International Labour Organization

A just energy transition in Southeast Asia

The impacts of coal phase-out on jobs

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▶ Preface

Following its 2020 Operational Activities Segment the UN Economic and Social Council (ECOSOC) adopted a resolution in July 2020. It was endorsed in the General Assembly Resolution 74/297 which included a new regional architecture with a Regional Collaborative Platform (RCP) at the centre of the implementation. Importantly, the RCPs will have a set of Issue-Based Coalitions (IBC) that will drive the regional development agenda forward, taking into consideration regional issues and specificities.

Ongoing efforts to support more regional ambition in phasing down coal are being undertaken by IBC on Raising Ambitions on Climate Actions. The purpose of the IBC is to coordinate the UN response to cross-cutting challenges of climate change mitigation in the region, help realize synergies among related areas of work of different UN entities, and serve as platforms to reach out to non-UN stakeholders. As part of the IBC on Raising Ambitions on Climate Actions, a working group on the phase down of coal has been formed.

The participating UN agencies (UNEP, UNESCAP, ILO and UNFCCC) have undertaken advocacy efforts and developed a series of knowledge products to better understand the opportunities surrounding the phase-out of coal. UNESCAP partnered with Climate Analytics to develop a report entitled "Coal Phase-out and Energy Transition Pathways for Asia and the Pacific". The ILO has adopted the "Guidelines for a just transition towards environmentally sustainable economies and societies for all" designed to promote decent work on a large scale and ensure that social protection exists where needed; these guidelines also include mechanisms for social dialogue among governments, workers and employers' organizations throughout policy making processes at all levels. UNFCCC has recently published the initial version of the Nationally Determined Contributions (NDC) Synthesis Report, compiling information from 48 new or updated NDCs (representing 75 Parties) that were submitted before 31 December 2020.

At the 26th UN Climate Conference (COP26) in November 2021, more than 40 countries pledged to phase-out coal. More than 30 developed nations and the European Union have signed the COP26 Just Transition Declaration in Glasgow. These countries are committed to ensure that workers, businesses and communities are supported as countries transition to greener economies. While pressure is mounting in the South for more actions to phase-out coal at the national level, there is still some way to go to fully understand the impact on jobs at the local level and how population and economic shrinkage will ultimately affect the livelihoods of mining regions.

This report discusses the need to ensure a just transition while phasing out coal examining the cases of Indonesia, the Philippines and Viet Nam. These countries are among the five economies with the highest levels of coal consumption in Southeast Asia. Indonesia and Viet Nam are important coal producers while the Philippines relies heavily on coal imports for energy generation. A just transition away from coal is indispensable and it can bring untapped opportunities for quality jobs that are green and decent. Yet transitioning from coal into other economic activities is on THE policy agendas OF THE THREE COUNTRIES only to varying degrees due to the dependency of such developing countries on coal to meet a growing energy demand during their development process. The report sets out a framework of cooperation for a just energy transition in partnership with national, regional and local actors to work TOGETHER to mitigate the negative socio-economic effects of coal phase-out and to maximize its transformative opportunities for mining communities to foster a better future. This report is essential reading for those willing to know more about the impacts of coal-phase-out on jobs and how to prepare for a just transition.

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1

Introduction

This report focuses on ensuring a just transition while phasing out coal in three selected countries: Indonesia, the Philippines and Viet Nam. These countries are among the five economies with the highest levels of coal consumption in Southeast Asia. Indonesia and Viet Nam are important coal producers while the Philippines relies heavily on coal imports. All three countries are simultaneously among the most vulnerable to climate change. A just transition away from coal is indispensable, yet coal phase-out is on their policy agendas only to varying degrees. Furthermore, the "phase-out" of coal was replaced with a "phase down" in the Glasgow Climate Pact (UNFCCC 2021) due to the dependency of developing countries on coal to meet a growing energy demand during their development process (The Guardian 2021).

The Paris Agreement on climate change adopted in 2015 notes the imperatives of a just transition and of the creation of decent jobs in national contexts and circumstances as essential aspects of responses to climate change. In the same year, ILO constituents adopted the *Guidelines for a Just Transition towards Environmentally Sustainable Economies and Societies for All* through consensus among representatives of governments, employers and workers (ILO 2015). The Guidelines offer a unique policy framework and a practical tool to steer the transformation to low-carbon and climate-resilient economies, taking into account the social and employment-related dimensions.

A just transition to sustainable development can power a human-centred approach to the future of work that transforms economies and societies, maximizes opportunities of decent work for all, reduces inequalities, promotes social justice, and supports industries, workers and communities. To turn this human-centred agenda into concrete action, in 2019, United Nations Secretary-General António Guterres announced a Climate Action for Jobs initiative (CA4JI) and selected the ILO to spearhead its implementation. The present report supports the ILO's efforts in the implementation of CA4JI.

The methodology used in this study includes research and analysis of the most up-to-date data and information available; tripartite consultations with constituents in Indonesia, the Philippines and Viet Nam, and consultation with the UN Resident Coordinator Offices as well as the ILO Country Offices in the three countries.

This report is made up of five sections. Following a brief introduction presented in this section, the second section discusses the current situation and recent developments regarding coal phase-out and a just transition in the context of CO_2 reductions at global and regional levels. The coal production and consumption in the national and local context of Indonesia, the Philippines and Viet Nam are described in the third section. The same section also provides an overview of the situation regarding Knowledge Intensive Business Services/ Mining Technology Services (KIBS/MTS) in the industrial ecology. The fourth section presents the labour market impacts of coal phase-out scenarios based on the data available for Indonesia, the Philippines and Viet Nam. The fifth and last section summarizes the emerging issues that the study identified for the way forward.

The cut-off date for data and information used in this report was 30 November 2021.


KOMATSU

2

Current state of affairs and recent developments

Fossil fuels are the primary cause of human-made climate change (World Bank 2021a). Coal is the most carbon-intensive fossil fuel, and its rapid phasing out is essential to limit global warming to 1.5°C, as set out in the Paris Agreement. In March 2021, the UN Secretary-General urged all The Organisation for Economic Co-operation and Development (OECD) countries to commit to phasing out coal by 2030 and non-OECD countries to do so by 2040 to be able to meet the 1.5°C goal (UN 2021a). However, the status of coal power plants as of 2021 shows that the world is far from reaching this objective unless drastic steps are taken immediately (figure 1). Since the negative effects of burning coal on the climate and on human health are not reflected in energy prices, coal remains one of the cheapest energy sources in many countries, notably in developing economies. Furthermore, in some countries, coal mines and power plants are important employers and contribute significantly to the state budgets (MMC 2018).

▶Figure 1. Status of coal power plants, global average 2021

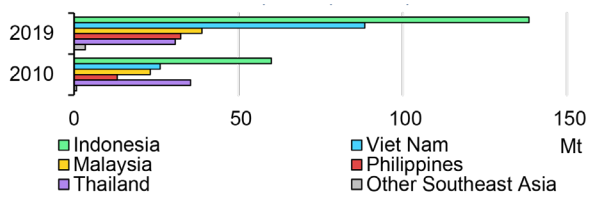
Source: (C40 Cities 2021).

According to the World Bank (2021), in 2019, some 57 per cent of annual global CO_2 emissions came from Asia. In the same year, coal-fired electricity generation accounted for 30 per cent of global CO_2 emissions (IEA 2019) and the majority of this generation was found in Asia and the Pacific. In this region, coal consumption has risen by 150 per cent over the last 20 years (World Bank 2021a) and the share of coal in the electricity mix has increased from 27 per cent in 2010 to 43 per cent in 2019 (Friedrich-Ebert-Stiftung 2021). Based on UNESCAP's calculations, if all the currently planned and announced coal-fired power generation capacity were realised, "emissions would rise from 4.2 $GtCO_2$ per annum in 2017 to 6.9 $GtCO_2$ per annum, and only peak around 2028". Any new capacity in the Southeast Asia region "will be exposed to greater risk, threatening to unnecessarily increase the cost of the energy transition and placing a

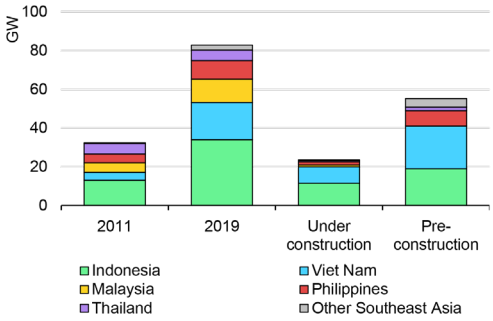
higher burden on the emerging economies that are less able to afford it" (UNESCAP 2021). The study by Friedrich-Ebert-Stiftung (2021) points out that the region must reduce its coal-powered consumption to 5 to 10 per cent by 2030 and completely phase-out coal use by 2040 to meet the 1.5°C goal. Yet, its energy demand is expected to double by 2030, and the countries in the region continue to build new coal-fired capacity (ADB 2021d).

The International Energy Agency (IEA) predicts that, by 2025, the Association of Southeast Asian Nations (ASEAN) will become the third-largest coal-consuming region in the world (IEA 2020a). Indonesia, Viet Nam and the Philippines are among the countries leading the growth in coal consumption in the region (figure 2). Moreover, these countries have the highest capacity of coal-fired power plants both under construction and pre-construction (figure 3), with the Philippines and Viet Nam having expansion pipelines larger than the current capacity (UNESCAP 2021). In 2019, some 42 per cent of the total demand of 332 million tonnes in Southeast Asia, which mainly originated from the power sector, was from Indonesia, whereas Viet Nam accounted for 27 per cent of the demand (IEA 2020a).

▶Figure 2. Southeast Asia coal consumption by country, 2010 and 2019



▶Figure 3. Southeast Asia coal-fired power plant capacity by country, 2011 and 2019, under construction and pre-construction

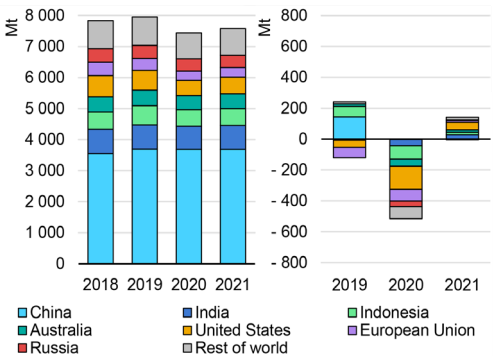


Source: (IEA 2020a).

The IEA (2020) estimates that "[I]ndustrial consumption, especially in the steel, cement and smelting sub-sectors, will maintain coal demand growth once the economies recover" from the COVID-19 crisis. On the other hand, recent coal phase-out pledges and coal divestment announced by over 100 banks, including global financial institutions, suggest that demand for coal might not fully recover to pre-pandemic levels in the post-COVID-19 era, according to the International Monetary Fund (IMF) (IMF 2021).

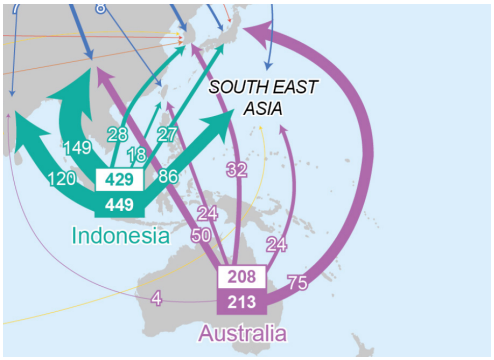
On the supply side, global coal production is mainly driven by the Asia and the Pacific region (73 per cent of global production), while production in the European Union and the United States has declined since 2018. Indonesia is among the largest coal producers (figure 4) and is a major thermal coal exporter in the region (figure 5) (IEA 2020a).

▶Figure 4. Global coal production and annual changes by region, 2018-21



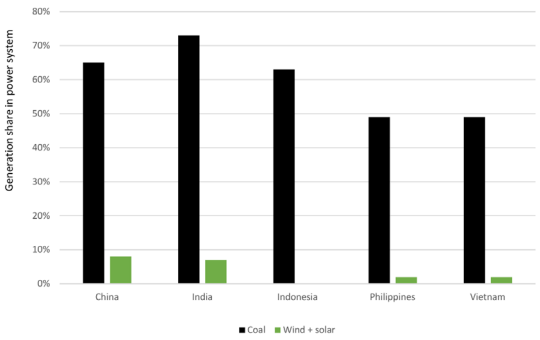
Source: (IEA 2020a).

▶Figure 5. Main trade flows in the thermal coal market in Southeast Asia, 2019 (Mt)



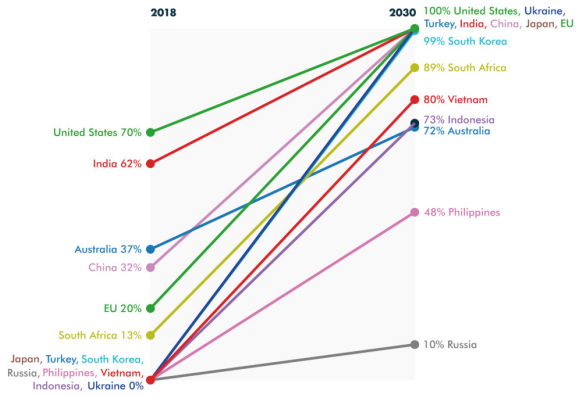
The economic case for renewable energy is growing, and the viability of building new coal plants or maintaining existing ones is decreasing in the world.[1] However, coal power dominates the energy mix in developing Asia (Climate Analytics 2021) (figure 6) in spite of the benefits of coal phase-out (box 1). According to the Carbon Tracker, in 2018, it was already cheaper to build new renewable generation plants than to run 35 per cent of coal plants worldwide. By 2030, this percentage will increase dramatically, with renewables overtaking costs for 96 per cent of today's existing and planned coal-fired generation plants (Carbon Tracker 2018d). In the case of Indonesia, the Philippines and Viet Nam, the percentages of operating and under-construction coal capacity with higher long-run operating costs than renewables will increase from zero in 2018 to 73, 48 and 80 per cent in 2030, respectively (figure 7).

▶Figure 6. Share of coal-fired power versus renewables in developing Asia, 2019



Source: (ADB 2021c).

