

Phasing out coal power in two major Southeast Asian thermal coal economies: Indonesia and Vietnam

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ABSTRACT

The phase-out of unabated coal power is crucial for meeting climate agreements in coal-dependent economies such as Indonesia and Vietnam. Despite both countries committing to the 2021 Global Coal to Clean Power Transition Statement, translating phase-out pledges into action poses considerable challenges. Drawing insights from interviews with government, civil society, and industry experts, this study identifies the key barriers hindering coal phase-out in each country. Concerns about potentially escalating electricity prices and power shortages loom large, with the former being more prominent in Indonesia and the latter more prominent in Vietnam. The obstacles appear particularly significant in Indonesia for reasons including its higher coal dependence. We conclude that prioritizing renewable energy growth, as well as halting the construction of new coal plants, would be the most practical and viable way forward for both countries rather than an oversized early focus on coal plant closures. The analysis is of high relevance to informing plans under the two countries' Just Energy Transition Partnerships.

Introduction

Phasing out the use of unabated coal power will play a crucial role in the decarbonization of Southeast Asian economies. Southeast Asia had about 106 GW of active coal fired power capacity and another 40 GW in the pipeline as of July 2023. In terms of operating plus in-the-pipeline coal power capacity, this was behind only China, India, and the United States. The region has a particularly young coal power fleet, with an average plant age of about 13 years as of 2023 (Global Energy Monitor, 2023). Coal is the largest contributor to the region's electricity mix, accounting for about 40 % in 2020 (IEA, 2023). Carbon dioxide (CO₂) emissions from coal power generation equaled about 500 million tons in 2020, about 30 % of the region's energy-related CO₂ emissions. The region's electricity use is expected to grow at around 4 % per annum to 2050 (ASEAN Centre for Energy, 2023). In a baseline scenario, electricity generation may reach 3388 TWh per annum by 2050, with coal still contributing a 34 % share.

Indonesia and Vietnam are the most and third-most populous countries in Southeast Asia, with Indonesia having about 276 million

people in 2022 (the world's 3rd most populous) and Vietnam 98 million (14th) (World Bank, 2023a). They were the largest electricity producers in Southeast Asia in 2022, with Indonesia generating about 333 TWh and Vietnam 260 TWh (Energy Institute, 2023). The two countries have experienced rapid electricity generation growth, at average compound rates of 5.2 % and 8.5 % per annum over 2012–2022 respectively (Energy Institute, 2023).

Indonesia and Vietnam have the largest coal power fleets in Southeast Asia. As of July 2023 Indonesia had 45.3 GW in operation, 14.5 GW under construction, and 3.7 GW permitted and pre-permitted (Fig. 1) (Global Energy Monitor, 2023). Vietnam was second with 25.8 GW in operation, 5.4 GW under construction, and 4.0 GW permitted and pre-permitted. In 2022, Indonesia and Vietnam produced 205 TWh and 101 TWh of coal power respectively (Figs. 2–3). Vietnam's coal power output declined that year, with solar, wind, and hydropower output increasing. Neither country is recorded as having retired any coal power plants so far this century. Coal power generation capacity has instead been expanding (Global Energy Monitor, 2023).

Given the current and potential future emissions profiles of the two

Abbreviations: ASEAN, Association of Southeast Asian Nations; CCUS, carbon capture, utilization, and storage; CO₂, carbon dioxide; COP26, 26th Conference of the Parties; GDP, gross domestic product; ETS, emissions trading scheme; EVN, Electricity of Vietnam; JETP, Just Energy Transition Partnership; GW, gigawatt; IEA, International Energy Agency; LNG, liquefied natural gas; PLN, Indonesian State Electricity Company (Perusahaan Listrik Negara); TWh, terawatt-hour; UNFCCC, United Nations Framework Convention on Climate Change.

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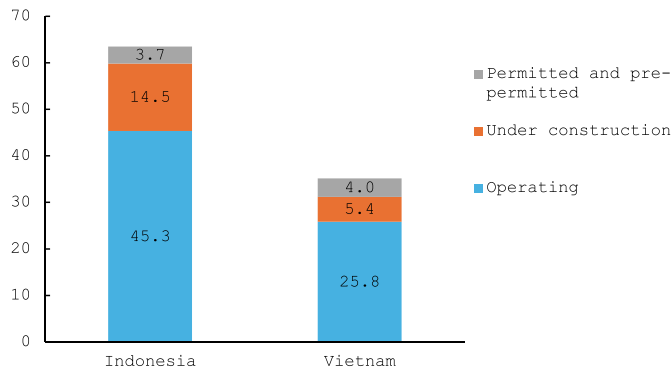


Fig. 1. Coal power capacities of Indonesia and Vietnam as of July 2023 (GW). Source: Global Energy Monitor (2023).

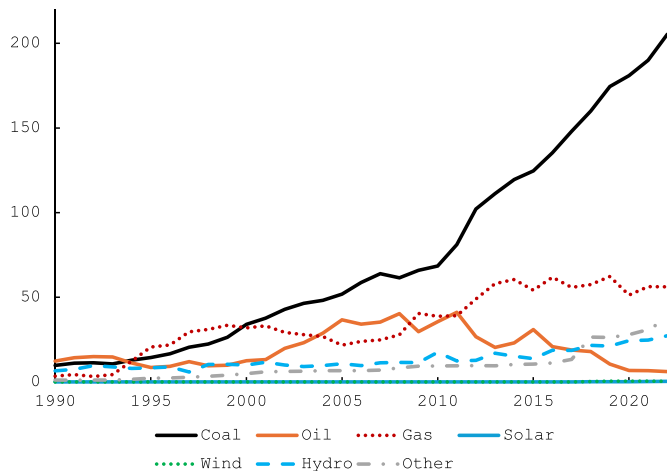


Fig. 2. Indonesia's electricity generation, 1990–2022 (TWh per year). Source: Energy Institute (2023).

