file?id=3603](https://www.medcoenergi.com/download/download_file?id=3603)

<sup>39</sup> bp, "Five Aims to Get Bp to Net Zero", bp global, 2023, <https://www.bp.com/en/global/corporate/sustainability/getting-to-net-zero/five-aims-to-get-bp-to-net-zero.html>

<sup>40</sup> bp, "Net Zero Ambition Progress Update", 2023, <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/investors/bp-net-zero-progress-update-2023.pdf>

<sup>41</sup> bp, "Methane Matters: The Science and the Challenges", bp global, 2018, <https://www.bp.com/en/global/corporate/news-and-insights/reimagining-energy/managing-methane-emissions-from-gas-production.html>

<sup>42</sup> Malampaya, "Clean Energy for Luzon", 2022, <https://malampaya.com/clean-energy-for-luzon/>

<sup>43</sup> Prime Infra, "Our Porftolio", <https://primeinfra.ph/portfolio/portfolio-industry-all/portfolio-industry-energy/> (accessed 18 March 2024).

ExxonMobil is a signatory of the Oil and Gas Climate Initiative’s Aiming for Zero Methane Emissions Initiative which pushes for near zero methane emissions from oil and gas assets by 2030. It reported that it is on plan to reduce methane intensity by 70–80 per cent by 2030 across all operated assets.<sup>44</sup> Shell has a target to halve absolute emissions from operations by 2030 compared to 2016 levels.<sup>45</sup> However, it is unclear whether Southeast Asia assets are included in their current decarbonization efforts. For instance, ExxonMobil’s monitoring and detection efforts are concentrated in its US assets, which account for 76 per cent of its methane emissions.<sup>46</sup>

PetroVietnam has a 2050 net zero target with an emphasis on liquid natural gas development. It formed a partnership with the Asian Development Bank in 2021 to assist its energy transition—however, focus areas do not include methane but rather carbon capture, hydrogen, offshore wind and energy efficiency.<sup>47</sup>

### *Oil and Gas Refining*

The top emitting oil and gas refining assets in the region are owned by a mixture of Southeast Asian state-owned energy enterprises, namely PETRONAS, PTTEP and Pertamina; and global energy giants, namely ExxonMobil and Shell (Table 3). All the asset owners on this list have company-wide climate targets and are pursuing some degree of methane abatement.

Most of the assets on the list belong to state-owned energy enterprises. As detailed above, PTTEP and Pertamina have set overall emissions targets and joined methane pledges. PETRONAS targets a 50 per cent

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<sup>44</sup> ExxonMobil, “Methane”, 2024, <https://corporate.exxonmobil.com/sustainability-and-reports/advancing-climate-solutions/methane>

<sup>45</sup> Shell Global, “Methane Emissions”, <https://www.shell.com/what-we-do/oil-and-natural-gas/methane-emissions.html> (accessed 18 March 2024).

<sup>46</sup> ExxonMobil, “Methane”, 2024.

<sup>47</sup> PetroVietnam, “ADB and PVN Establish Partnership to Promote Green Energy Development in Vietnam”, 2021, <https://www.pvn.vn/sites/en/Pages/detail.aspx?NewsID=69632ff7-2bf5-4095-be1b-cd72511404fc>