▶Figure 7. Percentages of operating and under-construction coal capacity with higher long-run operating cost than renewables, 2018 and 2030



Source: (Carbon Tracker 2018d).

1 For instance, a recent study of the climate think tank Energy Innovation found that today about 80 per cent of US coal plants are more expensive to operate than to switch to new wind and solar capacity (Energy Innovation LLC 2021).

▶Box 1. Potential benefits of coal phase-out

According to the UN, coal phase-out in Southeast Asia has tangible socio-economic and environmental benefits (UN, n.d.). However, not phasing out coal will add CO_2 emissions that will intensify extreme weather events in the region, leading to significant damages, fatalities and economic losses.

The benefits of coal phase-out in Southeast Asia can be summarized as follows:

- Reducing fossil fuel subsidies worth US$35 billion in 2018 will lower the budget deficits of the countries in the region.
- Coal phase-out will accelerate the transition to renewable energy and green jobs.
- Phasing out coal and focusing on renewables will reduce the risk of investing in stranded assets and will further enhance the region's energy independence and security.
- Investing in renewables will enable countries to provide remote areas with access to electricity.
- Replacing coal with renewables will improve education, productivity and technology access for the population and will eradicate poverty and inequality in the underserved areas. There is evidence to suggest that renewables create more jobs than coal does.
- A coal phase-out will yield substantial environmental and public health benefits as it will reduce soil, water and air pollution.
- An initial 50 per cent reduction in coal emissions will lower the region's current total CO_2 emissions by 34 per cent and will also make the region responsible for 32 per cent of the global CO_2 emissions instead of the 48 per cent at present.

Source: (UN, n.d.).

In the mining sector, coal remains the largest revenue-generating commodity globally (PWC 2019). The global coal industry today has a market size of US$791 billion and employs 8,918,000 people (IBISWorld 2021). A World Bank study indicates that during the past half-century, large-scale changes to coal industries in China, Europe and the United States led to the loss of 4 million coal jobs. A similar trend is predicted for coal-producing countries in Asia, where large job losses are already taking place in China. The study underlines that this situation is likely to produce significant negative socio-economic impacts on families and communities in coal-dependent regions (World Bank 2018).

At the UN Climate Conference (COP26) in November 2021, more than 40 countries pledged to phase-out coal. Viet Nam is among the countries that signed the phase-out deal. The country also promised to stop building and permitting unabated coal power plants, while those that have secured financing are expected to be completed. The coal phase-out will help Viet Nam reach net-zero emissions by 2050. However, according to the Prime Minister, this target can only be reached with technology transfer and investment from rich countries (IHS Markit 2021). The Philippines declared to scale up clean power generation and energy efficiency measures (Department of Foreign Affairs 2021). It already has a moratorium on new coal power but will allow projects that have been approved to be built (Mongabay 2020). Indonesia, not a signatory of the coal phase-out deal, pledged to reduce methane emissions and agreed to consider accelerating the coal phase-out into the 2040s -if it receives more financing and technical assistance- as part of its commitment to reach net zero by 2060 or sooner with international assistance (UN 2021b). It did not endorse a commitment to cease permitting or building new projects for

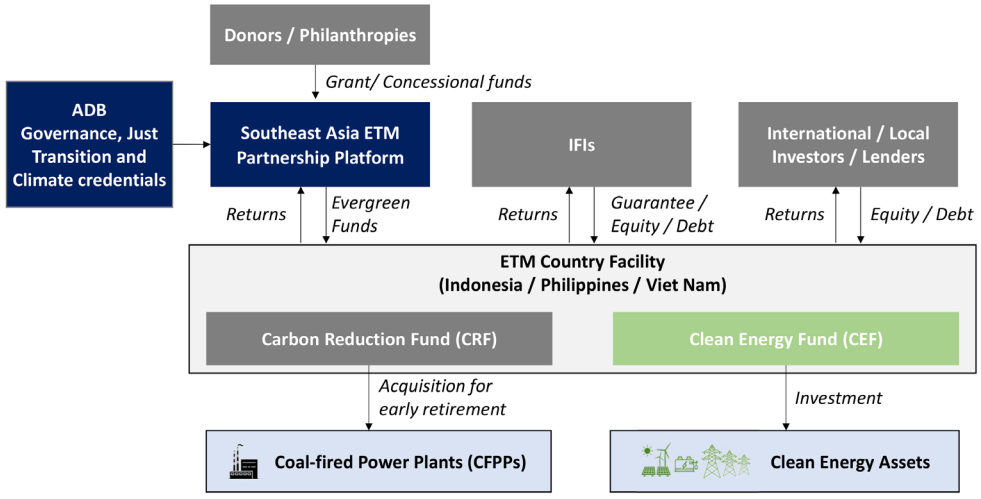
coal power generation.[2] COP26 also witnessed the announcement of a partnership between Indonesia, the Philippines and the Asian Development Bank (ADB) on a new mechanism to accelerate coal phase-out and the transition to clean energy (box 2).

▶ Box 2. ADB Energy Transition Mechanism

At COP26, the Asian Development Bank (ADB) announced the launch of the Energy Transition Mechanism (ETM), a funding vehicle to phase-out coal while scaling up renewables in Southeast Asia. It will first be piloted in Indonesia and the Philippines for a period of 2–3 years to accelerate the retirement of 5–7 coal-fired plants. At full scale, the ETM is expected to retire 50 per cent of the entire coal fleet, with a combined capacity of 30 gigawatts (GW) in Indonesia, the Philippines and Viet Nam during the next 10–15 years, and to help cut 200 million tonnes of CO_2 emissions per year. The partnership was endorsed by Denmark, the UK, and the US, as well as leading global financial institutions and philanthropies. Japan committed a grant of US$25 million, which is the first seed financing for the ETM.

The draft structure of ETM is indicated in figure 8.

▶Figure 8. The draft structure of ETM



Source: (ADB 2021c).

The ETM will consist of two funds: the Carbon Reduction Fund and the Clean Energy Fund. The Asian Development Bank (ADB) aims to raise a total of US$3–5 billion in funding for them.

ADB has completed a pre-feasibility study for the ETM and is conducting a full feasibility study, including finalizing the financial structure, identifying potential coal plants for the pilot and designing transition activities. The timeline of the ETM is given below (figure 9).

2 (NikkeiAsia 2021) (Within Electricity Supply Business Plan (RUPTL) 2021-2030, as part of the net-zero emission target by 2060, it is planned that the state-owned utility company (PLN) will keep developing coal-powered plants until 2027 (PLN 2021)

▶Figure 9. ETM Timeline

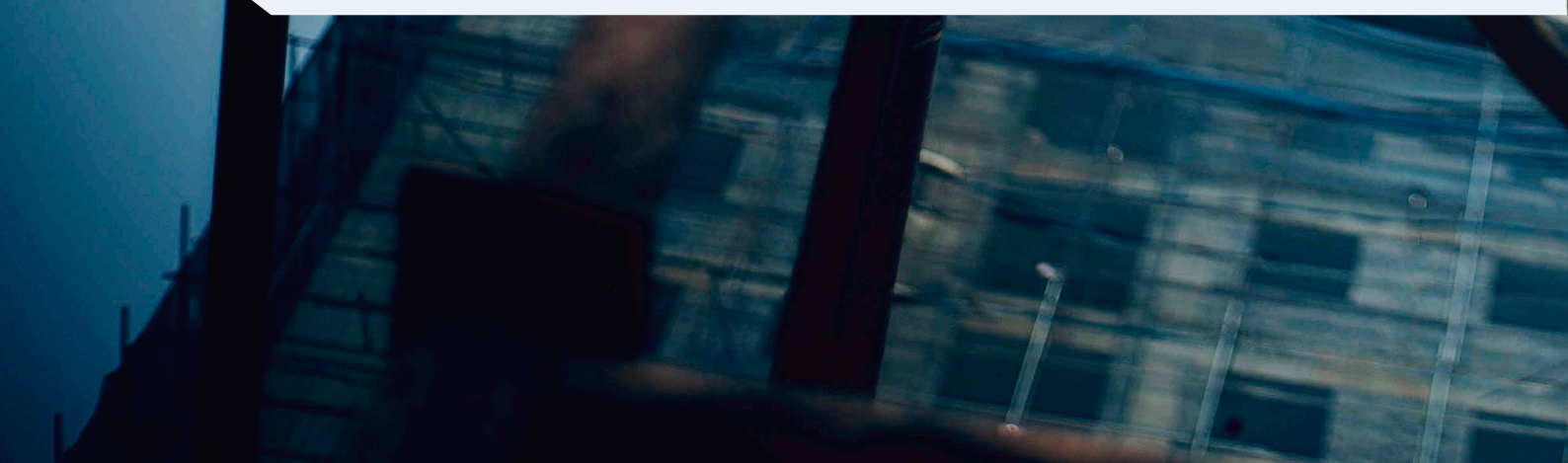
Source: (ADB 2021c).

In addition, ADB will support Indonesia and the Philippines in establishing policies and business conditions for improving the ETM's governance, carbon reduction and just transition goals. It will also provide technical assistance for reskilling and developing the livelihoods of affected workers and communities. The Bank aims to form an advisory group with non-governmental organizations and civil society groups for the ETM.

ADB defines its role in the ETM as follows:

- convenor and trusted regional stakeholder to ensure the "climate credentials" of the ETM;
- potential provider of low-cost loans to the ETM;
- potential contributor and manager of technical assistance for just transition elements (such as community skills training);
- provider of expertise on carbon markets to potentially enable the creation of internationally accredited offsets that can be used under Article 6 of the Paris Agreement.

Sources: (ADB 2021c), (ADB 2021d), (ADB 2021e), (IJGlobal 2021).



3

Coal in the national and regional context

3.1 Country characteristics

Indonesia is the world's fourth most populous country and the tenth-largest economy in terms of purchasing power parity (World Bank 2021c). Its population, which is mainly urban, is growing with a fertility rate of 2.4 children and a life expectancy of 69.1 years. Around 67 per cent of the population is of legal working age (15–64 years) (ILO 2019a). According to ADB data, 1.4 million of Indonesia's 128.8 million working population were employed in mining and quarrying in 2019 (Annex 1). In the same year, the share of the mining sector in gross domestic product (GDP) was 7.3 per cent, which had dropped from 10.5 per cent in 2010.

The Philippines is one of the most dynamic economies in Asia and the Pacific, with an average annual growth rate of 6.4 per cent between 2010 and 2019 (World Bank 2021b). The population of the country is mainly rural and is growing, with a fertility rate of 2.9 children and a life expectancy of 68.4 years. Around 63 per cent of the population is of legal working age (ILO 2019b). Mine reserves, including coal, are limited, and therefore the mining sector has a small share in the economy. Some 200,000 of its 39.4 million working population were employed in mining and quarrying in 2020 (Annex 1). That year, the share of the mining sector in GDP was 0.8 per cent, compared with 1.4 per cent in 2010.

Viet Nam is a development success story; from being one of the world's poorest nations, it became a middle-income economy in one generation. Between 2002 and 2020, GDP per capita increased 2.7 times, reaching about US$2,800 (World Bank 2021d). The country's population is mostly rural and growing, with a fertility rate of 2.0 children and a life expectancy of 76.5 years. About 70 per cent of the population is of legal working age (ILO 2019c). In 2020, approximately 200,000 of its 53.4 million working population was employed in mining and quarrying (Annex 1). The share of the mining sector in GDP was 5.6 per cent in 2020, having dropped from 9.5 per cent in 2010.

Indonesia, the Philippines and Viet Nam are among the countries most vulnerable to climate change-related risks. According to the 2020 World Risk Index, they are in the top ten countries with the highest natural hazard risk exposure (European Commission, n.d.). In Indonesia, climate change is likely to impact water availability, health and nutrition, disaster risk management, and urban development, particularly in coastal zones, with implications for poverty and inequality (World Bank 2021c). ADB estimates that the impacts of climate change could cost 2.5 to 7 per cent of Indonesia's GDP by 2100 (World Bank and ADB 2021a). The Philippines is among the world's most disaster-prone countries. It has experienced an increase in damaging extreme events, such as heavy rainfall and tropical cyclone activity, which is a major risk to good development outcomes (World Bank and ADB 2021b). The country can lose 6 per cent of its

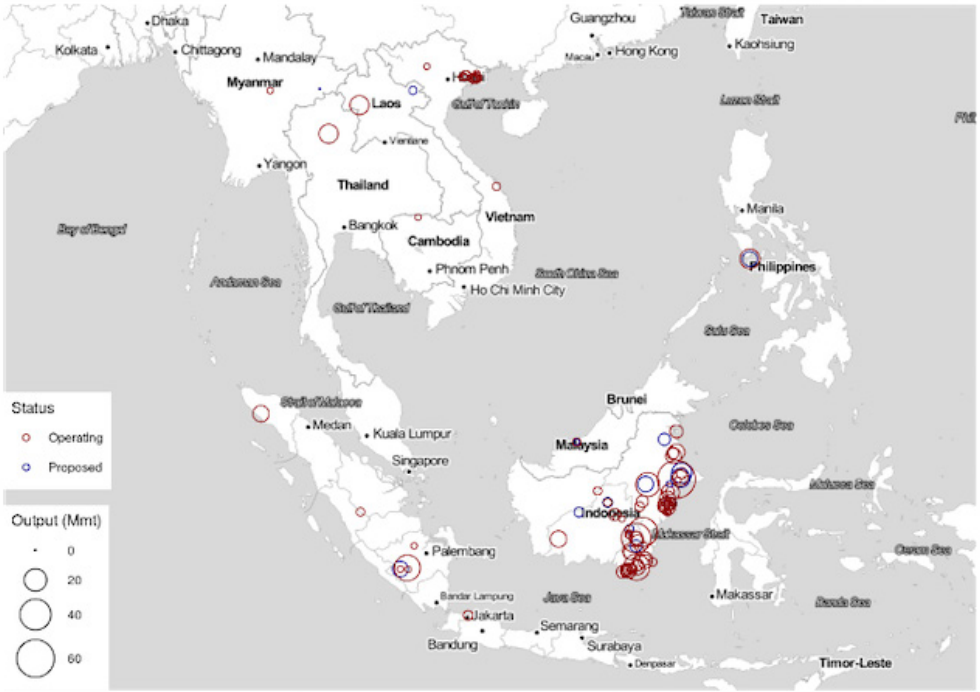
GDP annually by 2100 due to climate change (NICCDIES, n.d.). Viet Nam is one of the top five countries likely to be most affected by climate change, according to the World Bank. It is estimated that climate change will reduce national income by up to 3.5 per cent by 2050 (World Bank, n.d.).