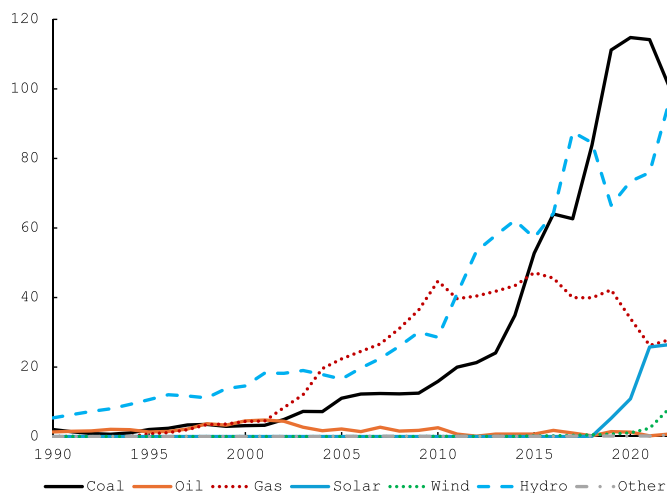


Fig. 3. Vietnam's electricity generation, 1990–2022 (TWh per year). Source: Energy Institute (2023).

countries' thermal coal sectors, phasing out unabated thermal coal in Indonesia and Vietnam is of global importance. Yet while both countries have committed to the 2021 Global Coal to Clean Power Transition Statement (UK Government, 2023), turning their pledges (as detailed in Appendix A) into reality poses considerable challenges. Under

Indonesia's National Electricity Supply Business Plan (RUPTL), coal is expected to continue to account for about 34 % of Indonesia's power capacity in 2030 (IISD, 2023a). Similarly, Vietnam's Power Development Plan 8 specifies that coal will contribute about 20 % of power capacity in 2030 (Government of Vietnam, 2023). Some question whether the two countries will achieve their coal power phase-out commitments (Do and Burke, 2023a; Indrawan et al., 2023; Resosudarmo et al., 2023).

The signing of Just Energy Transition Partnerships (JETPs) by both Indonesia and Vietnam in 2022 marked a significant milestone in securing international financial support. The Group of Seven (G7)-led JETPs offer the two countries the opportunity to receive US\$20 billion and US\$15.5 billion in grants, loans, and private financing over the next 3–5 years respectively. The main goal is to accelerate decarbonization in the electricity sector.

Among prior studies on coal transition in Southeast Asia, political economy factors in individual countries were examined by Mori (2020) and Toumbourou et al. (2020) for Indonesia and Dorband et al. (2020) for Vietnam. Jakob, Flachsland, et al. (2020), Steckel and Jakob (2021), Ohlendorf et al. (2022), and Manych et al. (2023) provided comparative analyses of the political economy of coal in major coal economies, including in Southeast Asia. Gallagher et al. (2021), Edianto et al. (2022), and Sauer et al. (2022) discussed drivers of international coal investment in the region. Reasons for coal plant cancellations in Indonesia and Vietnam were examined by Gao et al. (2021). Diluiso et al. (2021) provided a review of global coal production and consumption and high-level discussion of the case of Indonesia. Do and Burke (2023a) used surveys and interviews to examine the case of Vietnam. There is yet to be a study providing a comparative analysis of the thermal coal phase-out challenge in these two key Southeast Asian economies in the post-COP26 era.

This study examines the phase-out of unabated coal power in Indonesia and Vietnam by addressing two key questions:

1. What are the similarities and differences in the underlying barriers to realizing the commitments to phase out unabated coal power of Indonesia and Vietnam?
2. What specific strategies would be suitable to overcome these barriers?

Our study contributes to the ongoing debate regarding the phase-out of coal power. Perspectives in this debate range from directly and indirectly arguing for a rapid phase-out (Aleluia et al., 2022; Jakob, Steckel, et al., 2020; Oei et al., 2020) to cautioning against overly abrupt energy transitions given the socio-political feasibility constraints that are faced (Firdaus & Mori, 2023; Montrone et al., 2021; Muttitt et al., 2023). We conclude that, given the substantial challenges, prioritizing the uptake of renewable energy, along with ceasing the construction of new coal plants, would be a more feasible and conducive approach than a strong focus on the early closure of existing coal plants. Rapid uptake of renewables could pave the way for a major transition from unabated thermal coal over coming years.

The paper seeks to offer timely and relevant insights for policy-making on unabated coal power phase-out in Southeast Asia. Specifically, it addresses the pressing issue of whether the transition should prioritize coal power plant closures (Brauers et al., 2020; Cui et al., 2021; Shah et al., 2024) or renewable energy uptake (Do & Burke, 2023a,b; Gielen et al., 2019; Ordóñez et al., 2022). This is highly relevant given the two countries are currently determining priorities for energy transition in the power sector, including as part of initiatives with partner countries (JETP Indonesia, 2023; JETP Vietnam, 2023). Due to the importance of international collaboration for the energy transition in developing countries, our analysis covers not only domestic but also international aspects (Diluio et al., 2021; Edianto et al., 2022; Gallagher et al., 2021; Sauer et al., 2022).

In terms of method, the paper aims to contribute to a better

understanding of the energy policies needed to achieve a net-zero emissions future in developing countries through insightful expert elicitation (Bhattacharyya, 2017; Diluio et al., 2021; Lacey-Barnacle et al., 2020; Yao et al., 2023). The insights are of potential relevance for other coal-rich developing countries such as India and South Africa (Hanto et al., 2022; Montrone et al., 2021).

This paper comprises five sections. The next discusses methods and data. The subsequent section analyzes the identified barriers. Enabling strategies to overcome the barriers are then explored. The final section concludes and discusses policy implications.

Methods and data

This research employs a country-comparative case study approach (Gibbert et al., 2008; Ohlendorf et al., 2022; Sovacool et al., 2018), utilizing mixed methods that integrate expert interviews with a thorough literature review. We apply an analytical framework developed in previous studies on energy issues in Vietnam that addresses economic, institutional, social, and technical barriers. This framework is able to provide insights on key policy issues within a highly context-specific setting (Do et al., 2020, 2021, 2022).

We set out to identify key barriers for coal phase out via expert interviews, defining a barrier as any problem, rule, or situation that hinders a country from fulfilling its commitment to phase out unabated coal power (Oxford, 2023). This includes identified perceptions and concerns (Do & Burke, 2023a).

We carried out interviews with 31 experts from government agencies, research institutions, civil society, international organizations, and industry, with 14 from Indonesia and 17 from Vietnam. There is no rigid rule for determining the number of interviews in qualitative research (Flick, 2018). Nevertheless, the number of interviews in our study falls within the common range of 8 to 17 for qualitative research regarding the energy sector (Galvin, 2015).

In the interviews, the experts were asked to consider two criteria in identifying effective strategies for overcoming barriers to unabated coal power phase-out. The first is the feasibility of proposed strategies, considering institutional and political constraints (Do et al., 2022; Muttitt et al., 2023). The second is optimal timing, based on the idea that strategies should be introduced with timing and sequencing that will best enable transformative conditions and capacities (Tabara et al., 2022).

We employed purposive and snowball sampling techniques to target potential respondents who have knowledge of energy and climate issues in Indonesia and Vietnam (Do & Burke, 2023a). Invitations were initially extended to 57 energy experts across the two countries, with experts defined as individuals who have published on energy and climate change in Indonesia and Vietnam or represented government agencies, industries, and research institutions at regional fora on energy and climate change held by the Australian National University during 2021–2023. The interview protocols received ethics approval from the Australian National University following the guidelines of the Australian National Statement on Ethical Conduct in Human Research.