**Table 3: Ten Largest Methane-Emitting Oil and Gas Refining Assets**

<b>Asset Name</b>	<b>Country</b>	<b>Owner Direct Parent/s (as of 2021)</b>	<b>Emissions Quantity (tonnes) (2017–21 Average)</b>
ExxonMobil Singapore Refinery	Singapore	ExxonMobil	9,225
Shell Eastern Petroleum Singapore Pulau Bukom Refinery	Singapore	Shell	7,624
Pengerang Refining Company (PRefChem)	Malaysia	PETRONAS (Malaysia)	6,426
PTT Rayong Refinery	Thailand	PTTEP (Thailand)	5,706
Pertamina Cilacap Refinery	Indonesia	Pertamina (Indonesia)	5,566
Pertamina Balikpapan Refinery	Indonesia	Pertamina (Indonesia)	5,212
Pertamina Dumai Refinery	Indonesia	Pertamina (Indonesia)	3,408
Singapore Refining Company Refinery	Singapore	Chevron (50%), China National Petroleum Corporation (China) (50%)	3,358
Thai Oil Co Sriracha Refinery	Thailand	PTTEP (Thailand)	3,095
ExxonMobil Sriracha Refinery	Thailand	ExxonMobil	2,838

*Source:* Author's own analysis.

reduction in methane emissions from its group-wide natural gas value chain by 2025, followed by a 70 per cent reduction in 2030. In addition, it aims to cap greenhouse gas emissions at 49.5 MtCO<sub>2</sub>e in 2024 and reach net zero by 2050.

While most of the state-owned assets are Southeast Asian, the one exception is the refinery of the Singapore Refining Company, a joint venture between the Singapore Petroleum Company (a subsidiary of PetroChina, the listed arm of the China National Petroleum Corporation (CNPC)) and Chevron Singapore).<sup>48</sup> PetroChina aims to achieve overall near-zero emissions by around 2050; and to reduce methane intensity to 0.25 per cent by 2025 (a 50 per cent reduction from 2019 levels) and 0.2 per cent by 2035.<sup>49</sup>

Both ExxonMobil and Shell have a strong presence in the refinery sector, but their methane abatement targets are mostly limited to upstream (production) operations and not downstream operations such as refining. Similarly, Chevron's climate targets are focused on upstream operations.<sup>50</sup> Nevertheless, ExxonMobil and Shell have general climate targets (mentioned in the above section on oil and gas production) covering all operations, which should give a precedent for more aggressive methane abatement efforts in the region, especially given that the top two emitting assets on the list (both in Singapore) are owned by ExxonMobil and Shell respectively.

## **Discussion and Recommendations: What Are the Challenges of Tackling Methane in Each Subsector?**

### *Coal: Phaseout, Methane Management, or Both?*

The only prominent coal mine owner in Table 1 with climate commitments is Indika Energy, a diversified energy company which

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<sup>48</sup> Singapore Refining Company, "About Us", 2021, <https://src.com.sg/about-us/>

<sup>49</sup> PetroChina, "PetroChina 2022 Environmental, Social and Governance Report", 2023, <http://www.petrochina.com.cn/ptr/xhtml/images/shyhj/2022esgen.pdf>

<sup>50</sup> Chevron, "Actions to Reduce Our Carbon Intensity", [chevron.com, https://www.chevron.com/sustainability/environment/lowering-carbon-intensity](https://www.chevron.com/sustainability/environment/lowering-carbon-intensity) (accessed 18 March 2024).

is open to transitioning away from coal towards other energy sources. Yet, state-owned mining and energy enterprises in this sector must soon account for national strategies for energy transition, while private owners like the Bakrie Group and Adaro Energy (which mostly supplies coal-fired power plants<sup>51</sup>) must evaluate the long-term risks of stranded assets in the coal mining sector.<sup>52</sup>

The global discourse on methane abatement is generally focused on the oil and gas subsector, but for coal, the need for eventual phaseout (rather than abatement) is a topic of debate especially in Southeast Asia. Projections by the Intergovernmental Panel on Climate Change (IPCC) point to a median 88 per cent reduction in unabated coal generation globally from 2020 to 2030 in a 1.5-degree scenario<sup>53</sup> and in all Paris-aligned IPCC scenarios, unabated coal consumption is totally phased out by 2050,<sup>54</sup> but regional and national strategies differ. The 2021 Glasgow Climate Pact called for the “phasedown of unabated coal power”,<sup>55</sup> implying that coal consumption (and consequently, mining) will continue as long as mitigation measures such as carbon capture are in place. Some countries plan to continue relying on coal for the foreseeable

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<sup>51</sup> Indonesia Investments, “Adaro Energy”, <https://www.indonesia-investments.com/business/indonesian-companies/adaro-energy/item191> (accessed 18 March 2024).