3.2 Coal mining and consumption

Among the three countries covered by the study, Indonesia has the largest coal reserves, which amounts to 37.6 billion tonnes as of 2019 (ADB 2021b). With 4 per cent of the world's coal reserves, the country ranks sixth, just after India. Viet Nam's coal reserves amount to around 4 billion tonnes, half of which have high production costs (IEEFA 2021). The Philippines has a total coal resource potential of 596.5 million metric tonnes as of 2017 (Philippine Statistics Authority 2018).

As seen in figure 10, the majority of Indonesia's coal mines are found in Kalimantan Island. The Philippines' coal mines are in Semirara Island, and Viet Nam's mines are mainly found in Quang Ninh province and the Red River Delta basin (also see the "Regional dimension" sections below).

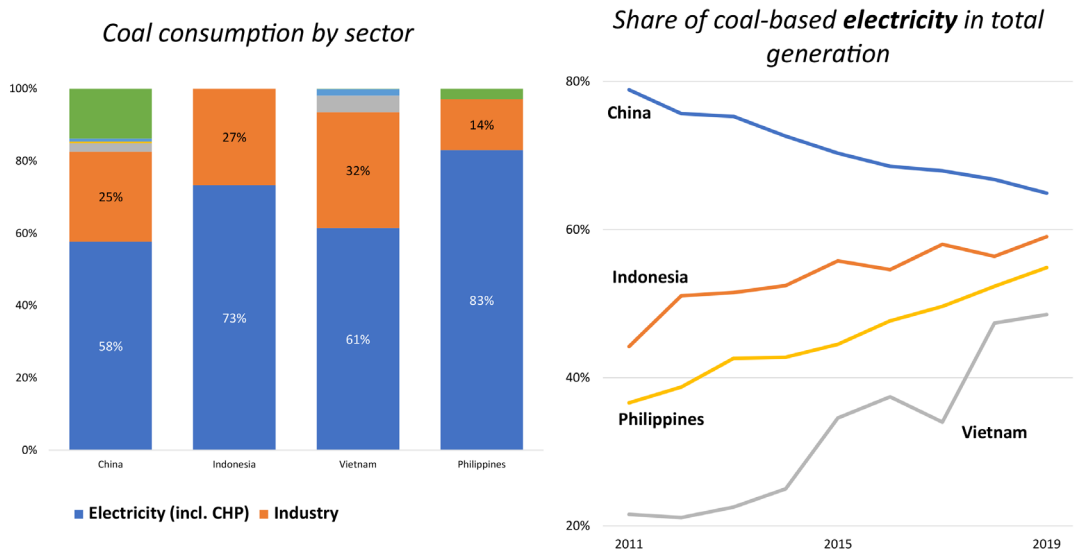
▶Figure 10. Locations of coal mines in Indonesia, the Philippines and Viet Nam



Source: (Global Energy Monitor, n.d.).

Indonesia, the Philippines and Viet Nam have the highest shares of coal use in Asia and the Pacific after China. These four economies account for 98 per cent of coal consumption in the region (World Bank 2021a). A large portion of coal is used to generate electric power, as seen in figure 11. The share of coal-based electricity in total power generation shows an increasing trend in Indonesia, the Philippines and Viet Nam (figure 11). The majority of the existing plants are younger than ten years old (65.6 per cent of the installed coal power capacity in Indonesia and 83.8 per cent in Viet Nam). Retiring them soon presents a challenge since coal plants have a normal lifespan of 40–50 years (IHS Markit 2021).

▶Figure 11. Coal consumption in Indonesia, the Philippines and Viet Nam



Source: (World Bank 2021a).

Table 1 indicates the status of coal power plants in the three countries. Indonesia and Viet Nam have the highest number of coal plants in the pre-construction development phase as of 2020.

▶Table 1. Coal power capacity in development and operating by country (megawatts), 2020

Country	Pre-construction	Construction	All active development	Shelved*	Operating	Cancelled** (2010–2020)
Indonesia	22 210	10 739	32 949	5 550	33 966	30 270
The Philippines	6 720	1 906	8 626	4 244	10 289	8 324
Viet Nam	21 880	6 820	28 700	4 750	20 317	43 715

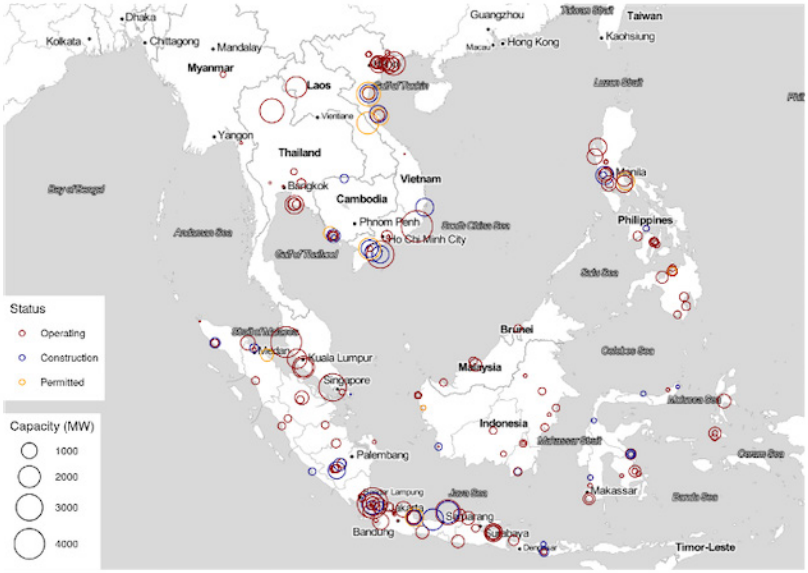
*** A project that shows no activity over a period of two years.**

**** Projects that are switched to natural gas or biomass.**

Source: (Global Energy Monitor, Sierra Club, CREA, Climate Risk Horizons, GreenID, Ekosfer 2021).

Figure 12 shows the locations of the power plants in the three countries. The number and concentration of the plants demonstrate the extensive use of coal in electricity production. In Indonesia, the majority of the high-capacity plants are located in Java Island. Those in the Philippines are mainly found in the north of the country, around the capital, Manila. In Viet Nam, high-capacity plants are concentrated in the economically important regions in the north and south of the country.

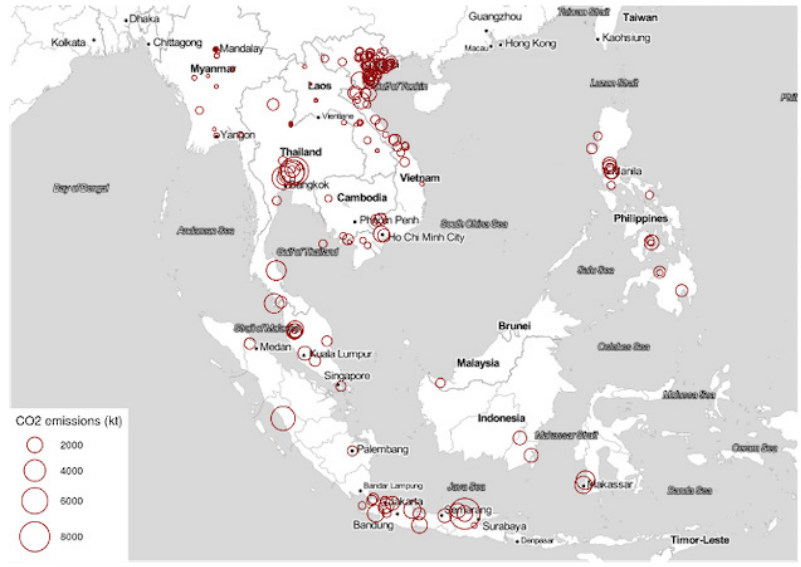
▶Figure 12. Locations of power plants in Indonesia, the Philippines and Viet Nam



Source: (Global Energy Monitor, n.d.).

Within the industry, the cement sector consumes the highest amount of coal. The majority of CO_2 emissions from the sector are produced by the plants located in Java Island in Indonesia and around the capitals Manila and Hanoi in the Philippines and Viet Nam (figure 13).

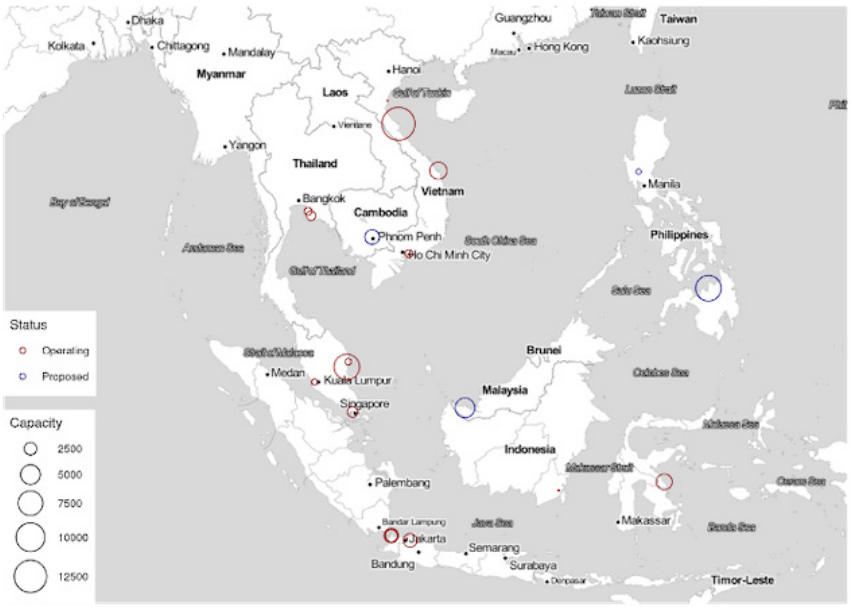
▶Figure 13. Locations of cement plants in Indonesia, the Philippines and Viet Nam



Sources: (Global Infrastructure Emission Database, n.d.), (Liu et al. 2021).

The number of steel producers using coal is low in all three countries. There are only a few operating steel plants in Java Island and one in Sulawesi in Indonesia, two proposed plants in the Philippines, and three operating plants in Viet Nam (figure 14).

▶Figure 14. Locations of steel plants in Indonesia, the Philippines and Viet Nam



Source: (Global Energy Monitor, n.d.).

An analysis of the supply, use and input data for the coal industry in Indonesia and Viet Nam[3] for the latest available years (2016 and 2012, respectively) (Annex 2) confirms the following:

- The electricity and cement industries in both countries are the main users of coal supply. The share of the iron and steel industry is negligible for both Indonesia and Viet Nam (0.8 and 1 per cent, respectively). The use of coal by households is low.
- In the case of Indonesia, exporting is of high importance: more than half of the coal produced is exported.
- With regards to the inputs of coal production, there are notable differences between the two countries. In Viet Nam, the majority of the coal production cost is incurred by inputs, mainly refined petroleum products (fuel) and mining services. The share of wages is low, at about 16 per cent. Gross operating surplus is too low, only 3 per cent, probably since coal is produced by the government through a state-owned company (see Section 3.2.3.1) which sells it at a low price. As for Indonesia, the share of inputs in cost is low (42 per cent) compared to that of Viet Nam (78 per cent). Indonesia's share of wages in cost is also low (10 per cent), but gross operating surplus is high (60 per cent). This may be because of high export prices and/or the low cost of extracting coal due to the abundance of reserves. The findings indicate that coal phase-out will have a much higher impact on Indonesia than Viet Nam.

The IEA provides the most up-to-date data for labour costs in coal mining in Indonesia: The average labour costs decreased from US$6/tonne in 2018 to US$5/tonne in 2021, although the share of wages in

3 Data are not available for the Philippines.

total coal mining costs increased from 18 per cent in 2018 to 21 per cent in 2020. Both the average labour costs and the share of wages in total coal mining costs are the lowest in Indonesia among the countries covered in the IEA study (for example, compared to China where these figures are US$12/tonne and 32 per cent, respectively) (IEA 2020b), suggesting that most coal mining jobs may not be decent in Indonesia.

According to the IEA, in 2019, the demand for coal in Southeast Asia was 332 Mt, of which 42 per cent were accounted for by Indonesia and 27 per cent by Viet Nam due to the new coal power plants. In 2020, coal demand in Viet Nam increased by 12 per cent because of strong economic growth while it fell in Indonesia and the Philippines due to COVID-19. In 2021, a 7 per cent rebound in coal demand is expected as economies recover (IEA 2020a).

The country-level information on coal production and consumption as well as on the regional dimension and just transition policies is given in the following sections.

3.2.1 Indonesia

Indonesia is the eighth largest greenhouse gas emitter, the largest coal exporter (International Monetary Fund. Asia and Pacific Dept 2021) and the seventh-largest coal power producer in the world (EMBER 2021). The country's coal exports account for around 10 per cent of the world's total exports. The number of workers in the mining and quarrying sector corresponds to 1.1 per cent of total jobs (International Monetary Fund. Asia and Pacific Dept 2021).

3.2.1.1 Coal production

Coal mining accounts for about 2 to 2.7 per cent of GDP in Indonesia (IESR 2020). In 2005, the country overtook Australia in exports, and since then it has been leading world exports in thermal coal. A large share of demand for its coal originates from China and India. During the peak years, coal contributed to around 85 per cent of state revenue from the mining sector (ADB, n.d.). A significant portion of the coal reserves, and therefore, the exported coal is of medium quality (between 5,100 and 6,100 calories/gram) and low quality (below 5,100 calories/gram). If the current rate of production continues, the reserves of the country will last around 83 years (ADB, n.d.). Table 2 indicates the annual changes in coal production as well as in employment in the mining and quarrying sector.[4]

▶Table 2. Coal production and employment in the mining and quarrying sector in Indonesia

	2016	2017	2018	2019	2020
Coal production*			461.1	558.0	616.2
Number of employees**	1 469 846	1 386 900	1 466 215	1 428 556	1 352 236

*** Million tonnes**

**** In mining and quarrying**

Source: (Badan Pusat Statistik, n.d.).