We drafted a questionnaire (Appendix B) based on a literature review of energy transition. We then sent pre-interview questionnaires to the interviewees, giving them two weeks to respond, with the aim of ensuring adequate time for thoughtful responses (Do & Bennett, 2010). Respondents completed the questionnaires using the Qualtrics platform, with multiple-choice response options shuffled to mitigate potential response biases (Do & Burke, 2023a). Interviews were then held either in-person or virtually using Zoom during April–September 2023. They were in either English or Vietnamese.

The composition of interviewees from each stakeholder group was determined based on availability and willingness to participate and with the aim of balanced representation. Interviewees were assured of the confidentiality of their personal and institutional information. During the interviews they were invited to elaborate on their questionnaire

responses and given the chance to raise any additional points. We encouraged them to thoroughly evaluate underlying barriers and consider local contextual factors in identifying appropriate enabling strategies. Each interview lasted approximately 1 h.

Responses were then transcribed and coded in Excel for analysis, with interviewees designated as follows: G for government official, C for civil society or academic representative, and B for industry participant. Indonesia-based (hereinafter referred to as “Indonesian” for brevity) respondents were coded as “I”, while their Vietnam-based (Vietnamese) participants were coded as “V”. For instance, “GI” represents an Indonesian government official and “BV” represents a Vietnamese industry representative. Discussion points raised by more than 10 % of the interviewees, or by fewer than 10 % but supported by secondary data, underwent detailed analysis. The paper includes anonymized quotes from selected interviews to illustrate key findings. The interviewee details are presented in Table 1.

To supplement the expert elicitation, we conducted comprehensive reviews of the academic literature, news stories, and regulations, reports, and databases of governments and international organizations. Our analysis integrates the findings from these reviews with the results of the interviews, seeking to provide a cohesive and comprehensive exploration of the subject matter.

While concerted efforts were made to select interviewees who are knowledgeable about energy and climate issues within the studied countries, the interviews may not fully encompass the perspectives of all experts on the matter given that these are large countries with many energy-sector stakeholders. Questions related to specific plant-by-plant phase-out sequencing would be of interest in a future study. Future studies with interviews in Bahasa Indonesia and also for other countries could offer additional insights.

Results: underlying barriers

The interviewees emphasized various barriers to the implementation of the phase outs. Both countries face notable hurdles, with economic and institutional challenges being the predominant factors raised. The barriers appear to be particularly high in Indonesia. As a result, most of the Indonesian interviewees (71 %) anticipate that the completion of the unabated coal power phase-out will extend beyond 2050. Vietnam is expected to progress faster, with 41 % of the Vietnamese respondents believing it will be achieved between 2040 and 2050. A little over one-fifth of interviewees expressed uncertainty regarding the timing. This section presents insights on four types of barriers: economic, institutional, social, and technical (Table 2).

Table 1
Composition of interviewees (number and %).

	Indonesia		Vietnam	
	Interviews (n = 14)	Code	Interviews (n = 17)	Code
Government agencies responsible for energy, climate change, environment, economic development, and finance	4 (29 %)	GI	7 (42 %)	GV
Civil society	7 (50 %)	CI	5 (29 %)	CV
Industry	3 (21 %) ^a	BI	5 (29 %) ^b	BV

^a One participant was from the fossil fuel industry, one from the renewable energy industry, and one from industry using both fossil fuels and renewable energy.

^b Two participants were from the fossil fuel industry, two from the renewable energy industry, and one from industry using both fossil fuels and renewable energy.

Source: Interviews.

Table 2

Ranking of key barriers to unabated thermal coal power phase-out in Indonesia and Vietnam.

Barrier	Rank (% of interviewees)		Type of barrier
	Indonesia	Vietnam	
Concerns about impacts on the economy, including electricity shortages and price increases	1st (86 %)	1st (94 %)	Economic
Financial limits, including costs of compensating existing coal generators	2nd (79 %)	3rd (47 %)	Economic
Incomplete regulations	4th (36 %)	2nd (65 %)	Institutional
Coal sector lobbying	3rd (57 %)	5th (11 %)	Economic
Limited technical capacity	5th (21 %)	4th (18 %)	Technical
Concerns about unemployment	6th (14 %)	5th (11 %)	Social

Note: Interviewees were asked to choose the three most important barriers among 11 identified through literature review. They could also volunteer new ideas but to a maximum of three barriers in total. Those selected by 10 % or more of the respondents are reported as key barriers. 1st is the most important.

Source: Interviews.

Economic barriers: formidable fortresses

Concerns about potential negative impacts on the economy emerged as the most prominent perceived barrier in both Indonesia and Vietnam after gaining the highest proportion of mentions among the interviewees (Table 2). However, there are nuanced differences in the specific concerns between the two countries. Indonesian participants expressed particular concerns about rising electricity and related product prices (BI1, BI2, CI2, CI5, CI6, CI8, GI1, GI3, GI4), while the Vietnamese experts were particularly worried about potential power shortages (BV1, BV3, BV5, CV1, CV2, CV4, CV5, CV7, GV1, GV2, GV5). In Indonesia, coal power has been receiving substantial policy support, contributing to artificially low electricity prices. Hence, people are concerned that transitioning away from coal would lead to an increase in electricity prices. The concerns about power shortages in Vietnam are particularly pertinent in that the country's northern region experienced power shortages of over 4.3 GW in May and June 2023 due to insufficient dispatchable power from hydropower and coal, although this was not specifically linked to issues with intermittent renewables (Đức, 2023).

Coal power holds an entrenched position in both economies. One respondent remarked that “It has traditionally served as a familiar source for powering our economy; potential changes raise concerns of possible disruptions in the power supply and increasing electricity prices” (GI1). Limited information on the impacts of unabated thermal coal power phase-out further compounds these concerns (CI2, CV5, GV1). Experts assessed that some policymakers are cautious that such changes could impede economic growth (CI6, GI4, CV5, GV1, GV2, GV4). This has led to arguments for the *status quo* in the electricity sector, particularly by those from economic agencies such as the Ministry of Finance (CI8, GI4, CV2).

Another significant shared economic hurdle is the financial costs involved. As of 2023, the average age of Indonesia's coal power fleet was 10 years, while for Vietnam this was 11 years (Global Energy Monitor, 2023). Retiring young coal power plants entails significant costs. The estimated cost of decommissioning 1 GW of coal power and replacing it with clean energy is around US\$1.9 billion or even higher (World Bank, 2023b), meaning that Indonesia and Vietnam would need at least US \$114 billion and US\$57 billion respectively to retire their current and under-construction coal power fleets and transition to clean energy. Policymakers ask where the necessary funds will come from given that State budgets are limited and competition for resources is high (BI1, CI1,

CV5, GV3). There are major concerns about using public funds to compensate for private coal plant closures (CI2, CI8, CV6). Key current plants hold multi-year power purchase agreements (PPAs) that are highly valuable for the incumbents.