<sup>52</sup> Christian Hauenstein, “Stranded Assets and Early Closures in Global Coal Mining under 1.5°C”, *Environmental Research Letters* 18, no. 2 (January 2023): 024021, <https://doi.org/10.1088/1748-9326/acb0e5>

<sup>53</sup> Greg Muttitt et al., “Socio-Political Feasibility of Coal Power Phase-out and Its Role in Mitigation Pathways”, *Nature Climate Change* 13, no. 2 (February 2023): 140–47, <https://doi.org/10.1038/s41558-022-01576-2>

<sup>54</sup> K. Riahi et al., “Mitigation Pathways Compatible with Long-Term Goals”, in *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, by IPCC [P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, J. Malley, eds.], pp. 295–408. (Cambridge, UK and New York: Cambridge University Press, 2023). <https://doi.org/10.1017/9781009157926.005>

<sup>55</sup> Conference of the Parties 26, “Decision -/CP.26 Glasgow Climate Pact”, 2021, [https://unfccc.int/sites/default/files/resource/cop26\\_auv\\_2f\\_cover\\_decision.pdf](https://unfccc.int/sites/default/files/resource/cop26_auv_2f_cover_decision.pdf)



future, with ASEAN’s coal power generation set to almost triple by 2050 under a baseline scenario,<sup>56</sup> though dwindling coal reserves also put the region on track to becoming a net importer of coal by 2039.<sup>57</sup> Indonesia exported over US\$30 billion in coal in 2021, especially to China, India and Japan;<sup>58</sup> and is continuing to set higher annual targets for coal mining output.<sup>59</sup> Its reported coal mine methane emissions increased by 12 per cent annually from 2000 to 2019, yet these estimates are six to seven times lower than independent studies. Newly launched underground coal mines in South Kalimantan by China Qinfra Group could more than triple existing emissions.<sup>60</sup>

At the same time, Indonesia, Vietnam and the Philippines are joining partnerships that support coal phaseout and the early retirement of coal-fired power plants, such as the Energy Transition Mechanism with the Asian Development Bank and the Just Energy Transition Partnership. Southeast Asia is also exploring the use of sustainable finance to address coal phaseout through the ASEAN Taxonomy for Sustainable Finance and Singapore and Indonesia’s own national taxonomies, though much of the focus is currently on coal power plants. Most of the initiatives under these partnerships target coal consumption for power generation, but a gap remains when it comes to tackling coal mining directly.<sup>61</sup> Similarly, ASEAN’s vision for clean coal technologies focuses on

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<sup>56</sup> ACE, “The 7th ASEAN Energy Outlook” (Jakarta: ASEAN Centre for Energy, 2022), <https://aseanenergy.org/the-7th-asean-energy-outlook>

<sup>57</sup> ACE, “Outlook on ASEAN Energy 2023: Key Insights About ASEAN Energy Landscape and Trends in 2023” (Jakarta, 2023), <https://asean.org/wp-content/uploads/2023/04/Outlook-on-ASEAN-Energy-2023.pdf>

<sup>58</sup> Ibid.

<sup>59</sup> Antonio Delos Reyes, “Indonesia Seeks Investments in Underground Coal Mining”, *Argus Media*, 28 December 2023, <https://www.argusmedia.com/en/news-and-insights/latest-market-news/2523009-indonesia-seeks-investments-in-underground-coal-mining>

<sup>60</sup> Setiawan and Wright, “Uncovering Indonesia’s Hidden Methane Problem”.