Based on the IEA's assumptions, of about 1 million workers employed in coal-related sectors in 2015, nearly 180,000 people, were directly employed in coal mining and 130,000 in mining services. In line with the growth of coal production, employment in mining and quarrying grew by 2.7 per cent between 2010 and 2014 (German Environment Agency 2019).

The Indonesian coal industry is dominated by small coal mine owners. There are around ten big

4 Data on the number of workers in the coal sector is not available.

producers in the country (Annex 3). According to the Indonesian coal mining association APBI-ICMA, 70 to 75 per cent of coal is produced by its 90 member companies; they contribute to around 90 per cent of state income and meet 70 per cent of coal demand of Perusahaan Listrik Negara (PLN), the state-owned electricity generation company. The sector has been expanding since the early 1990s when it was reopened for foreign investment. Although domestic coal consumption and therefore domestic sales were limited in the country, the government's ambitious energy programme involving the construction of coal-fired power plants led to a rapid increase in domestic coal sales. The Ministry of Energy and Mineral Resources (MEMR) Regulation No. 34/2009 on Domestic Market Obligation (DMO) mandates coal companies to allocate a certain percentage of their production to national use. In 2021, the DMO target of the government is 137.5 million tonnes. As of June 2021, some 37.3 per cent of this amount was realized (Ministry of Energy and Mineral Resources 2021a). Another driver for increased domestic production has been the transformation of Indonesian large mining firms into integrated coal-consuming energy companies because of decreased commodity prices that made coal exports unattractive (Indonesia Investments 2018).

With the rise in coal mining activities, illegal mining has also increased. The amount of coal extracted through illegal mining is estimated at 50–80 million tonnes per year (Stockholm Environment Institute 2018). For example, it is reported that, in South Sumatra, "more than 700,000 hectares of land are occupied by illegal mining operations run by community collectives of local residents" without any safety measures, and as a result, "deadly accidents happen" (SCMP 2021). Another issue is so-called "semi-legal" mining, which refers to cases such as mining within a protected forest by miners with a permit that normally should not have been issued. Illegality is also observed in the coal supply chain; for instance, in the transport of coal via unauthorized waterways (Stockholm Environment Institute 2018).

A study by the Stockholm Environment Institute (2018) on the coal dynamics in Indonesia reports that "mining appears not to have significantly benefited local communities or improved poverty outcomes, and it may even have exacerbated poverty compared to areas without mining". There are also cases of displacement of residents due to illegal permits issued inside residential areas. Related health and social problems, including conflicts, were cited in the study.

3.2.1.2 Coal consumption

Indonesia is the largest energy consumer among the ASEAN countries. The electricity distribution is uneven across the regions of the country. Industrialized areas such as Java-Bali account for more than 70 per cent of power demand. In 2019, coal accounted for 59 per cent of the entire power generation (figure 15). Between 2010 and early 2021, "Indonesia opened 22.7 gigawatts of coal-fired power capacity" (Science The Wire 2021). The country also has 10.7 GW of coal power plants under construction. The government set a target of creating 24.6 GW of new coal capacity by 2026 but then revised it down to 20.8 GW in the 2018–2027 Electricity Power Supply Plan. Indonesia's electricity demand is predicted to increase by 80 per cent by 2030. In the 2014 National Energy Policy, the government set a goal of providing 23 per cent of the country's energy supply from renewables by 2025 and increasing this share to 31 per cent by 2050 (Carbon Tracker 2018a).

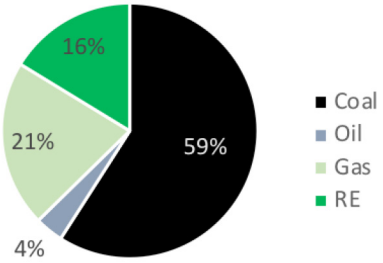
The coal-fired power plant pipeline in Indonesia is one of the largest in the world. The increase in installed capacity is a main driver of emissions growth in the country (Climate Action Tracker 2021). The state-owned corporation PLN has a monopoly on electricity generation and distribution. It has unofficial plans that outline a retirement timeline for coal-powered plants in an effort to reach carbon neutrality by 2060. The company has committed to stop building new coal power plants after 2023, and any additional power generation is planned to come from renewable sources (EIA 2021).

In Indonesia, coal is the main energy source in cement, basic chemicals (ammonia fertilizer, nitric acid and other petrochemicals), iron and steel making, and metal smelters (nickel, gold, aluminium, bauxite and so on). However, their consumption is small due to the relatively underdeveloped state of these industries (figure 16) (Kurniawan et al. 2020). The government's National Industry Development Master Plan

(RIPIN) 2015–2035 foresees 10.5 per cent growth in the national manufacturing industry, excluding oil and gas (Government of Indonesia 2021). To support this growth, Indonesia plans to increase electricity generation by 553.5 per cent (from 70,777 gigawatt hours in 2014 to 446,993 in 2035) and coal production by 147.5 per cent (from 33,571 thousand tonnes in 2014 to 83,095 thousand tonnes in 2035) (Ministry of Industry 2015).

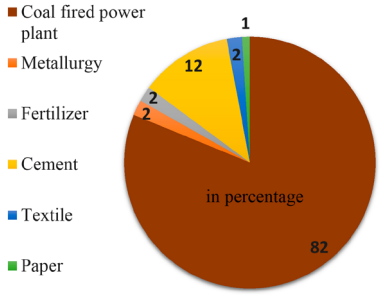
Indonesia intends to increase the share of renewables in the energy mix from 16 per cent in 2019 to 23 per cent in 2025 (IHS Markit 2021).

▶Figure 15. Electricity generation mix in Indonesia, 2019



Source: (Government of Indonesia 2021).

▶Figure 16. Shares of domestic coal consumption in Indonesia, 2016



Source: (Kurniawan et al. 2020).

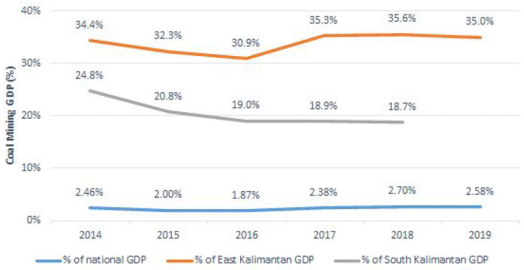
3.2.1.3 Regional dimension

The regions in Indonesia with the largest coal reserves are East Kalimantan, South Sumatra, South Kalimantan and Central Kalimantan. These regions account for more than 90 per cent of the country's coal resources and production. There are also numerous smaller pockets of reserves in the islands of Sumatra, Java, Kalimantan, Sulawesi and Papua (Indonesia Investments 2018). The Kutai, Tarakan and Barito coal basins in East Kalimantan have medium-quality reserves, and the Central and South Sumatra basins have low-quality coal reserves (IESR 2020).

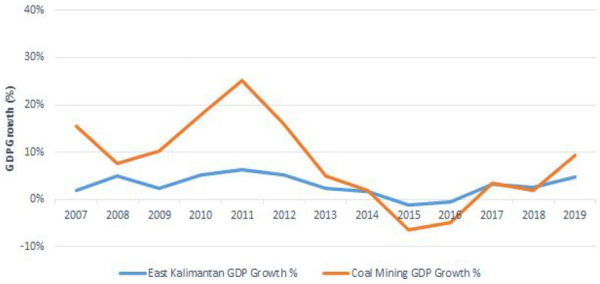
Coal makes a substantial contribution to the local economies of the regions that host the largest reserves. Among them, East Kalimantan's economy highly depends on coal; there the sector contributed up to 31.5 per cent of provincial GDP in 2020 (Statista, n.d.). In the case of South Kalimantan, on the other hand, the coal sector's contribution to the provincial GDP was around 19 per cent in 2018 (figure 17) (IESR 2020) and the industry, trade and transportation sectors have comparable shares in the economy with coal mining. East Kalimantan's economy is four times larger and is less diverse than that of South Kalimantan. Because of the large share of the coal industry in the economy, East Kalimantan experienced a contraction in 2015-16 when coal prices dropped due to falling demand (figure 18). In the region, the other sectors[5] contributing to the GDP are manufacturing and processing (18.9 per cent), construction (9.5 per cent), and agriculture, forestry and fishery (8.8 per cent) (Statista, n.d.)

5 Water supply, waste management and recycling are also listed as notable sectors in Kalimantan in addition to the mining and quarrying in a paper by (Darma Putra and Yuli Pratiwi 2019).

▶Figure 17. Share of coal mining in national and regional GDP



▶Figure 18. East Kalimantan's GDP growth and coal mining GDP growth



Source: (IESR 2020).

While it will be more challenging for East Kalimantan than South Kalimantan to shift away from its coal-dominated industry, coal phase-out is predicted to have notable impacts on the local economic, social and political environment in both provinces (IESR 2019a). However, East Kalimantan is already witnessing a transformation, with significant investments underway to diversify its economy as a part of the plans to make the province Indonesia's new capital (see box 3).

▶Box 3. East Kalimantan: Transformation plans and the industrial ecosystem

The Government of Indonesia plans to move the country's capital to the province of East Kalimantan in 2024 (Bloomberg 2021). The Presidential Regulation No.85/2021 allocates 510.79 billion Indonesia rupiah for the new capital city project in the 2022 Government Work Plan (Tempo 2021). The total project cost is estimated at US$33 billion to construct a smart, green city where the government expects to move more than 1 million public-sector employees. In addition to developing East Kalimantan's infrastructure, the government intends to diversify its economy, boost its tourism industry and reduce its dependence on commodities (ASEAN Briefing 2019).

The government also plans to turn East Kalimantan into one of the most foreign investment-ready provinces in Indonesia. To this end, the provincial government is offering foreign investors incentives, such as tax holidays, land and building tax reductions, and import facilities. It is also investing in human resources to ensure that the local workers are optimally employed by the industrial sectors. For this purpose, training programmes are organized in the Samarinda Job Training Centre of the Manpower and Transmigration Office of East Kalimantan, and local enterprises are encouraged to open apprenticeship programmes (Markets Insider 2019).

East Kalimantan also hosts a number of emerging industrial estates, such as Kariangau Industrial Zone (KIZ) and Special Economic Zone Maloy Batuta Trans Kalimantan (MBTK). Located in the port city Balikpapan in East Kalimantan, KIZ is an important economic hub for processing commodities such as coal, oil and gas, methanol, and agribusiness products. With direct connections to Sepinggan Airport and Kariangau power plants, it is seen as one of the highest potential investment destinations in Indonesia. MBTK is the first crude palm oil port located in the Indonesian Archipelago Sea Channel (ALKI) and on the international trading route connecting Kalimantan and Sulawesi Islands. The provincial government aims to attract foreign direct investment of 34.3 trillion rupiah to the zone because of its strategic location (Markets Insider 2019).

There are also several clusters of small and medium-sized enterprises (SMEs) in East Kalimantan. A study analysing the Batik, Tofu Tempe and Cruband Handicraft Clusters in the region lists numerous key actors with active roles in cluster development, such as the Province Tourism Agency; the District Technology and Industry Department; the Provincial Social Department; Technical and Vocational Education and Training centres; the Province Industry and Trade Cooperative and SME Department; the District Tourism Department; and the District Cooperative and SME Department (Noor and Daryono 2020).

3.2.1.4 A just transition

In July 2021, Indonesia submitted its Long-Term Strategy for Low Carbon and Climate Resilience 2050 (LTS-LCCR 2050) to the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat "to contribute to global goal[s] and to achieve national development objectives, taking into consideration the balance between emission reduction, economic growth, justice and climate resilience development" (Government of Indonesia 2021). The LTS-LCCR 2050 sets the goal of "adaptation of pathways to reduce the impact of climate change on national GDP loss by 3.45 per cent in 2050, through increasing resilience in four basic necessities (food, water, energy, and environmental health), with three target areas of resilience (economy, social and livelihood, ecosystem and landscape)".

According to the LTS-LCCR, the overall energy transition efforts of the country will cover preparing a transition from the fossil-based energy system to a low-carbon energy system through policies and programmes on human resource development, in line with the Indonesia Vision 2045 (which is to achieve high-income status and reduce poverty to nearly zero when the country celebrates its 100 years of independence in 2045 (World Bank 2020)). The strategy lists four areas for a just transition to be implemented by 2030 (table 3).

▶Table 3. Key policies to address a just transition of coal phase-out by 2030 under the LTS-LCCR 2050

Key Interventions	Policy and Measures	Lead and Related Ministries/ Institutions
Addressing challenges faced by sectors, cities and regions in transitioning to low carbon development and in ensuring a decent future for workers affected by the transition	Strengthening climate governance and implementation of sustainable development goals at all levels	Ministries responsible for climate change, national development, finance, and local governments
Promoting low greenhouse gas emission and sustainable economic activities that will create quality jobs in cities and regions	Enhancement of green investments and alignment between investment and climate policies and programmes, including alignment of COVID-19 recovery with climate policies	Ministries responsible for economic development, investment, finance, and environment – forestry and land uses – natural resources
Enhancing capacity of workforces to facilitate access to decent work and quality jobs, taking into account gender and inter-generational equalities, as well as the needs of vulnerable groups	Strengthening and evolving programmes on skilling, upskilling, reskilling and human resource development in general	Ministries responsible for workforce, gender and inter-generation, education and social affairs
Enhancing participatory public dialogue to foster high employment rates, adequate social protection, labour standards and wellbeing of workers and their communities	Increasing the effectiveness of existing communication mechanisms and platforms	Ministries responsible for workforce and social affairs

Source: (Government of Indonesia 2021).