Foreign financing for coal power presents another challenge. While the governments of China and Japan have announced their ceasing of financing of overseas coal power, concerns linger regarding continued private foreign investment in captive coal projects in Indonesia (CI6; Mongabay, 2023a). These plants are primarily being employed for nickel, cobalt, and aluminum processing as part of the Indonesian Government's efforts to foster domestic value-adding.

Realizing JETP benefits remains a complex journey. Specifically, there is a pressing need to define various aspects of the JETPs, such as the focus on coal power plant closures or renewable energy uptake; the allocation of grants and loans within each economy; the applicable interest rates; and risk mitigation measures to encourage private sector participation (CI7, GI4, CV5, CV6, GV5). Disagreements have arisen with international partners. A Vietnamese interviewee (CV6) observed that “JETP is like a nice-looking piece of cake, but it needs more time in the oven to become digestible”.

The influential coal industry presents a formidable obstacle to the phase out of unabated coal power in both countries. Indonesia in particular faces resistance due to its substantial coal reserves (the world's 7th largest coal reserves as of 2022) and coal dependence. In addition to domestic use it was the world's largest coal exporter in energy equivalent terms in 2022, with coal export revenues reaching US \$46.8 billion (Energy Institute, 2023; Statista, 2023). Given the size of the sector, the coal industry wields significant lobbying power in policymaking (GI1, CI5; Sambodo & Novandra, 2019). This influence is less pronounced in Vietnam, but still exists (CV6, BV3).

Coal power has benefited from various government interventions in both countries. In Indonesia, domestic market obligations have mandated that coal miners allocate 25 % of their coal production to local power generators at a price of US\$70 per ton or below (CI5, GI1).¹ Similarly, coal power plants in Vietnam have signed agreements with the state-owned coal supplier Vinacomin to secure coal at a fixed price of about US\$80 per ton for 20 years (BV3). Interventions to suppress the domestic price of coal are often opaque and help to perpetuate a perception that coal power is cheap (CI2, CI4, CV2, GV2).

In contrast, renewable energy sources such as solar and wind power have often faced less favorable conditions. In Indonesia, solar feed-in tariffs were previously capped at 85 % of the local electricity generation cost in some locations, which itself was artificially low due to distortions that push down fossil fuel-based generation expenses (Burke et al., 2019). Presidential Regulation 112/2022 now requires negotiations between independent power producers and PLN for a tariff not exceeding a specified ceiling that varies by renewable energy plant type and location (Government of Indonesia, 2023). The negotiations add uncertainty and the ceiling is currently insufficient to incentivize some adoption of solar and wind power given that local costs remain relatively high (CI5, GI1). In Vietnam, generous feed-in tariffs for solar and wind power ended in 2020, leading to stagnation in uptake. New projects have since faced uncertainty (Do et al., 2021).

Institutional barriers: an intricate maze

Both countries share the common challenge of incomplete regulations, with the Vietnamese experts expressing greater concern on this score. Crucial areas lacking regulations include detailed plans for unabated coal power phase-out, the management of coal power assets, job transitions, and compensation for early closures (BI2, BI3, CI2, GI4, BV1, CV1, CV5, CV7, GV1, GV3). There is also a lack of well-developed

¹ The annual average Australian thermal coal export price for 2012–2022 was US\$108 per ton (World Bank, 2023c).

regulations to facilitate the advancement of renewable energy, for example relating to grid transmission bottlenecks and energy storage development (GI4, BV5; Dutu, 2016).

Current regulations tend to favor coal power. In Indonesia, captive coal power projects are permitted to proceed if they are deemed to add value to natural resources and contribute to job creation and economic growth (Resosudarmo et al., 2023). Captive coal power plants continue to proliferate, constituting approximately two-thirds of the coal power projects under construction (BI3, CI6; Mongabay, 2023a). Meanwhile, renewable energy development is subject to local content requirements, significantly hindering adoption (CI5, CI8). The requirements for local content in solar photovoltaic (PV) systems remain at a high threshold of 60 % (Ordóñez et al., 2022).

In Vietnam, developers of utility-scale solar PV projects are responsible for constructing transmission lines to the national grid. In contrast, coal power projects share the cost with EVN (Do et al., 2020). Inadequate regulatory frameworks related to public procurement and electricity pricing have impeded the introduction of reverse auctions for clean energy projects (Do & Burke, 2023a).

Enforcement of regulations in the context of industry capture also poses challenges. Powerful entities such as PLN and EVN can influence regulatory enforcement and often favor coal (GI1, CV5). In Indonesia, PLN reports to the Ministry of State-Owned Enterprises rather than the Ministry of Energy and Mineral Resources (GI1; IRENA, 2022b). Similarly, Vietnam's EVN reports to the Commission for the Management of State Capital in Enterprises rather than the Ministry of Industry and Trade (BV1, CV5). The utilities may consequently not prioritize the directives of the energy ministries. The two utilities also play key roles in the development of the Electricity Supply Business Plans in Indonesia and Power Development Plans in Vietnam.

There has been some progress, however. For example, Indonesia introduced a renewable energy certificate scheme in 2020 that helps companies to meet renewable energy targets. Vietnam is considering the introduction of direct power purchase agreements for renewable energy, including for both sales via private transmission lines and on a contract-for-difference basis via the national grid.

Technical barriers: looming headaches

Managing the transition to clean energy presents a substantial technical challenge in both countries (BI2, CI3, BV4). PLN and EVN are still relatively inexperienced in dealing with variable renewable energy. Solar and wind power accounted for around 13 % of electricity generation in Vietnam in 2022 (Ember, 2023), but due to grid and grid management limitations, some solar and wind projects have had to reduce their output (CV2, CV3, GV4) and EVN has struggled to ensure grid stability (BV3, CV7). Inadequate energy storage exacerbates the issue (Do & Burke, 2023a).

Both countries are seeking ways to expand and upgrade their grids (CI1, GI4, CV1). With about 16,000 islands, Indonesia faces sizeable challenges, including in transmitting power to Java where demand concentrates (GI4; IRENA, 2022b). In many locations, decentralized power systems are likely to continue to be highly important (Derks & Romijn, 2019; Ha & Kumar, 2021). Vietnam is aiming for an additional 12 GW of interregional connections by 2030 – about 40 % more than the present level (Do & Burke, 2023a). There is a particular need to ensure that solar and wind power generated in the central and southern regions can reach demand centers in the north (CV1, CV2, BV5).

The cost of carbon capture, utilization, and storage (CCUS) from coal power remains high, typically ranging from US\$84–95 per ton of CO₂ in the United States (Gillingham & Stock, 2018). CCUS remains only in the research and development phase in Indonesia and Vietnam, with no strong short-term prospects (ASEAN Centre for Energy, 2021). Indonesia has conducted several laboratory tests and is considering promoting CCUS, starting with the coal and gas industry. Vietnam planned to pilot CCUS for a gas-fired power plant in 2004 but is yet to have any

commercialized CCUS projects (Bokka & Lau, 2023). Renewables provide a faster and cheaper way forward.