<sup>61</sup> Emmy Hawker, “Too Much Leeway Offered by Updated ASEAN Taxonomy”, *ESG Investor* (blog), 6 March 2024, <https://www.esginvestor.net/too-much-leeway-offered-by-updated-asean-taxonomy/>

coal-fired power plants by reducing emissions intensity or adopting carbon capture.<sup>62</sup> Even with mitigation adopted at the power generation stage, the coal mines that power plants rely on will continue to be an unabated source of methane emissions without targeted interventions. Coal mine methane is gradually gaining high-level attention: in 2022, the Joint Declaration from Energy Importers and Exporters on Reducing Greenhouse Gas Emissions from Fossil Fuels by the United States, European Union, Japan, Canada, Norway, Singapore, and the United Kingdom pledged to support “policies and measures to achieve rapid and sustained reductions in methane and CO<sub>2</sub> emissions across the fossil energy value chain” including “measures to capture, utilize, or destroy methane in the coal sector”.<sup>63</sup> Cooperation with other governments on the sharing of such expertise and capacity building with companies facing challenges like Vinacomin could benefit the overall safety and efficiency of the coal mine sector while reducing emissions. For instance, the IEA recommends that the Just Energy Transition Partnership, which is being implemented in Vietnam and Indonesia in collaboration with developed countries, could support the adoption of coal mine methane abatement technology.<sup>64</sup> Exploration of such new financial instruments to support coal mine methane abatement in addition to international pressure could help motivate the sector to consider abatement or phaseout solutions.

As the energy landscape rapidly evolves under the influence of different, sometimes conflicting agendas, the pace at which coal power can be phased out and how that will affect the coal mining industry is uncertain. Nevertheless, as mentioned in an earlier section, coal mine methane emissions in the region are likely dominated by a few large emitters, with over half of emissions traced to the top ten emitting assets

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<sup>62</sup> ACE, “Outlook on ASEAN Energy 2023: Key Insights About ASEAN Energy Landscape and Trends in 2023”.

<sup>63</sup> European Commission, “Joint Declaration from Energy Importers and Exporters on Reducing Greenhouse Gas Emissions from Fossil Fuels”, 2022, [https://ec.europa.eu/commission/presscorner/detail/en/STATEMENT\\_22\\_6827](https://ec.europa.eu/commission/presscorner/detail/en/STATEMENT_22_6827)

<sup>64</sup> IEA, “Strategies to Reduce Emissions from Coal Supply—Global Methane Tracker 2023—Analysis”, 2023, <https://www.iea.org/reports/global-methane-tracker-2023/strategies-to-reduce-emissions-from-coal-supply>

which may be more closely monitored. Currently, operational mines require close monitoring to minimize leaks and inefficiencies, with a priority on closing or introducing mitigation measures to the highest emitting and the most emissions-intensive coal mines<sup>65</sup> identified here. As coal reserves decrease, retiring coal mines need proper end-of-life management to avoid further emissions. Ideally, mines require closure planning from an early stage supported by clear standards for mine closure and post-closure responsibility. The Asia-Pacific Economic Cooperation<sup>66</sup> and World Bank<sup>67</sup> have developed guidelines to help governments identify and address limitations in their mine closure standards based on national or local circumstances; for instance, South Africa holds companies accountable for future mine closures by implementing financial assurance requirements to ensure that the expected costs of closure are accounted for. To tackle its legacy of abandoned mines, Chile built a nationwide inventory of sites and developed a risk evaluation methodology to prioritize those with a greater need for remediation.<sup>68</sup> Such planning can minimize hazards and address the socio-economic impact of mine closure on local communities by switching to alternative uses. One option for emission reduction is the capture and use of abandoned mine methane, for which established best practices have been documented by the United Nations Economic Commission for Europe.<sup>69</sup> Well-managed mine

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<sup>65</sup> Conal Campbell and Achmed Shahram Edianto, “Addressing Coal Mine Methane Is Crucial for Indonesia”, *Ember*, 25 February 2022, <https://ember-climate.org/insights/commentary/addressing-coal-mine-methane-is-crucial-for-indonesias-climate-pledge/>

<sup>66</sup> APEC Mining Task Force, “Mine Closure: Checklist for Government” (Asia-Pacific Economic Cooperation, 2018).