In November 2021, Indonesia's government announced that as of 2031 it will start the first stage of coal power plant retirement and reduce the utilization of diesel power plants. It plans to increase the share of renewables to 57 per cent by 2035. The second stage of coal power plant retirement is planned for the period 2036-40, raising the share of new and renewable sources to 66 per cent in the energy mix. In the following five years, this share is scheduled to be increased to 93 per cent. The government aims to complete coal power plant retirement between 2051 and 2060 (Ministry of Energy and Mineral Resources 2021b).

In 2020, the government declared that it would "convert the coal business to adapt with the global and domestic development, for example by adopting Clean Coal Technology" (Ministry of Energy and Mineral Resources 2020). However, the clean coal concept is considered a myth, and the UN Secretary General said that "there is no such thing as clean coal" and "coal should have no place in any rational recovery plan" (Euronews Green 2020).

The Indonesian government also announced that it "has prepared fiscal and non-fiscal incentives to make downstream projects more profitable. Non-fiscal incentives include granting of mining licence during reserves life. This means that mining business licences are no longer limited to 20 years." (Ministry of Energy and Mineral Resources 2020).

3.2.2 The Philippines

In the Philippines, the share of coal in the electricity supply increased from 37 per cent in 2000 to 48 per cent in 2016 (Climate Analytics 2019a), which led to a rise in the share of coal and other solid fossil fuels in CO_2 emissions from 22.1 per cent in 2007 to 39.0 per cent in 2017 (OECD, n.d.). The country is poor in coal resources and imports most of its coal from Indonesia (96.9 per cent), Australia (1.8 per cent) and Viet Nam (0.4 per cent) as of 2020 (Statista, n.d.).

3.2.2.1 Coal production

The Philippines has 0.03 per cent of the world's coal reserves which are estimated to last about 16 years (at current consumption levels and excluding unproven reserves) (Worldmeters, n.d.). In 2019, coal production increased for the fourth consecutive year and reached 16,832 million short tonnes (MMst). Semirara Mining and Power Corporation (SMPC) is the country's primary coal producer, contributing to about 98 per cent of total coal production annually. SMPC is also the only power supplier in the country (EIA 2020).

The coal mining sector employed around 4,000 workers and created a value added of US$322 million in 2016. The wage bill was about US$20 million per year between 2012 and 2016 (table 4).

▶Table 4. Coal mining statistics for the Philippines, 2012–16

	2012	2013	2014	2015	2016
Mining of coal and lignite (ISIC 05)					
Employees	3 732	3 135	3 268	2 905	4 022
Establishments	8	7	7	7	8
Female employees	192	211	226	180	282
Investment*	17.9	30.8	130.3	38.3	70.2
Output*	472.1	404.4	429.1	384.5	515.2
Value added*	129.5	163.2	126.4	205.6	322.8
Wage bill*	19.7	22.0	16.0	19.4	21.9

*** Million US dollars**

Source: (UNIDO, n.d.).

3.2.2.2 Coal consumption

Coal represents the largest share in thermal electricity production in the Philippines. Its share in total production increased from 35.2 per cent in 2010 to 67.8 per cent in 2019 (Annex 5). The country imports coal not only for electricity generation but also for coking, clay works and other industries. The electricity prices in the Philippines are the highest in Southeast Asia, partly due to excessive reliance on imported coal (Ahmed 2019). The country also sells coal mainly to China, which received 96 per cent of the 12,165 MMst coal exported by the Philippines in 2019. Thermal power from fossil fuels, primarily coal and natural gas, accounted for 68 per cent of total installed capacity (25 GW) in 2018. Hydropower and other renewables accounted for 8 GW. In 2019, coal-fired capacity increased by more than 1,000 megawatts (MW) because of new coal-fired power plants (EIA 2020).

The electric power generation sector employs around 47,000 workers. In 2016, the wage bill was about US$746.5 million (table 5).

▶Table 5. Electric power generation statistics for the Philippines, 2012–16

	2012	2013	2014	2015	2016
Electric power generation, transmission (ISIC 351)					
Employees	46 473	46 424	46 561	46 335	47 002
Establishments	233	224	223	224	225
Female employees	8 847	9 263	9 037	9 185	9 340
Investment*	268.9	589.4	924.4	689.7	655.3
Output*	17 042.9	17 556.1	16 236.4	16 293.8	15 875.4
Value added*	4 904.1	4 709.1	4 187.0	4 455.1	4 737.2
Wage bill*	580.8	687.4	626.8	642.4	746.5

*** Million US dollars**

Source: (UNIDO, n.d.).

The Philippines was the first country in the region to announce a moratorium on new coal power plants. It did so in October 2020 to shift to a more flexible power supply mix (BusinessWorld 2021) which could remove up to 10 GW of planned coal capacity from the current pipeline (Fuentes 2021). After this announcement, its pipeline of coal capacity fell by 43 per cent to 8.73 GW, during a ten-month period ending in June 2021 (BusinessWorld 2021).

3.2.2.3 Regional dimension

Many provinces in the Philippines have banned coal power plants within their borders. As a result, the amount of coal power in the pre-construction phase declined by 33 per cent, from 10.3 GW in 2019 to 6.7 GW in 2020. It is expected that more projects for plants will be cancelled with the moratorium. In February 2020, the Antique Provincial Board passed a ban on new coal-fired plants, cancelling the Semirara power station, a 50 MW mine-mouth coal-fired plant project in the region (Burgos Jr. 2020). In November 2020, an expansion of the existing Calaca power station was cancelled. In December 2020, Rizal became the first bank in the Philippines to declare that it would no longer finance new coal-fired power projects (Global Energy Monitor, Sierra Club, CREA, Climate Risk Horizons, GreenID, Ekosfer 2021). In October 2021, the government announced plans to close coal-fired power plants in Mindanao (Philippine News Agency 2021).

It is expected that coal mining will also be put under significant pressure in the coming years due to the moratorium (Engineering News 2021). However, in April 2021, the President of the Philippines issued an order to lift a nine-year moratorium on granting new mining permits (Mongabay 2021). A case study on the Semirara Coal Mines (CEED, n.d.), which was given exclusive rights by the Department of Energy to mine coal and conduct operations in Semirara, explains that "as the global and climate situation compel[s] the Philippines to transition away from fossil fuels, the continuing expansion of coal, the lack of development in renewable alternatives and transition policies leave affected communities even more susceptible to environmental and economic threats".

3.2.2.4 A just transition

In 2016, the government enacted Republic Act No. 10771, or the Philippines Green Jobs Act (PGJA), which aims "to scale up promotion of sustainable growth and decent job creation, while building resilience against impacts of climate change by providing incentives to enterprises generating green jobs across all economic sectors" (ILO 2016). The implementing regulations of the law were published in 2017 (Department of Labor and Employment 2017). The PGJA specifically focuses on incentivizing green jobs rather than regulating them, as well as encouraging all businesses and the public sector to

create and sustain green jobs (Sharpe and Martinez-Fernandez 2021). In 2019, the government created an interagency green task force led by the Department of Finance to coordinate just transition policies which include coal phase-out in line with the 2030 target of reducing greenhouse gases by 70 per cent, compared to the business-as-usual scenario of 2000-30 (ADB 2020).

The Philippines increased its installed renewable capacity from 5.5 GW in 2013 to 7.0 GW in 2017, with solar energy accounting for 57 per cent. The government's Energy Plan 2012–2030 set a long-term target of 9.9 GW of new renewable capacity by 2030 (Carbon Tracker 2018b).

3.2.3 Viet Nam

Viet Nam made significant progress in economic development between 2000 and 2017. In this period, total energy use doubled and CO_2 emissions per capita tripled, mainly due to the development of the industry sector that consumes almost 40 per cent of total final energy. The country relies on coal as one of the key sources to meet its energy needs (Climate Analytics 2019b).

3.2.3.1 Coal production

Viet Nam's coal production volume has been growing steadily year on year. In 2020, approximately 48.63 million tonnes of coal were produced, with an increase from 42.08 million tonnes in 2012 (CEIC, n.d.). More than 80 per cent of coal output is produced by the state-owned company Vinacomin (Que, Nevskaya, and Marinina 2021).

The coal mining sector employed 86,399 workers and created a value added of US$1,199.2 million in 2017. Employment in the sector decreased by 17.19 per cent from 2013 to 2017. The wage bill was US$486.1 million in 2017 (table 6).

▶Table 6. Coal mining statistics for Viet Nam

	2013	2014	2015	2016	2017
Mining of coal and lignite (ISIC 05)					
Employees	104 337	101 065	96 094	90 240	86 399
Establishments	82	90	95	106	120
Female employees	18 940	17 916	16 337	15 199	14 468
Investment*	1 405.0	1 464.4	1 330.9	378.7	1 349.9
Output*	3 767.5				
Value added*	1 165.9	1 833.5	1 153.8	1 137.8	1 199.2
Wage bill*	474.8	538.4	517.6	528.5	486.1

*** Million US dollars**

Source: (UNIDO, n.d.).

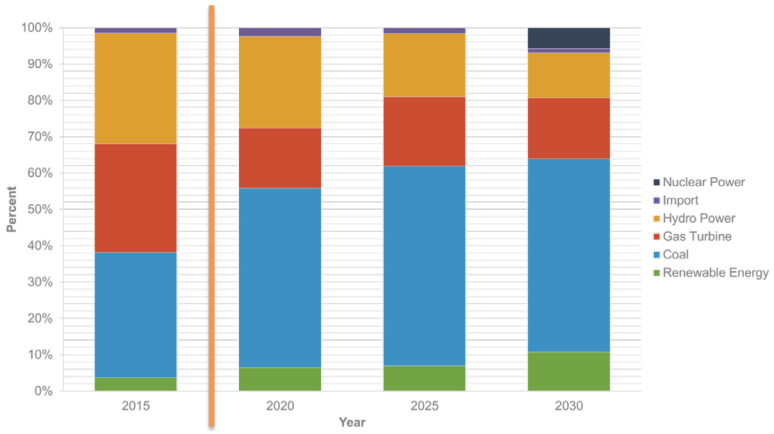
In 2020, Viet Nam turned from a net coal exporter to an importer to feed its growing fleet of coal-fired power plants. Its coal imports increased by a quarter in 2020 to 54.8 million tonnes, and the domestic coal output rose by 5.1 per cent to 48.6 million tonnes. In 2021, the government expressed its intention to increase domestic coal production as the country grows more reliant on imports. The Deputy Prime Minister said that this would be done "by focusing its investment in new mines and upgrading existing ones to meet the economy's demand for coal" (Reuters 2021b).

A study conducted for the German Environment Agency reports serious occupational safety and health issues in the coal mines in Viet Nam. These include spontaneous combustion of coal in the waste rock pile in some mines (for instance, in Lang Cam, Phan Me in Thai Nguyen province and Khe Bo in Nghe An province) and high noise levels (97–106 decibels) that exceed the allowed value of 75 decibels according to the Vietnamese standard TCVN 5949:1998. The latter causes occupational deaf among mining workers (German Environment Agency 2019).

3.2.3.2 Coal consumption

Coal is the largest source in thermal electricity production in Viet Nam. Its share in total production increased from 29.3 per cent in 2010 to 58.7 per cent in 2018 (Annex 5). The country increased the electricity production from coal-fired plants by 72 per cent between 2010 and 2017, reaching a coal capacity of 17 GW in 2017. According to the 2020 version of the Power Development Plan VII (PDP 7), 43 GW of new coal plants will be added to the capacity by 2030 (Carbon Tracker 2018c), and coal will continue to be the primary source for energy production (figure 19).

▶Figure 19. Sources of total electricity production according to Viet Nam's revised PDP 7, 2020



Source: (GIZ, n.d.).

The revised PDP 7 still lists coal as the main source of energy in total installed capacity, although it decreased coal's portion from the original target of 51.6 to 42.6 per cent for 2030 (GIZ, n.d.). A preliminary draft of PDP 8 (2021–30) envisages 37 GW of coal power by 2030. It also proposes the cancellation of seven coal plant projects totalling 9.5 GW and the deferral of six coal projects of 7.6 GW to post-2030 (Global Energy Monitor, Sierra Club, CREA, Climate Risk Horizons, GreenID, Ekosfer 2021). The draft submitted for the Prime Minister's approval in October 2021 indicates that the country may double the amount of coal-fired plants by 2030 (Reuters 2021a). In the same month, Viet Nam announced the construction of the 1,230 MW coal-fired plant, a US$2.2 billion project, to begin by December 2021 (Reuters 2021c). Although renewable energy (mainly solar and wind) investments (IRENA 2021) in Viet Nam are increasing, the country's coal pipeline is still huge (Climate Analytics 2021).

The electric power generation sector employed 121,581 workers in Viet Nam in 2017. The wage bill was about US$1,098.2 million in the same year (table 7).

▶Table 7. Electric power generation statistics for Viet Nam

	2013	2014	2015	2016	2017
Electric power generation, transmission (ISIC 351)					
Employees	214 017	202 460	120 448	124 149	121 581
Establishments	321	365	399	463	561
Female employees	37 765	35 794	24 118	24 703	24 669
Investment*	18 507.0	24 298.1	27 889.9	38 696.9	35 845.5
Output*					
Value added*	10 517.1	17 070.6	11 542.9	18 930.8	19 837.5
Wage bill*	1 304.2	1 511.1	834.3	1 046.7	1 098.2

*** Million US dollars**

Source: (UNIDO, n.d.).

3.2.3.3 Regional dimension

Viet Nam's coal reserves are concentrated in Quang Ninh province and the Red River Delta basin. Exploited since 1839, the Quang Ninh coal basin also hosts coal preparation plants. The reserves in the Red River Delta basin were discovered in 1960 (Mijal 2018).

A report published in 2016 on the socio-environmental impacts of coal and coal-fired power plants in Viet Nam indicates that, in 2015, coal mining in Quang Ninh province impacted 750 hectares of forest and caused the agricultural land to shrink by 79 hectares compared to 1985; 30 of the hectares lost were paddy fields (Ha-Duong et al. 2016). Illegal underground coal mining caused land sinking in the residential area, affecting 80 households and forcing them to relocate. The report also states that due to the construction of the coal power plant in Hai Phong, a major port city in north-eastern Viet Nam, 53 per cent of the people whose land was acquired became unemployed. Only a few of them got jobs in the Hai Phong Coal Power Plant, and only 20 per cent found new jobs or new ways of making a living, such as opening small restaurant, according to the report.