Social barriers: sensitive contexts

The interviewees in both countries assessed that additional concerns include unemployment and other potential adverse effects for local communities. These social barriers are currently considered of lower prominence compared to other obstacles, being mentioned by only 14 % and 11 % of the Indonesian and Vietnamese interviewees respectively (Table 2). Some experts cautioned that social resistance could grow if the transition results in a substantial increase in electricity prices and inflation (CI2, CI6, CI8, CV2, GV5).

Furthermore, some of the experts expressed concern that community protests may emerge because of renewable energy and transmission projects, especially if local communities are not included in decision-making processes or not satisfied with outcomes, including compensation for land acquisition (CI3, CI5, CV4, BV4). Noteworthy examples of protests can be observed in the case of the Seko hydro dam in Sulawesi, Indonesia (Mongabay, 2023b) and a floating solar project in Binh Dinh, Vietnam (Do et al., 2020). Community concerns are also arising in other countries such as Australia.

Summary of barriers

In summary, Indonesia and Vietnam face similar key barriers to phasing out coal power, including concerns about negative economic impacts, incomplete regulations on energy transition, technical limitations, and a lack of social acceptance. Indonesia appears to face relatively greater challenges due to its larger coal dependence and more influential coal industry. Interestingly, about two-thirds of the interviewed experts observed that barriers appear to have come into a clearer light in the post-COP26 period given the step-up in ambition since then. Some of the experts also cautioned that the barriers may evolve, with new obstacles potentially arising during the transition such as competition for land use. Many of the interviewees emphasized that the countries are unlikely to overcome the barriers at a reasonable speed without international support.

Ways forward

This section discusses potential strategies to overcome the barriers to Indonesia and Vietnam meeting their unabated coal power phase-out commitments, as summarized in Fig. 4. These strategies are tailored to local contexts and consider the time needed to establish transformative conditions and capacities.

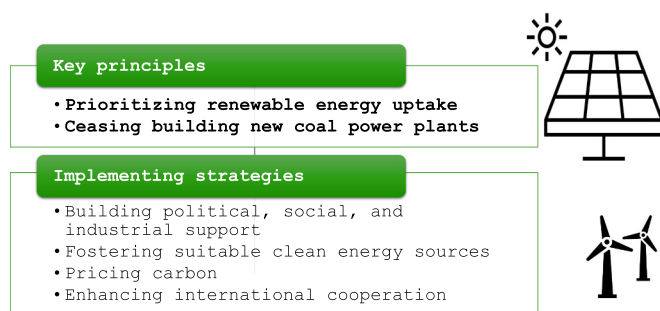


Fig. 4. Key strategies for phasing out coal power in Indonesia and Vietnam. Source: Interviews.

Key principles: prioritizing renewable energy uptake and ceasing building new coal power plants

From our interviews, two key principles emerged regarding phasing out unabated coal power in Indonesia and Vietnam, based on the criteria of feasibility and timing. The first emphasizes prioritizing renewable energy growth over short-term closures of existing coal plants. Over 80 % of interviewees in both countries emphasized the importance of prioritizing renewable energy uptake.

According to the experts, placing renewable energy at the forefront would help to facilitate a smoother transition from coal power. As renewable energy utilization matures and becomes more widespread, renewables will organically overtake coal power in a phased manner, as seen in some other countries that are further down the energy transition path such as Australia, the United Kingdom, and Germany (Jakob, Steckel, et al., 2020). This pathway is likely to be cost effective given the rapid decrease in costs for sources like solar and wind (IRENA, 2022a) and that it avoids an up-front focus on plant closures. The focus on additional well-managed clean supply reduces risks of power shortages and system instability, thereby enhancing energy security in the context of rapid electricity demand growth. Moreover, it alleviates the risk of strong resistance from incumbent coal and coal-dependent industries and communities.

The second principle involves ceasing the construction of new coal power plants. Refraining from adding to the stock of coal-fired stations will mitigate the risk of them becoming future stranded assets (IRENA, 2022a). It also frees up resources for cleaner options. Some experts noted that while this principle is not new, it requires policy attention, particularly regarding the issue of captive coal power plants in Indonesia, which have been proliferating.

It was generally assessed to be preferable to avoid taking on a principal early focus on closing existing coal plants given the costs involved and that any issues caused in terms of reliability problems or price spikes may be a setback for the energy transition. However, caution is needed to avoid the situation of coal power persisting for too long (York & Bell, 2019). As an expert summarized, “Let clean energy see coal out” (CV1).

Implementing strategies

Building political, social, and industrial support

The interviewees stressed the significance of garnering political, social, and industrial support in both countries (BI1, CI1, CI4, GI4, CV5, GV1, GV3). A strategic approach could center on highlighting the benefits of (a) addressing the pressing issue of local air pollution, and (b) securing international support, which the interviewees rated as the highest priorities in Indonesia and Vietnam, respectively (Table 3). Helping to address climate change could also be a persuasive argument given that both Indonesia and Vietnam are highly vulnerable to its impacts (Overland et al., 2021). Highlighting other benefits such as the avoidance of stranded assets in the coal power sector and the goal of a

Table 3
Ranking key benefits of Indonesia and Vietnam's coal power phase-out.

Driver	Rank (% of interviewees)	
	Indonesia	Vietnam
Attract international support for green growth	2nd (50 %)	1st (76 %)
Reducing local air pollution	1st (57 %)	2nd (53 %)
Addressing climate change	2nd (50 %)	2nd (53 %)
Avoiding stranded assets	4th (43 %)	4th (30 %)
Securing clean energy supply	5th (35 %)	5th (18 %)

Note: Interviewees were asked to choose the most important driver among seven presented. They could also volunteer new ideas. Those selected by 10 % or more of the respondents were reported as key drivers. 1st is the most important. The top 5 are shown here.

Source: Interviews.

clean energy future could further bolster the case for the transition. The energy transition could be viewed as an opportunity rather than a threat, and one that involves the adoption and integration of modern technologies such as solar panels, batteries, and grid management tools.

The interviews identified that research to provide insights on the socioeconomic impacts of the transition could help to develop local adaptation strategies. Developing comprehensive plans for employment transition would also garner support from coal industry workers as well as communities located near coal power plants and mines (CU7, GI3, GV1; Wang & Lo, 2022). Effective communication could be instrumental in fostering public acceptance of potential fluctuations in electricity prices, including the likelihood of short-term increases (CI2, CI7, CV1; Blazquez et al., 2020).