<sup>67</sup> Boubacar Bocoum et al., “Mine Closure: A Toolbox for Governments” (Washington, DC: World Bank Group, 2021), <http://documents.worldbank.org/curated/en/278831617774355047/Mine-Closure-A-Toolbox-for-Governments>

<sup>68</sup> APEC Mining Task Force, “Mine Closure: Checklist for Government”.

<sup>69</sup> United Nations, *Best Practice Guidance for Effective Methane Recovery and Use from Abandoned Coal Mines*; United Nations, *Best Practice Guidance for Effective Methane Drainage and Use in Coal Mines*, ECE Energy Series (UN, 2010), <https://doi.org/10.18356/8c636627-en>

closures can contribute to a just transition, but meeting the financial costs is a challenge.<sup>70</sup> Such initiatives may also require the close cooperation of subnational governments overseeing hotspots such as East Kalimantan, which contributes 48 per cent of national coal production and harbours seven of the ten largest emitting coal mines in Indonesia.<sup>71</sup>

### *Oil and Gas Production and Transport: Growing but Unclear Commitments*

The ownership structures in the oil and gas production subsector raise uncertainties about how corporate climate and methane abatement strategies can translate to action. In joint ventures, some owners may have climate targets while others do not; or climate targets may vary in ambition and scope. For instance, ExxonMobil owns a 45 per cent stake in Banyu Urip, Indonesia, but its operator is Pertamina. This could be an opportunity for more ambitious companies to take the lead and influence others that share their assets, while progressing towards their own targets. One of BP's targets is to work with joint venture partners to set their own methane intensity targets of 0.2 per cent. OGMP 2.0 members have additional incentive to engage with their partners as they are also required to report emissions under all joint ventures, including those where they are not the operator. If their joint venture operator is not an OGMP 2.0 member, they may face obstacles in obtaining monitoring data and must describe reasonable efforts to “work with the partner toward improving its methane emissions reporting” to maintain

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<sup>70</sup> World Bank Group, “Managing Coal Mine Closure: Achieving a Just Transition for All”, 2018, <https://documents1.worldbank.org/curated/en/484541544643269894/pdf/130659-REVISED-PUBLIC-Managing-Coal-Mine-Closure-Achieving-a-Just-Transition-for-All-November-2018-final.pdf>

<sup>71</sup> IESR, “Redefining Future Jobs: Implication of Coal Phase-out to the Employment Sector and Economic Transformation in Indonesia’s Coal Region” (Jakarta: Institute for Essential Services Reform, 2022), <https://www.climate-transparency.org/wp-content/uploads/2022/07/Redefining-Future-Jobs-IESR-CT.pdf>

their OGMP 2.0 status.<sup>72</sup> The Methane Guiding Principles have built a Joint Venture Playbook which tackles this issue, providing tactics for engagement with joint venture partners and other key stakeholders.<sup>73</sup>

Ownership can also be transient as companies buy and sell assets, raising questions on the continuity of methane abatement strategies. The oil and gas sector has seen major changes since 2021 with companies, including some with climate targets (such as ConocoPhillips, Chevron, Shell and TotalEnergies) selling their stakes or exiting the region altogether.<sup>74</sup> Eighty-five per cent of the emissions reductions claimed by BP in 2022 were attributed to variations in production and divestments while only 14 per cent were attributed to sustainable emissions reductions.<sup>75</sup> The extent to which such companies' targets can be achieved not through mitigation but through changes in ownership (with little impact on the region's emissions) is another source of uncertainty.