The report also mentions that in the case of Duyen Hai Coal Power Plant, which is located in Trà Vinh province in the Mekong Delta region in the south, "job transition for people who lost their land is not yet effective". This is because the investors do not have a commitment and a plan to train local people or use the local labour as promised before acquiring their land. According to the report, during the construction and operation of Duyen Hai 1 and Duyen Hai 3 Coal Power Plants in Trà Vinh province, "only a limited number [of] local people was hired to work in the construction site, mostly for temporary and low paid positions. Recruiters used many excuses not to accept local [labour] including the reason of 'not qualified and lack of skills" (Ha-Duong et al. 2016).

Furthermore, a number of grave health issues and negative impacts on local livelihoods were noted in the coal hotspots, notably Quang Ninh, both due to the coal mining activities and coal-fired power plant (German Environment Agency 2019).

▶Box 4. Quang Ninh's economic diversification through FDI

The 2020 plan for the socio-economic development of Quang Ninh explains that the province's economy has gradually shifted from brown to green, with priority given to the development of the service sector and non-mining industries. It also ensures that coal mining operations are cleaner and more sustainable (ASEM Connect Vietnam 2021).

Improvements in the business climate and the legislative framework have led to increased foreign direct investment (FDI) inflow to the province. Since its launch in 1997, Cai Lan has attracted about US$7.4 billion, some 56.5 per cent of which has been sourced from FDI to develop infrastructure in local economic zones, industrial parks and clusters (VNA 2021). The Texhong Hai Ha Industrial Park, including heavy and light industries such as thermoelectricity, mechanical engineering, and textile and garment auxiliary (NSO 2021), has a total registered investment exceeding US$727 million. The park's energy is supplied from the Hai Ha Thermal Power Plant, a 2,100 MW coal plant complex in Hải Hà district of Quảng Ninh (Global Energy Monitor, n.d.).

In March 2018, the Thai industrial estate developer Amata was granted a license to construct the 714-hectare Song Khoai Industrial Park in Yen Hung. Amata plans to invest more than US$2 billion to develop an eco-industrial and urban area in Quang Ninh. In March 2021, China's solar panel manufacturer Jinko Solar invested around US$500 million to establish a solar photovoltaic cell factory at the Song Khoai Industrial Park. It then received a license for its second project worth US$365 million to produce silicon solar panels, which is expected to create 2,188 local jobs (VNA 2021).

Another investor is the Belgium-based company DEEP C which, with its partners, developed the 369.8-hectare Nam Tien Phong Industrial Park and 1.193-hectare Bac Tien Phong Industrial Park in Quang Yen Economic Zone. DEEP C's mission "[t]o become [the] first Eco-Industrial Park in Viet Nam" (DEEP C, n.d.). Its power is provided by renewable sources from DEEP C Green Energy, a partnership between DEEP C Industrial Zones and Japan's TEPCO Power Grid Inc. (DEEP C, n.d.) The industries operating in the zone include chemical and petrochemical, electronics, automotive, renewable energy components, machinery, food, logistics and post operations.

In 2020, Taiwan's Foxconn, one of the main suppliers of companies such as Apple, Motorola, Nokia and HP, opened a production base in Quang Ninh (VNA 2021).

3.2.3.4 A Just transition

Viet Nam implements a range of policies and adaptation measures against climate change. In 2011, the National Climate Change Strategy was issued, outlining the objectives for 2016–50. In 2012, the National Green Growth Strategy was approved, which includes mitigation targets and measures. In 2013, the Law on Natural Disaster Prevention and Control was enacted, aiming to address diverse natural hazards that affect the country, which mainly relate to climate change. The 2014 Law on Environment also included a chapter on climate change (World Bank and ADB 2020).

Viet Nam's Green Growth Strategy (Green Policy Platform 2021) and Nationally Determined Contributions (NDC) to the implementation of the Paris Agreement highlight the need for a transition in the country's energy sector to a low-carbon pathway (Okunlola et al. 2019). In October 2021, the National Green Growth Strategy for 2021–2030 was adopted. The government aims to reduce greenhouse gas emissions per GDP by at least 15 per cent by 2030 and at least 30 per cent by 2050 compared to 2014. It also intends to increase the share of renewables in total primary energy supply to 15 to 20 per cent and the forest coverage to 42 per cent over the next decade (Viet Nam MoIT 2021).

As of November 2021, Viet Nam has installed 17 GW of solar power and 11.8 GW of wind power. It is among the world's top ten countries with the highest installed solar capacity. Its wind power potential is also large, with an estimated amount of 311 GW. If Viet Nam keeps its COP26 pledge, it will achieve coal phase-out by the 2040s. It will also gradually decrease coal by 30 per cent by 2030, replacing it with gas and renewable energy sources (Energy Tracker Asia 2021).

3.3 Knowledge Intensive Business Services/Mining Technology Services (KIBS/MTS) impact

The providers of Knowledge Intensive Business Services/Mining Technology Services (KIBS/MTS) are important actors in the industrial ecology of coal-dependent regions, as they contribute to local productivity, innovation and skills development. While no studies could be identified on the KIBS/MTS impact in Indonesia, the Philippines and Viet Nam, based on the evidence from other mining regions (Martinez-Fernandez, Miles, and Weyman 2011). KIBS/MTS providers should be regarded as among the main agents of regional transformation and a just transition considering their role in the transfer of knowledge and technologies to the other sectors of the economy (mainly to SMEs) as well as to the current and potential labour force (box 5).

▶Box 5. The role of KIBS/MTS firms in the industrial ecology of mining regions in Australia

A study on the impact of Knowledge Intensive Business Services/Mining Technology Services on the mining regions in Australia found that MTS firms played a significant role in the transformation of the country's mining industry. The study identifies the following knowledge intensive service activities (KISA) performed by these firms:

- exploration and other mining consulting;
- design and engineering consulting;
- technical consulting services;
- research and development services;
- services related to intellectual property;
- occupational health and safety.

It explains that the interaction between the mining companies and MTS firms "brings content and quality to the innovation process". It also notes that the process of KISA development by MTS firms depends not only on formal contractual arrangements but also on flexible interchanges and interactions in the innovation ecosystems of the firms, creating a significant impact both on the mining company where they operate and on other KIBS operating in the region. The study underlines that "mining sites are innovation intensive ecosystems that often lack the attention to the management of KISA as a value added to the organisational structure".

Source: (Martinez-Fernandez, Miles, and Weyman 2011).

Table 8 shows the available data for the support services on a fee or contract basis required for mining activities (IDC 2020) in the Philippines and Viet Nam,[6] which can provide a proxy of KIBS/MTS in these two countries.

Additional desk research found a number of national and international companies offering a broader range of KIBS/MTS in all three countries. As seen in the brief company descriptions below, the KIBS/MTS providers possess valuable transferable expertise and skills. In addition, they invest in Industry 4.0 technologies. The study *Moving to Mining 4.0 in Asia/Pacific: Mining Wealth from Data* indicates that the majority of companies in the region have Industry 4.0 strategies, and they refer to increased innovation capacity due to the use of these strategies (IDC 2020).

▶Table 8. Data on "support activities for other mining and quarrying" (ISIC 099): The Philippines and Viet Nam

The Philippines	2012	2013	2014	2015	2016
Employees	1 276	1 641	1 048	1 093	1 737
Establishments	10	11		6	8
Female employees	178	203		186	187
Investment*	41.7	36.3		37.6	2.5
Output*	97.5	93.8		198.6	166.7
Value added*	45.3	48.0		126.3	72.5
Wage bill*	12.5	10.0		9.0	10.9

Viet Nam	2013	2014	2015	2016	2017
Employees	5 662	6 741	1 862	2 297	2 266
Establishments	64	72	61	85	96
Female employees	1 225	1 491	515	416	454
Investment*	30.8	26.2	18.3	23.2	19.3
Output*					
Value added*	24.8	51.8	34.5	35.8	175.2
Wage bill*	25.5	28.9	7.3	9.9	9.1

*** Million US dollars**

Source: (UNIDO, n.d.).

Brief information on notable KIBS/MTS firms operating in Indonesia, the Philippines and Viet Nam is given below:

- Petrosea (Indonesia): The company offers pit-to-port mining solutions, integrated engineering, procurement and construction services as well as logistic support. In 2019, Petrosea was selected by the World Economic Forum as "the only mining company and the only Indonesian owned company to join the Global Lighthouse Network" due to its success in implementing Industry 4.0 technologies (such as artificial intelligence and big data analytics) to drive the company's financial and operational performance (PETROSEA, n.d.).

6 Data for Indonesia is not available.

- Royal HaskoningDHV (Indonesia): The company's operations cover all aspects of the development, operation and closure of mining facilities. It uses state-of-the-art design and modelling tools to deliver consultancy services on mine design and engineering. Its expertise encompasses mechanical, electrical, metallurgical, environmental and logistic aspects of surface and underground mines. Some of the transferrable services include hydrology and hydrogeology work and engineering, risk and asset management, technology selection and implementation, project management, construction management, environmental engineering, social impact assessment, and stakeholder management (Royal HaskoningDHV, n.d.).
- Britmindo Group (Indonesia): This is a multi-disciplined provider of services in many aspects of mining and related activities, providing one-stop-shop solutions to the coal industry. It also offers specialized services such as technical studies, cost evaluations to operational mining audits, and confidential due diligence reports for a range of international and local clients (Britmindo Group, n.d.).
- Intertek (Indonesia, the Philippines and Viet Nam): The company provides assurance, testing, inspection and certification solutions to a range of industries including coal. It also shares its expertise through an array of training and implementation programmes, helping its clients and their supply chains understand regulatory requirements, improve their business processes and meet customer demands (Intertek, n.d.).
- SGS (Indonesia, the Philippines and Viet Nam): The company offers a range of services such as testing, inspection and certification for a variety of industries including coal. It also provides training services to help keep up with the latest developments in standards, regulations and technology, as well as consultancy services on identifying, meeting and complying with the requirements of the target markets of corporate clients (SGS, n.d.).
- Development & Investment Mining Technology Co. Ltd (Viet Nam): It offers consulting and marketing services on the most advanced and optimal technologies to coal mines in Viet Nam, in addition to importing specialized coal equipment, drilling machines, mine tools and other specialized equipment, as well as transferring technology for its clients (DIMT, n.d.).

A recent study conducted for the German Environment Agency states that the construction of coal-fired power plants requires skilled workers and engineers, creating job positions with high wages (German Environment Agency 2019). Considering the high level of investments in coal-fired power plants in all three countries, it is assumed that, in addition to MTS firms, KIBS providers of the coal-fired plant sector also have an impact on and a role to play in a just transition of coal phase-out in the coal-dependent regions.

4

Labour market impacts of coal phase-out scenarios and mitigating measures

4.1 Labour market impacts of coal phase-out scenarios

4.1.1 Definition of scenarios

The analysis of the coal phase-out effects in Indonesia, the Philippines and Viet Nam was made based on three scenarios:

1. **The worst-case scenario (do nothing):** In this scenario, it is assumed that
   - ▶ All coal mines are closed; coal exports and imports are ended (the direct effect).
   - ▶ There is a decline in the output and employment of those sectors that provide inputs for coal mines (the indirect effect).
   - ▶ Those sectors that use coal import a "coal equivalent" energy source from abroad at the same cost: there is no contraction in the output and employment of coal-using sectors.
   - ▶ All workers become unemployed without any support. The income losses of the employed workers and 50 per cent of the lost surplus cause a decline in aggregate household demand for consumption (the induced effect), which further leads to declining output and to unemployment in all sectors.
2. **Partial support scenario (income support):** In this scenario, the government provides full income support to unemployed workers and partial support to the owners of closing businesses to fully compensate for the decline in households' demand for consumption; the "induced effect" of coal phase-out is completely avoided.
3. **The best-case scenario (full and just transition):** In this scenario, the government provides temporary income support and helps the unemployed workers through pre-layoff planning, pre-layoff assistance, post-layoff assistance and active labour market policies so that they are employed in other sectors (see Section 4.2). Moreover, alternative sectors providing renewable energy are created so that complete phasing-out of coal does not lead to any increase in energy imports and unemployment. Since the net

effect of developing renewable energy sectors depends on the level of investment and technological characteristics of alternative technologies, this scenario simply assumes that the government aims at eliminating the negative effects of coal phase-out.

The effects of these scenarios on a number of main macroeconomic variables are summarized in tables 9–11. The best-case scenario is the continuation of the current case, without any negative effect (the "base" case). In the partial support scenario, income support policies will mitigate the induced effects, but because of the direct effects (closing coal mines) and indirect effects (declining output in supplier industries), total output and employment will decline to some extent ("+ Indirect effect" case). In the worst-case scenario, income losses will intensify the contraction in the economy (the "+ Induced effect (surplus)" case).

The effects of the scenarios are calculated by assuming that all coal mines will be closed down at the same time and that all coal using sectors will adopt new energy sources instantaneously to understand the order of magnitude of the effects of complete coal phase-out. However, in order to achieve the best-case scenario, that is, the full and just transition, where the costs of transition are minimized and the benefits are maximized, the governments should prepare an action plan for sequential coal mine closures (probably starting from the least efficient ones) so that the process to help affected workers and communities, and to adopt green energy and fuel sources will be manageable.

4.1.2 Labour market impacts under three scenarios

An analysis of the effects of closing all coal mines in Indonesia, the Philippines and Viet Nam is shown in tables 9, 10 and 11, respectively. The calculations are based on input-output tables of Indonesia, the Philippines and Viet Nam for the latest years available (2016, 2017 and 2012, respectively). For Indonesia and Viet Nam, the effects are calculated for wages, surplus, taxes, value added, output and imports. In the case of the Philippines, since the input-output table does not have a separate coal mining sector, the mining and quarrying sector data was used, and it was assumed that coal makes up about 14.5 per cent of this sector. Also, since the input-output table of this country was not detailed enough, some of the variables could not be calculated. Nevertheless, the results are indicative.