Several interviewees assessed that engaging with industry is essential. They highlighted the pivotal roles of private conglomerates such as Bumi Resources, a large coal producer in Indonesia, and VinGroup, Vietnam's largest conglomerate and one that is leading the way in electric vehicle manufacturing (CI4, CI6, BV3, CV1). If these industry giants were to switch to investing in clean energy, they could become a formidable force. Strengthening the renewable energy sector could help counteract the influence of fossil fuel lobbyists.

Sustaining political support is also paramount. Government policies wield significant influence over energy transitions (Rai et al., 2010; Sharma et al., 2023), particularly in countries where the government has a large role in the energy sector such as Indonesia and Vietnam (Zhao & Alexandroff, 2019). The interviewees particularly underscored the pivotal role of the government in Vietnam, articulating that “the government assumes a steering role, while civil society and industry provide support” (GV1) and that “the government is akin to a captain – it is open to passenger suggestions but may resist coercion. Contributions from stakeholders are important but are best presented in a constructive manner” (CV1). Some Indonesian interviewees expressed particular concern about the political vulnerability of the commitment to phase out coal power in Indonesia, including in the light of Presidential transitions – with one on the way in October 2024 (CI5, GI3, GI5).

Fostering appropriate clean energy sources

Solar energy received the most mentions as a promising future energy source from interviewees in both countries. This aligns with the high potentials of solar PV of about 1052 GW in Indonesia (13 times of the country's installed power capacity in 2022) and about 2847 GW in Vietnam (36 times) when assessed in terms of projects with a levelized cost of energy of less than US\$150 per megawatt-hour in 2018 (Ember, 2023; Lee et al., 2020).

Other potential electricity sources that were mentioned include geothermal power and hydropower for Indonesia and offshore and onshore wind for Vietnam. Domestic natural gas was mentioned for both countries, and imported liquefied natural gas (LNG) for Vietnam. Vietnamese experts demonstrated a greater openness to other technologies, mentioning nuclear power, hydrogen, and CCUS. They were however unsure about some of the details such as the potential share of CO₂ reduction from CCUS.

The experts suggested a combination of policies to promote clean energy adoption. In both countries there would be potential benefits from reforming electricity markets to encourage more flexible pricing and greater participation of renewables (CI8, CV5; Shem et al., 2019). In addition, implementing compulsory renewable portfolio standard schemes, for example in line with the Renewable Energy Target model used in Australia, could accelerate uptake in a controlled manner (CV1, CV5; Burke & Do, 2021). Generous feed-in tariffs could promote renewable energy sources that are in their early stages or that involve sizeable risk, such as offshore wind and geothermal power (Do et al., 2022). Reverse auctions could also be increasingly used to procure low-cost clean energy sources (Burke & Do, 2021). Importantly, both countries would benefit from issuing transparent and stable regulations to boost certainty for investors in clean energy.

It appears that Vietnam will be likely to advance more rapidly than Indonesia. Vietnam's non-fossil share of the electricity mix was already about 50 % in 2022, while Indonesia's stood at about 20 % (Ember, 2023). Vietnam also has a relatively more conducive investment environment for renewable energy (Do et al., 2021). In 2021, Vietnam ranked among the top 40 countries in the Renewable Energy Country Attractiveness Index, whereas Indonesia did not make the list (EY, 2023). In 2021, Vietnam ranked among the top five countries globally for its rapid improvement in renewable energy, achieving a score of 84/100 in the World Bank's Regulatory Indicators for Sustainable Energy, whereas Indonesia received a score of 56/100 (World Bank, 2023d).

Pricing carbon

The experts assessed that carbon pricing should ideally play an important role in promoting renewable energy and reducing coal dependence in both countries, especially Indonesia. Although approximately two-thirds of coal power units are state-owned in both countries (Benoit et al., 2022; Global Energy Monitor, 2023), carbon pricing is still useful in incentivizing enterprises to adapt their business strategies to align with phase-out plans (BI2, BI3, CI4, CV7; Simsek et al., 2019; Ordonez et al., 2022). However, achieving a sufficiently high carbon price soon appears unlikely (Do & Burke, 2021; Resosudarmo et al., 2023). It is thus advisable to apply carbon pricing alongside other policy instruments.

Both countries have established legal frameworks for carbon pricing. Indonesia introduced Presidential Regulation 98/2021 on carbon pricing in 2021. Following a pilot emission trading scheme involving 32 power plants in 2021, an emission trading scheme (ETS) for coal power plants was initiated in February 2023, with plans for future expansion to encompass oil and gas power plants in 2025. Vietnam incorporated an emission trading scheme (and implicitly a carbon tax) into the Law on Environmental Protection in 2020 (Do & Burke, 2021). Vietnam's ETS is intended to undergo a pilot phase from 2025 to 2027 before official implementation in 2028.

However, some of the interviewed experts assessed that the proposed designs for the ETS in Indonesia appear overly complex and the approach is likely to face delays in implementation (GI1, GC5). The design of an ETS for Vietnam has also been a challenge (CV4, GV5). Concerns in both countries include the risk of setting an emission cap that is too high, which would undermine desired emission reduction effects (Resosudarmo et al., 2023). A well-designed carbon tax could be a simpler and more administratively feasible alternative. Effective communication will be crucial to secure support.

Key experts believed that international trade-related climate measures such as the European Union (EU) carbon border adjustment mechanism (CBAM) will provide an additional incentive for carbon pricing (CI5, CV1). Both countries have emission-intensive manufacturing exposure such as in the steel, aluminum, and cement industries. CBAM will diminish their trade competitiveness. By imposing a carbon price, these countries could mitigate CBAM implications while generating revenue that could be reinvested within their respective economies, including for the energy transition.

The interviewees tended to believe that the establishment of a regional carbon tax or a regional ETS within the Association of Southeast Asian Nations (ASEAN) would pose considerable challenges and be undesirable to pursue (CI8, CI5, CV1). As Do and Burke (2023b) pointed out for the example of the ASEAN Power Grid, large and complex ASEAN initiatives often encounter substantial delays. In the case of a regional emissions trading scheme, it would be highly challenging to reach consensus on critical elements such as emission caps or the role of offsets. Perverse incentives and measurement issues would abound. Domestic carbon pricing and retention of revenue would be more feasible.

Enhancing international cooperation

About 80 % of the interviewees in the two countries held the view that foreign concessional finance will play a vital role. Interviewees

emphasized the importance of prioritizing foreign concessional funding for investment in clean energy over retiring coal power (BI1, BI2, CI1, CI3, CI4, GI5, BV2, BV6, CV4, GV2, GV4). Additional priorities include developing energy storage (as stressed by Indonesian experts BI3, CI5, and GI4) and bolstering power grids (a focal point for Vietnamese experts BV5, CV1, and GV1). Utilizing available foreign funding to invest in infrastructure for cross-border electricity trade, focusing on bilateral agreements, could also help facilitate the energy transition (Do et al., 2023; Lu et al., 2021).