There are encouraging signs of more companies in this region taking up methane pledges, which may exert pressure on others to follow. However, to ensure consistent action and accountability, countries cannot rely solely on companies' internal targets and motivations. Multinational companies could limit their efforts to regions outside Southeast Asia, or owners and operators could change. Certain minimum regulatory requirements, such as those on emissions reporting and minimizing non-emergency flaring, could help ensure the consistency of implementation.

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<sup>72</sup> United Nations Environment Programme (UNEP), "Oil and Gas Methane Partnership (OGMP) 2.0 Framework" (Climate & Clean Air Coalition, 2020), <https://www.ccacoalition.org/resources/oil-and-gas-methane-partnership-ogmp-20-framework>

<sup>73</sup> Methane Guiding Principles, "Joint Ventures", 23 August 2023, <https://methaneguidingprinciples.org/resources/joint-ventures/>

<sup>74</sup> Nermina Kulovic, "PTTEP to Take over as Operator of Myanmar Gas Field", *Offshore Energy*, 14 March 2022, <https://www.offshore-energy.biz/pttep-to-take-over-as-operator-of-myanmar-gas-field/>

<sup>75</sup> bp, "Our Net Zero Ambition", 2023, <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/sustainability/group-reports/bp-net-zero-aims-at-a-glance.pdf>

Nigeria integrated its strategy on short-lived climate pollutants (including methane) into its national development planning and implemented new regulations requiring oil and gas operators to submit emissions management plans, report fugitive emissions, and carry out regular leak detection and repair inspections, among other obligations.<sup>76</sup> Norway taxes flaring-related emissions and in the United States, Colorado, New Mexico, and Alaska have banned routine flaring.<sup>77</sup>

### *Oil and Gas Refining: Lack of Specific Targets*

Globally, downstream methane made up 20 per cent of fossil methane emissions in 2020, but most countries' methane emissions regulations focus explicitly on upstream emissions.<sup>78</sup> Among the owners listed here, there are little to no climate commitments that explicitly focus on refining operations. Of the regional fossil fuel assets covered by Climate TRACE's data, only about 4 per cent of total methane emissions are from refining. Although refineries make up a smaller share of methane emissions, existing technologies and solutions such as leak detection and repair programmes can potentially reduce fugitive emissions drastically at low net costs,<sup>79</sup> while methane procurement standards remain an option for oil and gas importers and refineries. which may be especially significant for countries like Singapore and Brunei where refining makes up a sizeable share of the industry.

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<sup>76</sup> Climate & Clean Air Coalition, "Nigeria Begins Implementation of Oil and Gas Methane Reduction", 2023, <https://www.ccacoalition.org/news/nigeria-begins-implementation-oil-and-gas-methane-reduction>

<sup>77</sup> IEA, "Gas Flaring—Energy System", <https://www.iea.org/energy-system/fossil-fuels/gas-flaring> (accessed 2 May 2024).

<sup>78</sup> IEA, "The Case for Regulating Downstream Methane Emissions from Oil and Gas", 2021, <https://www.iea.org/commentaries/the-case-for-regulating-downstream-methane-emissions-from-oil-and-gas>

<sup>79</sup> ICF International, "Economic Analysis of Methane Emission Reduction Opportunities in the U.S. Onshore Oil and Natural Gas Industries", 2014, [https://www.edf.org/sites/default/files/methane\\_cost\\_curve\\_report.pdf](https://www.edf.org/sites/default/files/methane_cost_curve_report.pdf)

## *Regional and International Collaboration*

International pledges and initiatives are a promising sign of growing political will and awareness of the methane problem. Initiatives like the OGMP 2.0 and the Methane Guiding Principles have made progress in building standardized reporting and implementation frameworks and attracting major oil and gas companies, including a growing number from Southeast Asia; while others such as the Oil and Gas Climate Initiative contribute in the form of capacity building, partnerships and technological innovation. In Southeast Asia, region-led initiatives are emerging—the first ASEAN Energy Sector Methane Roundtable was hosted in 2021 by PETRONAS, supported by PTT Public Company Limited (Thailand) and attended by Pertamina and Shell as well as international organizations.<sup>80</sup> In 2023, the ASEAN Energy Sector Methane Leadership Program was launched to conduct capacity building for ASEAN energy companies.<sup>81</sup> However, these are focused on the oil and gas sector. Similar first steps to tackling coal mine methane by raising awareness and monitoring capacity would help fill the gap in the region’s approach to methane abatement.