In Indonesia (table 9), a direct effect of coal phase-out will be a decrease in all variables: wages (by 0.8 per cent compared to the base value of 2016), surplus (2.5 per cent), taxes (0.9 per cent), value added (1.8 per cent), output (1.6 per cent) and imports (0.2 per cent). Indirect effects indicate the decrease in the production in the sectors supplying inputs to the coal production sector. If all coal mines are closed in Indonesia, wages will drop by US$6.11 billion (2016 prices), of which US$3.07 billion due to layoffs in closed mines and the rest due to layoffs by suppliers of coal mines. Induced effects (wages) show the effects of a decrease in consumption demand of the households in the case of closure of all coal mines. It is assumed that the level of a decrease in consumption demand is equal to the decrease in wages. In such a case, wages will drop by US$8.83 billion. Induced effects (surplus) indicate the effect of a decrease in consumption demand due to the decrease in profit in addition to all these effects. It is assumed that only 50 per cent of the surplus goes to consumption. In this case, the total decrease in wages will amount to US$11.78 billion.

As a result of all these effects, GDP (value added) will decrease by 4.5 per cent compared to the base value in 2016, which will significantly affect Indonesia's economy. Since the country's coal industry in the country grew rapidly in recent years (production increased from 424.0 Mt in 2016 to 616.2 Mt in 2019), the effects are likely to be higher. In order to decrease the negative effect of coal mine closures, effective policies and policy measures will be needed to create new job opportunities for laid-off coal mine workers and for the workers of coal mine suppliers and exporters and to increase production in other sectors. The above analysis assumes that coal phase-out will not have a negative effect on the sectors using coal since these sectors will start using alternative energy sources. Therefore, policies and policy interventions are also needed to achieve technological transformation in the coal-using sectors as well as to switch to green energy resources.

▶Table 9. Effects of coal phase-out in Indonesia (billions of US dollars)

	Wages	Surplus	Taxes	Value added	Output	Imports
Base (2016)	370.53	537.37	14.46	914.66	1 745.72	173.91
Direct effect	3.07	13.61	0.13	16.77	28.69	0.35
(% of base)	0.8	2.5	0.9	1.8	1.6	0.2
+ Indirect effect	6.11	19.27	0.27	25.53	44.60	2.33
(% of base)	1.6	3.6	1.9	2.8	2.6	1.3
+ Induced effect (wage)	8.83	23.80	0.38	32.84	57.98	3.44
(% of base)	2.4	4.4	2.6	3.6	3.3	2.0
+ Induced effect (surplus)*	11.78	28.72	0.49	40.78	72.52	4.65
(% of base)	3.2	5.3	3.4	4.5	4.2	2.7

*** It is assumed that 50 per cent of the surplus is spent on consumption.**

Notes: "Taxes" means taxes minus subsidies. In 2016, US$1 = 13,307 rupiah.

Source: (Badan Pusat Statistik, n.d.).

In the Philippines (table 10), a direct effect of the closure of all mines will be a decrease in wages (US$26 million in 2017 prices), and an indirect effect will be a decrease of US$33 million in wages due to layoffs by suppliers of coal mines. As a result of the effects analysed, GDP (value added) will decrease by 0.2 per cent compared to the base value in 2017.

▶Table 10. Effects of coal phase-out in the Philippines (billions of US dollars)

	Wages	Surplus	Taxes	Value added	Output	Imports
Base (2017)				313.60	608.83	101.23
Direct effect	0.03	0.36		0.38	0.55	
(% of base)				0.1	0.1	
+ Indirect effect	0.03	0.46		0.49	0.77	
(% of base)				0.2	0.1	
+ Induced effect (wage+surplus)*	0.04	0.59		0.63	1.04	
(% of base)				0.2	0.2	

*** It is assumed that 50 per cent of the gross value added is spent on consumption.**

Notes: No data on taxes and subsidies or imports. Wage and surplus effects are calculated from value added by using the 2016 wage/value added ratio.

Source: (ADB, n.d.).

In the case of Viet Nam, the effects will not be as significant as in Indonesia since the coal sector is smaller. The most recent detailed input-output table for Viet Nam available is for 2012. Since the coal industry in the country grew rapidly in the last decade, the effects are likely to be higher for the current period. According to the analysis given in table 11, a direct effect of the closure of all mines will be a decrease in wages (by 0.6 per cent compared to the base value of 2012), and an indirect effect will be a decrease of 1.4 per cent in wages due to layoffs by suppliers of coal mines. An induced effect (wages) will be a drop in wages by US$1.72 billion (2012 prices) because of the decrease in consumption demand of households in the case of mine closures. An induced effect (surplus) that indicates the result of a decrease in consumption demand due to the decrease in profit will be a total decrease in wages amounting to US$1.90 billion. As a result of these effects, GDP (value added) will decrease by 2.1 per cent compared to the base value in 2012. Since coal production has increased in Viet Nam since 2012, the effects will be higher, which will require effective policies and policy measures.

▶Table 11. Effects of coal phase-out in Viet Nam (billions of US dollars)

	Wages	Surplus	Taxes	Value added	Output	Imports
Base (2012)	91.00	47.57	6.38	141.06	423.21	115.81
Direct effect	0.54	0.10	0.14	0.76	3.44	0.19
(% of base)	0.6	0.2	2.2	0.5	0.8	0.2
+ Indirect effect	1.25	0.51	0.17	1.89	6.59	1.69
(% of base)	1.4	1.1	2.7	1.3	1.6	1.5
+ Induced effect (wage)	1.72	0.77	0.21	2.63	8.68	2.16
(% of base)	1.9	1.6	3.3	1.9	2.1	1.9
+ Induced effect (surplus)*	1.90	0.87	0.22	2.92	9.49	2.34
(% of base)	2.1	1.8	3.5	2.1	2.2	2.0

*** It is assumed that 50 per cent of the surplus is spent on consumption.**

Notes: "Taxes" means taxes minus subsidies. In 2012, US$1 = 20,873 Vietnamese dong.

Source: (Ministry of Planning and Investment 2015).

Table 12 presents the results of the analysis for the most affected sectors in Indonesia and Viet Nam.[7] The table shows the decline in output in the affected sectors in the case of the worst-case scenario. It also indicates the effects of coal mine closures on the KIBS in these countries.

▶Table 12. The sectors most affected by coal mine closures in Indonesia and Viet Nam

	Decline in output (%)
Indonesia	
Coal and lignite	100.0
Other mining and excavation services	47.1
Transport support services	12.9
Sea freight services	10.9
Rail transport services	10.5
Other financial institution services	5.4
	Decline in output (%)
Viet Nam	
Hard coal and lignite	100.0
Support services to mining and quarrying	98.5
Services of head offices and management consulting services	15.6
Rubber products	9.8
Refined petroleum products	7.9
Sewerage services	4.9

Note: The six most affected sectors are shown.

Due to the lack of regional- and local-level data, the effects of coal phase-out in Indonesia, the Philippines and Viet Nam were analysed at national levels. Nonetheless, the findings indicate that the impact of completing phasing out coal in the coal-dependent regions in all three countries will be much more severe than on the national level.

7 A similar analysis could not be made for the Philippines due to a lack of detailed data for the sectors.

4.2 Impact mitigation measures

In order to mitigate the negative socio-economic effects of coal phase-out and to achieve the best-case scenario, it is essential that the governments implement just transition policies for affected populations. These are summarized in the sections below.

4.2.1 Assistance services and active labour market policies

An essential element of mitigating the negative impacts of mine closures is helping affected workers and communities through well-designed assistance and active labour market policies. The recent World Bank's study on "The Coal Transition: Mitigating Social and Labour Impacts" provides a conceptual framework that distinguishes between pre-layoff planning and pre-layoff and post-layoff assistance and discusses the main instruments for mitigating social and labour impacts. These are summarized below (Cunningham and Schmillen 2021):

- *Pre-layoff planning* is the process of (i) collecting information to identify the extent and nature of the social and labour challenge (namely, identifying workers to be affected by divesture decisions, impacts on auxiliary social services and assistance needs); (ii) reviewing relevant labour regulations and the social protection system; and (iii) setting up institutions and partnerships to support workers' transitions and beginning a communications campaign.
- *Pre-layoff assistance* is intended to prepare workers for impending layoffs and includes (i) giving notice of dismissal to affected workers; (ii) providing information regarding assistance options; and (iii) implementing services such as worker profiling and skill audits, job counselling, and placement services.
- *Post-layoff assistance* is the most active and costly phase in the divesture process and encompasses (i) the provision of temporary income support (until unemployed workers are relocated in new sectors); (ii) the implementation of active labour market policies to individual displaced workers and potentially a wider group of beneficiaries; and (iii) if necessary, the deployment of social programmes for continued access to health, education and similar services as well as pension benefits.
- *Active labour market policies* offer services, programmes and incentives that encourage and enable the re-employment of laid-off workers. They usually include one or a combination of the following: (i) employment services such as labour exchanges, vocational counselling and mobility assistance; (ii) education and training through institutional or on-the-job training; and (iii) small business support services (for example, micro credits and grants, technical assistance for start-ups, and support for business incubators) and subsidized employment in either the private or the public sector. These three different types of active labour market policies can be most effectively deployed to address frictional unemployment (when displaced workers need assistance to access existing demand), structural unemployment (when displaced workers lack relevant skills and need retraining to succeed), and a lack of labour demand (when there are no jobs regardless of the skills the displaced workers have or may acquire) (Annex 8).

4.2.2 Gender dimension

An important dimension in the mitigation policies for mine closures concerns women. The World Bank's paper "The Coal Transition: Mitigating Social and Labour Impacts" argues that mining sector restructuring affects the welfare of women in multiple ways: the loss of coal industry employment, the increased burden of domestic responsibilities when men lose their employment, intra-household tensions, and the impact of migration induced by mine closure (Cunningham and Schmillen 2021). However, effects on women may be overlooked if the focus is only on coal producers.

An example the study gives to show the impact is the mine closures in Poland: "The Poland Miners' Social Package in response to the 1998–2001 mine closures initially only covered underground workers, who were only men. A stakeholder workshop in 2001 revealed that women's employment had been directly affected by the mine closure, but they did not benefit from the package since they were surface, rather than underground, workers. In response, a new social package was introduced that included 3.6 months' severance payments for surface workers.

The study's example in Romania shows the scale of women's unemployment in the mine-dependent regions: "The Romanian mine restructure during 2002–2005 found that nearly 50 per cent of laid-off workers were female. Further, women likely fill many of the spillover jobs that serve coal mine producers and their families. Women tend to be over-represented in wholesale and retail, owning small shop[s], small restaurant[s], and performing various other services."

The paper also underlines that woman respond differently to job loss and redeployment than men: "Sometimes, women tend to be comfortable with a larger set of job options while men commonly identify with a more limited set of job options. For example, in response to economic shocks in Argentina, women more easily moved into alternative activities to supplement household incomes while men were frequently willing only to take jobs in their own narrow occupation."

It is also noted that women tend to be responsive to a wider range of active labour market policies: "[A]ccording to impact evaluations, post-training employment probabilities and wage gains of female workers exceed those of men, they have a higher incidence of usage of employment services, and they are a better credit risk than men when borrowing to start their own small businesses".

Finally, the ILO paper *Women in Mining: Towards Gender Equality* highlights the importance of incorporating a gender lens and adopting targeted measures to eliminate gender-based domestic violence and harassment in the wake of mine closures (ILO 2021).

4.2.3 Interventions related to illegal coal mining operations and informality in the coal mining sector

The coal mine closures and related labour market policies should also take into account the illegality as well as the situation of informal workers in the coal-dependent regions. As noted in the previous sections, illegal coal mining operations is an important issue for the countries under this study. Although no data are available on the number of informal workers in the legal and illegal mining operations, it is assumed that informality has a large negative effect on workers and communities in coal regions.

4.2.4 Interventions related to KIBS/MTS

Considering that the KIBS/MTS providers are among the most affected sectors of coal mine closures, it is important to develop and implement policies to mitigate the effects on these sectors. These policies should also ensure the transfer of skills, knowledge and technologies from MTS firms and KIBS providers of the coal-fired plants to other sectors of the economy, putting particular emphasis on knowledge and technology transfer to local SMEs as well as to the current and potential labour force.

4.2.5 Clean energy and fuel use

An important dimension of just transition policies is to invest in renewable energy to replace coal. As discussed in previous sections, Indonesia, the Philippines and Viet Nam continue to increase the share of renewables in their energy mix. However, these investments could be considerably stepped up considering both the increased affordability of renewable energy options and the availability of resources in these countries. In fact, all three countries have untapped renewable resources (AIGCC 2021):

- They are located near the equator and have good solar resources. For example, the solar potential is 208 GW in Indonesia and about 1,700 GW in Viet Nam.
- Although onshore and offshore wind resource potentials are relatively modest in the ASEAN region, Viet Nam is an exception with a wind resource potential of over 200 GW.
- Indonesia and Viet Nam have good hydropower potential (Viet Nam's commercially viable hydro resources are largely exploited).
- Indonesia and the Philippines have significant geothermal potential.

Considering that the cement sector is an important consumer of coal in these countries, switching to fuels is essential. A study conducted in Viet Nam for the World Bank found that alternative fuel types, which could have significant CO_2 saving potential and are already widely applied internationally, such as waste (for example, tyres and plastic) and biomass (for instance, rice husk and sawdust) are not used by the country's cement industry (RCEE Energy and Environment JSC and Full Advantage Co., Ltd 2010). The study also underlines the abundance of waste and biomass sources in Viet Nam, noting that 20 per cent utilization of biomass or waste at 2 cement production facilities could save as much as 175,000 tonnes of CO_2 per year. Therefore, policies are needed to ensure that cement facilities switch to these fuels in all three countries in the process of coal phase-out.

4.2.6 Effects on population shrinkage in mining communities

Previous studies (Martinez-Fernandez et al. 2012) on mining-dependent urban areas (cities and towns) and regions (systems of towns) indicate that many have experienced sustained population loss, employment decline and/or protracted economic downturns, sometimes in the form of several cycles of growth and shrinkage. It is seen that the strategies of the main company in these towns can, to a great extent, determine future developments and have a great impact on urban management plans.