Among international cooperation mechanisms, JETPs received most attention, with about two-thirds of the interviewees from each country considering it promising. The interviewees believed that “to make the JETP cake digestible” and even “delicious”, both the recipient countries and international partners would need to intensify their efforts. The recipient countries could apply measures to de-risk clean energy investments to unlock funding from the private sector, for example by providing sovereign guarantees for significant projects (GI4, CV1, GV1). With their general government debt shares of gross domestic product (GDP) standing at 39 % and 33 % respectively in 2022, both Indonesia and Vietnam also have the capacity to increase their public debts to support worthwhile infrastructure projects (IMF, 2024).

Some interviewees argued that international partners would need to elevate the share of grants within the JETPs and offer highly favorable loan terms (CI8, GI4, CV6). Doing so would underscore the “common but differentiated responsibilities” principle and the “just” pillar that Indonesia and Vietnam expect from their JETPs. Furthermore, there was a feeling that the countries need to be able to retain the autonomy to chart their own course without undue pressure from international partners (GI4, GV3).

Promoting regional and bilateral cooperation through the exchange of information and shared experiences emerged as a top priority as assessed by the interviewed experts. Interestingly, Indonesia and Vietnam have embarked on a mutual learning process – the two countries frequently look at one another's plans as a reference point when contemplating climate policy such as the adoption of net-zero emission targets (GI4; Do & Thi, 2022), and the countries' JETP Secretariats have regularly exchanged ideas and updates (CV1, GV3). There is scope for more in the way of bilateral collaboration between these two key ASEAN countries.

The transition could benefit from more countries emulating their peers (Baldwin et al., 2019). For instance countries such as India and the Philippines could consider also signing to JETPs with the aim of expediting their own energy transitions. Momentum against fossil fuels is growing. An Indonesian expert noted (GI4): “In our dynamic and interconnected world, countries often seek to avoid standing out in the international arena, so they align themselves with global and regional initiatives. They would be marginalized if pursuing fossil fuel pathways”.

Conclusions and policy implications

This study examined obstacles hindering the commitments to phase out unabated coal power of Indonesia and Vietnam, the two largest thermal coal economies in Southeast Asia. We interviewed 31 experts from government agencies, civil society, and industry between May and September 2023. The interviews were supplemented by reviews of the academic literature, news reports, and regulations, reports, and databases. The research represents the first comparative exploration of the challenges associated with phasing out young coal power fleets amid rising electricity demand in the post COP26 setting in these two key economies.

Our study reveals that the two countries share formidable barriers, with concerns about potential adverse effects on the economy being prominent. A secure and affordable energy supply emerged as the top priority among the interviewees. The entrenched coal industry and its historical contribution to economic growth present significant hurdles.

Indonesia, a country with major coal reserves, faces greater challenges in this regard. Other shared barriers include limited financing, incomplete regulations, and insufficient technical capacity. Concerns about public resistance to change, including potential short-term increases in energy prices, also present challenges. This is similar to circumstances in other developing countries such as China, India, and the Philippines (Bhattacharyya, 2017; Manych & Jakob, 2021; Montrone et al., 2021).

The most practical path forward appears to be for Indonesia and Vietnam to focus on rapidly accelerating renewable energy uptake, while ceasing building new coal power plants and pursuing a gradual phasing out of coal power. This would contribute to maintaining energy security and allow sufficient time for the thermal coal industry to devise exit strategies (Do & Burke, 2023a; Firdaus & Mori, 2023; Ordonez et al., 2022). As renewables rise, thermal coal will decline, both relatively and absolutely. The approach also aligns with the COP28 commitment to triple renewable energy by 2030 (IRENA, 2023). Further research would be useful to pinpoint least-cost pathways, including which solar and wind sites to prioritize and the feasible timing of coal plant closures.

A mix of tailored policies suited to each country's context is likely to be desirable. Such policies may encompass a carbon tax in Indonesia and direct regulations for unabated coal power phase-out in Vietnam (Do & Burke, 2023a,b). The key challenge is to design policies that would be effective in rapidly bringing in new clean energy sources. Greater emphasis could also be placed on efforts directed at energy conservation and efficiency (Warszawski et al., 2021). Transition efforts in both countries would benefit from a focus on garnering and sustaining political, social, and industrial support (Longhurst & Chilvers, 2019; Soares da Silva & Horlings, 2020).

Crucially, the energy transition could be boosted by emphasizing its benefits, such as improved air quality and the economic opportunities in clean energy, including eligibility for international support (Ekins & Zenghelis, 2021). Opportunities abound; both countries possess abundant renewable energy resources and have minerals that will be under high demand during the energy transition, including nickel in Indonesia and rare earth elements in Vietnam (IISD, 2023b). Vietnam may progress more rapidly due to factors such as its more centralized political system, lower dependence on coal, and a relatively more conducive investment environment for renewable energy.

International cooperation will play a pivotal role (Aisbett et al., 2023; Do, 2024). Initiatives like JETP can unlock financial and technical opportunities, although significant issues require resolution before these opportunities can be realized. The two countries and their international partners will need to align their expectations to reach common ground. The coal phase-out commitments made during COP26 and under the JETPs are not legally binding, meaning there is the potential for backstepping without conducive support.

Despite the challenges, the two countries' JETPs appear promising,

particularly if renewable energy uptake is prioritized. With a group of international partners collaborating with individual countries to advance energy transition efforts, this approach can reduce overlap and bolster synergies among international support efforts. In addition, countries could emulate one another for better outcomes. Early achievements include that both countries have moved their emissions peak targets to 2030, with Indonesia advancing by 7 years and Vietnam by 5 years from their original plans.

Our study underscores the value of expert elicitation for informing the energy transition. The approach unveils insights such as the existence of heightened current perceptions of barriers to energy transition in the face of rapid momentum for change, as well as the perceived centrality of international support for achieving progress. Further utilization of expert elicitation in energy-sector studies, especially in developing countries where relatively high uncertainty exists surrounding some elements of the energy sector and future trajectories, has the potential to provide additional clarity and understanding.

Solar power was identified by the interviewed experts as having large potential in both countries, and Vietnam also has major opportunities in wind power. If these could be harnessed rapidly, this will set the scene for a rapid phase-out of thermal coal, the most polluting energy source. By potentially collaborating in a bilateral way, in addition to multilateral collaborations, Indonesia and Vietnam could potentially show the way forward for other developing countries in Southeast Asia and beyond that are navigating the complex journey away from coal and other fossil fuels.