The IEA estimated that US\$100 billion and US\$70 billion of spending will be needed in the oil and gas and coal subsectors respectively, to achieve a 75 per cent reduction in fossil fuel methane emissions by 2030. In particular, US\$45 billion of new spending is needed in low- and middle-income countries. Global tracked finance flows for methane abatement reached US\$13.7 billion in 2021/22, of which less than 1 per cent went to fossil fuel sectors despite their high abatement potential. Southeast Asia has been identified as an area of opportunity for such investments due to the region’s rapid growth.<sup>82</sup> International and regional

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<sup>80</sup> PETRONAS Global, “PETRONAS, Key ASEAN Energy Players to Intensify Collaboration in Addressing Methane Emissions”, 2021, <https://www.petronas.com/media/press-release/petronas-key-asean-energy-players-intensify-collaboration-addressing-methane>

<sup>81</sup> PETRONAS Global, “PETRONAS Collaborates with Partners to Accelerate Methane Emissions Reduction”, 2023, <https://www.petronas.com/media/media-releases/petronas-collaborates-partners-accelerate-methane-emissions-reduction>

<sup>82</sup> Alberti and Naran, “Spotlight: Financing Oil & Gas Methane Abatement in Southeast Asia”.

financial institutions can consider integrating methane tracking into existing climate investment strategies and explore catalytic finance mechanisms.<sup>83</sup>

## LIMITATIONS

The Climate TRACE database used for this article provided granular, facility-level methane emissions data which allows for more detailed insights into regional and country-specific gaps and challenges in methane abatement. It should be noted that the database relies on modelling estimates and emissions factors rather than direct measurements (which are publicly unavailable for most facilities) and although not an exhaustive list of all facilities, it shows the highest emitting facilities globally, covering over 50 per cent of total coal emissions and two-thirds of global oil and gas production. This allows nevertheless for an assessment of the biggest contributors to methane emissions within each country. Finally, this article covers data up to 2021 and may miss out on developments such as more recent ownership changes.

## CONCLUSION

This article identifies the largest contributing emitters at the facility level as well as existing private sector commitments, to provide greater detail on national, subnational, subsectoral and company-level potential for abatement. While the global discourse on fossil methane often focuses on the oil and gas sector, coal mine methane is a crucial concern for Southeast Asia due to the region's continued addiction to coal. It is the only region in the world apart from India where coal's share in the energy

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<sup>83</sup> Caroline Alberti and Baysa Naran, "How to Start Scaling Methane Abatement Finance" (Climate Policy Initiative, 2023), <https://www.climatepolicyinitiative.org/wp-content/uploads/2023/11/How-to-Start-Scaling-Methane-Abatement-Finance.pdf>



mix is expected to increase,<sup>84</sup> and its coal strategies remain uncertain, including the strength of coal phaseout commitments. While greater clarity on future coal consumption in the power sector would help form more concrete plans for coal methane abatement, regional projections indicate that large volumes of coal consumption will continue in the near future under most scenarios. As such, coal methane monitoring and abatement solutions need urgent attention, while any coal mine closures should be accompanied by robust end-of-life monitoring processes. Private sector commitment to methane abatement in the oil and gas sector is growing, but how this will translate to action under complex and changing ownership arrangements is an area of uncertainty that could benefit from closer regional partnerships.

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<sup>84</sup> IEA, “Global Coal Demand Expected to Decline in Coming Years”, 15 December 2023, <https://www.iea.org/news/global-coal-demand-expected-to-decline-in-coming-years>

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