CRediT authorship contribution statement

Thang Nam Do: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. **Paul J. Burke:** Conceptualization, Formal analysis, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Participation of Indonesia and Vietnam in the Global Coal to Clean Power Transition Statement

Clause	Clause statement	Fully endorsing country
1	To rapidly scale up our deployment of clean power generation and energy efficiency measures in our economies, and to support other countries to do the same, recognising the leadership shown by countries making ambitious commitments, including through support from the Energy Transition Council.	Indonesia, Vietnam
2	To rapidly scale up technologies and policies in this decade to achieve a transition away from unabated coal power generation in the 2030s (or as soon as possible thereafter) for major economies and in the 2040s (or as soon as possible thereafter) globally, consistent with our climate targets and the Paris Agreement, recognising the leadership shown by countries making ambitious commitments, including through the Powering Past Coal Alliance.	Indonesia, Vietnam
3	To cease issuance of new permits for new unabated coal-fired power generation projects (New coal-fired power generation projects are defined as coal-fired power generation projects that have not yet reached financial close), cease new construction of unabated coal-fired power generation projects and to end new direct government support for unabated international coal-fired power generation, recognising the leadership of countries making ambitious commitments, including through the No New Coal Power Compact.	Vietnam
4	To strengthen our domestic and international efforts to provide a robust framework of financial, technical, and social support to affected workers, sectors and communities to make a just and inclusive transition away from unabated coal power in a way that benefits them, and expands access to clean energy for all, recognising the leadership of countries endorsing the COP26 Just Transition Declaration.	Indonesia, Vietnam

Source: UN Climate Change Conference UK 2021 ([UK Government, 2023](#)).

Appendix B. Questionnaire

Your Opinion about Coal Power Phase-Out in your country

This is part of a study conducted by researchers at the Australian National University.

Responses will be used for research purposes only. The names and institutional affiliations of respondents will remain confidential. Results will be reported in aggregated form only and identification of individual responses will not be possible. Participation is voluntary.

Background

At the United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP) in November 2021, Indonesia and Vietnam joined the Global Coal to Clean Power Transition Statement (herein after referred to as unabated coal power phase-out). Unabated coal power is where emissions are not prevented using carbon capture, utilization, and storage (CCUS) methods.

Short versions of the commitments' clauses are:

1. To accelerate the deployment of clean power and energy efficiency.
2. To phase out unabated coal power in the 2040s or as soon as possible thereafter.
3. To cease issuance of new permits and construction of unabated coal power projects.
4. To provide support to affected workers, sectors, and communities.

The full versions of the clauses are [here](#).

Indonesia did not endorse clause 3, stating that it “will consider accelerating coal phase out into the 2040s, conditional on agreeing additional international financial and technical assistance”.

Vietnam endorsed all clauses.

We would like to hear your opinion on this topic.

1. Which type of sector or institution do you work in? (tick one only)

- Local government agency.
- Regional government agency.
- National government agency.
- University/research institution.
- Industry/consultancy.
- International organization.
- Local non-governmental organization.
- Other (please specify).

2. Which country are you based in? (tick one only)

- Indonesia.
- Vietnam.

3. How much do you know about coal power issues in your country? (tick one only)

- Nothing.
- Not much.
- Quite a lot.
- A lot.

4. In your view, the level of ambition that your country has committed to under the Global Coal to Clean Power Transition Statement is: (tick one only)

- Too high.
- About right.
- Too low.
- Unsure.

5. In your view, what are the three most important barriers to unabated coal power phase-out in your country? (tick up to three only)

- Concerns about unemployment.
- Concerns about insufficient electricity supply.
- Concerns about electricity price increases.
- Legal and administrative difficulties.
- Public service inertia.
- Coal sector lobbying.
- Cost of compensating existing coal generators.
- Technical limits.
- Financial limits.

- Others (please specify).
- Unsure.

6. In your view, what are the three most important benefits of unabated coal power phase-out in your country? (tick up to three only)

- Improving local environmental quality.
- Mitigating climate change impacts.
- Avoiding stranded assets.
- Securing clean energy supply.
- Attracting international support for green growth initiatives.
- Boosting the country's image in the international arena.
- Others (please specify).
- Unsure.

7. In your view, what are the three most suitable policy instruments for unabated coal power phase-out in your country? (tick up to three only)

- Coal power plant phase-out regulations.
- Strict environmental regulations on coal power emissions.
- Government payments for closing coal power plants.
- Remaining coal power plants pay out early retiring plants.
- Removing subsidies for coal power.
- Imposing a carbon price.
- Enhancing enabling policies for renewable energy.
- Other (please specify).
- Unsure.

8. When do you think a complete phase-out of unabated coal power will be achieved in your country? (tick one only)

- Before 2040.
- During 2040–2050.
- After 2050.
- Unsure.

9. In your view, what should be the main replacement for unabated coal power in your country? (tick one or more)

- Solar.
- Onshore wind.
- Offshore wind.
- Domestic natural gas.
- Imported liquefied natural gas.
- Nuclear.
- Coal power with carbon capture, utilization, and/or storage.
- Biofuel and biomass, including waste.
- Geothermal.
- Other (please specify).
- Unsure.

10. In your view, what share of carbon dioxide emissions from thermal coal power will be captured and stored in your country in 2040? (tick one only)

- 0 %.
- Less than 20 %.
- 20–50 %.
- Over 50 %.
- Unsure.

11. In your view, which will be most important in funding unabated coal power phase-out in your country? (tick one only)

- Domestic resources.
- Foreign private investment.
- Foreign concessional funding sources (including official development assistance).
- Other (please specify).
- Unsure.

12. In your view, what should the international community focus on? (tick one only)

- Providing technical support for coal power phase-out.
- Providing support for updating policy and regulations.
- Ceasing all financing, both from public and private sources, for new coal power projects.
- Financing carbon capture, utilization and storage.
- Other (please specify).
- Unsure.

13. In your view, what are the priority uses for international concessional finance for the phase out of unabated coal power? (tick three only)

- New clean energy investments.
- Electricity transmission infrastructure.
- Compensation for coal plant closures.
- Energy storage infrastructure.
- Other (please specify).
- Unsure.

14. In your view, what is the most important international cooperation mechanism for phasing out unabated coal power in your country? (tick one only)

- Bilateral cooperation with another country.
- Multilateral cooperation with two or more organizations/countries.
- Multilateral development banks such as the World Bank, Asian Development Bank, and Asia Infrastructure Investment Bank.
- New initiatives such as the Just Energy Transition Partnership.
- Other (please specify).
- Unsure.

15. In your view, what is the most important action that Southeast Asian countries should take together to make progress toward an unabated coal power phase-out? (tick one only)

- Boost regional grid interconnectivity and electricity trade.
- Exchange experience and knowledge.
- Call for international support.
- Set a regional common phase-out target for unabated coal power.
- Establish a regional emission trading scheme.
- Impose a regional carbon tax.
- Other (please specify).
- Unsure.

16. Are there other ideas or thoughts that you would like to share? Please provide details.

17. Do you agree to participate in a follow-up discussion on this issue?

- Yes.
- No.

About yourself

Name:

Email:

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