The empirical studies on four shrinking mining cities in Australia, Canada, Japan and Mexico offer insights into how mining cities contest urban shrinkage through four types of strategies: (i) developing mining areas as innovation hubs; (ii) attracting business in information and communications technology; (iii) strengthening the resilience and common strategic development of the community by involving inhabitants in actions and in governance and decision-making; and (iv) seeking sustainability and resistance of the local community to mining industry plans and threats to local historic places and the inhabitants (Martinez-Fernandez et al. 2012).

▶Box 6. Lessons from the experiences of countries that phased out coal

The study *Challenges of Coal Transitions: A Comparative Study on the Status Quo and Future Prospects of Coal Mining and Coal Use in Indonesia, Colombia and Viet Nam* conducted for the German Environment Agency summarizes key lessons from the experiences of countries that phased out coal:

- Long-term transition planning: Due to the very long lead times of structural change processes (many decades), it is important to proactively engage in an economic development strategy, with the objective to diversify the national and regional economies.
- Policy coordination: Fields of action are manifold, and most of them lie outside the classical sphere of energy and climate policy. Thus, an exchange of knowledge between and coordination among the different policy spheres and sectors is necessary.
- Sustainable financing strategy: Structural change requires high investment volumes. It is important to redirect public finance streams away from old industries into sectors with high future potential.
- Strengthening the local innovation system: The innovation system in mining regions often is either geared towards mining (such as a strong focus on specialized engineering) or generally neglected (weak research and education in rural mining regions). This hinders a future-oriented diversification of the regional economy. Historic examples show that coal mining companies often do not have an interest in economic diversification as this would mean that they have to compete even more with other branches for land and workers.
- Environmental standards for coal mining: Low environmental standards for coal mines lead to high local pollution of soil and water, which reduces options for alternative economic activities in the region (including agriculture or tourism) in parallel to mining activities or after mine closure.

Source: (German Environment Agency 2019).

5

Key issues for a just transition of coal phase-out

As a main source of CO_2 emissions, coal should be phased out globally by 2040 to achieve the 1.5°C goal set by the Paris Agreement. To meet their commitments and eliminate the negative effects of coal on the environment and health, Indonesia, the Philippines and Viet Nam should end coal production and consumption to achieve a full and just transition to a sustainable economy. Due to the scale of coal mining activities, mine closures in Indonesia and Viet Nam will lead to significant impacts on their economies, making just transition policies indispensable for the phase-out process. Although the extractive sector in the Philippines makes a relatively small contribution to the economy, as a major importer and consumer of coal, the country should also put in place just transition policies.

From the employment point of view, coal mining jobs make up a small fraction of total employment in these countries. However, job losses due to mine closures in coal-dependent regions, as well as the loss of indirect jobs in their industrial ecologies, will have a deep negative effect on the labour markets, economies and livelihoods of local communities.[8] The policy choice of maintaining employment in such regions can be a significant impediment against a transition away from coal, "unless it is addressed specifically through targeted national support for regions affected (UNESCAP 2021). A scenario analysis conducted by IRENA in 2020 indicated that if new investment in Southeast Asia is focused on renewable energy, the region would gain five million jobs in renewables and energy efficiency by 2050, while it would lose less than half a million jobs in fossil fuels (UNESCAP 2021). Therefore, policies that are adapted at the regional and local levels with the aim to create "just transition hotspots" are of vital importance for a human-centred transition away from coal.

Based on the findings of the desk research and the consultations with the tripartite constituents as well as with the UNRCs, the following emerging issues are identified for the way forward:

1. **Regional focus with attention to industrial ecology and KIBS/MTS**: Although carried out at macro level due to the lack of regional and local data, the scenario analysis given in the previous section indicates that the impact of the phase-out on the coal-dependent regions in Indonesia, the Philippines and Viet Nam will be much more severe than on the national level because coal mines are concentrated in certain regions. Also, the effects will not only be on the coal mine firms, their workers, families and communities but also on others within the regional industrial ecologies. As key actors in this ecosystem, KIBS/MTS providers are among the firms that will be primarily affected by a coal phase-out. They will also have a role to play in a just transition due to their transferable expertise and skills.

8 Past experience in different countries, such as China, Poland and the United States, indicates that many displaced workers have long unemployment periods and that those who find work may suffer earnings reductions of more than 20 per cent over at least 15 to 20 years. (Cunningham and Schmillen 2021).

To be able to assess the impact at the regional and local levels and develop and implement effective policies based on evidence for the creation of "just transition hotspots/zones", it is important to collect regional- and local-level data (including those related to migration and population shrinkage, environmental goods and services, and informal workers) and map the industrial ecology in coal regions with a particular focus on KIBS/MTS providers by identifying the actors and connectivity between them.

2. **A Just Transition Toolkit for the energy sector:** Just transition processes in Indonesia, the Philippines and Viet Nam would benefit from a toolkit that looks at how to drive behaviours and practices throughout the supply chain in coal regions and that provides specific advice on a just transition to social partners and industry stakeholder groups, including governments and policy actors, enterprises and workers. Such practical tools will be vital for addressing transition needs and preparing the roadmaps which were highlighted as a requirement by the tripartite constituents during consultations. Key policy areas for a just transition to address environmental, economic and social sustainability simultaneously include (ILO 2015):

   (i) macroeconomic and growth policies;
   (ii) industrial and sectoral policies;
   (ii) enterprise policies;
   (iv) skills development;
   (v) occupational safety and health;
   (vi) social protection;
   (vii) active labour market policies;
   (viii) labour rights;
   (ix) social dialogue and tripartism.

   Therefore, it is important to identify and analyse the elements that should be included in a Just Transition Toolkit based on common needs and to ensure that social dialogue, gender, social protection, green recovery and the community dimension, among others, are integrated into it.

3. **Leadership at the regional and local levels:** The implementation of a just transition in coal-dependent regions necessitates building strong leadership through tripartite committees. It is important to define the leadership requirements and structures at the regional level together with social partners, giving specific attention to the representation of women in the leadership structures.

4. **Connectivity between the three countries:** The just transition in the coal-dependent regions of Indonesia, the Philippines and Viet Nam will benefit from continuous and systematic experience and knowledge exchange between the social partners of the three countries with the involvement of the UNRCs and United Nations Country Teams (UNCTs). The process could be initiated by a regional forum to be organized in early 2022 with the tripartite constituents, UNRCs and UNCTs on a just energy transition in Asia and the Pacific, as the first step of this inter-country exchange and collaboration. The modalities of regular exchange and connectivity between countries and regions would also need to be defined and put into practice.

5. **Policy coherence:** To support the just transition process and its outcomes, policy coherence and a whole-of-government approach across the government institutions at the national and regional levels as well as among the international organizations is important. This coherence would be established along the lines of the requirements elaborated in the ILO's *Guidelines for a Just Transition towards Environmentally Sustainable Economies and Societies for All*. (ILO 2015).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Annex 1. Key indicators

▶Indonesia

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total population (million)	237.6	242.0	245.4	248.8	252.2	255.6	258.5	261.4	264.2	266.9	270.2
Population (% annual change)	1.4	1.8	1.4	1.4	1.3	1.4	1.1	1.1	1.1	1.0	1.2
Employed (million)	108.2	107.4	112.5	112.8	114.6	114.8	118.4	121.0	126.3	128.8	128.5
Mining and quarrying	1.3	1.4	1.6	1.4	1.4	1.3	1.5	1.4	1.5	1.4	1.4
Manufacturing	13.8	14.8	16.1	15.5	15.6	15.5	15.9	17.6	18.5	19.2	17.5
GDP shares (%)											
Agriculture, forestry, and fishing	13.9	13.5	13.4	13.4	13.3	13.5	13.5	13.2	12.8	12.7	13.7
Mining and quarrying	10.5	11.8	11.6	11.0	9.8	7.6	7.2	7.6	8.1	7.3	6.4
Manufacturing	22.0	21.8	21.5	21.0	21.1	21.0	20.5	20.2	19.9	19.7	19.9
Electricity, gas, steam, and air-conditioning supply	1.1	1.2	1.1	1.0	1.1	1.1	1.1	1.2	1.2	1.2	1.2
GDP shares (%)											
Gross capital formation	32.9	33.0	35.1	33.8	34.6	34.1	33.9	33.7	34.6	33.8	32.4
Exports of goods and services	24.3	26.3	24.6	23.9	23.7	21.2	19.1	20.2	21.0	18.4	17.2
Imports of goods and services	22.4	23.9	25.0	24.7	24.4	20.8	18.3	19.2	22.1	19.0	16.0
Growth rates (% annual change)											
GDP	6.2	6.2	6.0	5.6	5.0	4.9	5.0	5.1	5.2	5.0	-2.1
Agriculture	3.0	3.9	4.6	4.2	4.2	3.8	3.4	3.9	3.9	3.6	1.8
Industry	4.9	6.3	5.3	4.3	4.2	3.0	3.8	4.1	4.3	3.8	-2.8
Services	8.4	8.4	6.8	6.4	6.0	5.5	5.7	5.7	5.8	6.4	-1.4
Coal (t '000)											
Production	275 164	353 271	361 028	345 933	402 552	406 539	423 950	461 087	548 000	616 160	...
Exports	298 954	353 556	384 378	424 461	408 238	366 970	369 597	389 530	429 062	459 136	...
Imports	55	42	82	511	2 275	2 815	3 565	4 353	5 358	6 769	...
Consumption	...	...	...	...	...	80	85	87	117	138	...
Natural gas (TJ)											
Production	2 890 084	2 761 875	3 023 470	2 821 680	3 149 501	2 644 065	2 605 595	2 496 383	2 541 308	2 374 248	...
Exports	1 012 356	1 147 722	862 458	771 576	679 885	687 092	689 126	705 968	653 735	516 054	...
Imports	–	–	75 723	81 827	85 743	–	0	13	–	–	...
Consumption	401 068	415 468	625 649	...	...	876 189	940 518	912 959	882 726	1 001 535	...
Electricity (kWh million)											
Production	175 976	185 927	204 205	222 207	238 019	239 750	250 842	262 661	276 883	281 757	...
Exports											
Imports											

... = data not available; | = marks break in series; 0 or 0.0 = magnitude is less than half of unit employed; * = provisional, preliminary, estimate

Source: (ADB 2021a).

▶The Philippines

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total population (million)	93.1	94.8	96.5	98.2	99.9	100.8	102.5	104.2	105.8	107.3	109.0
Population (% annual change)	1.0	1.8	1.8	1.7	1.7	...	1.7	1.6	1.5	1.5	1.4
Employed (million)	36.0	37.2	37.6	38.1	38.7	38.7	41.0	40.3	41.2	42.4	39.4
Mining and quarrying	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Manufacturing	3.0	3.1	3.1	3.2	3.2	3.2	3.4	3.5	3.6	3.6	3.2
GDP shares (%)											
Agriculture, forestry, and fishing	13.7	14.1	13.1	12.5	12.3	11.0	10.2	10.2	9.7	8.8	10.2
Mining and quarrying	1.4	1.5	1.2	1.0	1.1	0.9	0.8	0.9	0.9	0.8	0.8
Manufacturing	21.9	21.7	21.3	20.4	20.6	19.9	19.6	19.5	19.1	18.5	17.7
Electricity, gas, steam, and air-conditioning supply	2.9	2.8	2.9	2.8	2.7	2.6	2.5	2.5	2.5	2.6	2.8
GDP shares (%)											
Gross capital formation	20.4	20.7	19.6	20.6	20.9	21.3	24.6	25.6	27.2	26.4	17.4
Exports of goods and services	32.9	29.1	27.5	26.2	27.4	27.2	26.7	29.6	30.2	28.4	25.2
Imports of goods and services	33.2	31.7	30.4	29.6	30.1	31.9	35.1	38.6	41.9	40.5	33.0
Growth rates (% annual change)											
GDP	7.3	3.9	6.9	6.8	6.3	6.3	7.1	6.9	6.3	6.1	-9.6
Agriculture	1.3	3.4	3.1	2.9	1.9	0.7	-1.0	4.2	1.1	1.2	-0.2
Industry	9.8	1.6	7.7	6.8	7.5	6.5	8.2	7.0	7.3	5.5	-13.2
Services	7.6	5.2	7.4	7.6	6.7	7.4	8.2	7.4	6.7	7.2	-9.2
Coal (t '000)											
Production	6 650	6 911	7 340	7 100	7 601	7 378	11 211	11 932	11 755	13 738	12 951
Exports	4 099	2 736	3 173	3 401	5 767	3 105	6 835	6 172	5 054	10 087	7 525
Imports	10 966	10 963	11 895	14 415	15 182	17 279	20 030	22 268	26 301	30 667	29 524
Consumption	13 321	14 639	15 317	18 952	20 163	22 006	24 794	29 320	30 976	33 007	32 846
Natural gas (m3 million)											
Production	3 681	3 975	3 810	3 510	3 691	3 470	3 976	3 922	4 378	4 409	3 998
Exports	...	...	...	...	...	...	...	...	...	...	...
Imports	...	...	...	...	...	...	...	...	...	...	...
Consumption	3 609	3 867	3 685	3 377	3 557	3 339	3 827	3 809	4 114	4 219	3 783
Electricity (kWh million)											
Production	67 743	69 176	72 922	75 266	77 261	82 413	90 798	94 370	99 765	106 041	101 756
Exports	...	...	...	...	...	...	...	...	...	...	...
Imports	...	...	...	...	...	...	...	...	...	...	...

... = data not available; | = marks break in series; 0 or 0.0 = magnitude is less than half of unit employed; * = provisional, preliminary, estimate

Source: (ADB 2021a).

▶Viet Nam

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total population (million)	87.1	88.1	89.2	90.2	91.2	92.2	93.3	94.3	95.4	96.5	97.6
Population (% annual change)	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.1
Employed	49.0	50.4	51.4	52.2	52.7	52.8	53.3	53.7	54.2	54.7	53.4
Mining and quarrying	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2
Manufacturing	6.6	7.0	7.1	7.3	7.4	8.1	8.9	9.3	9.7	11.3	11.3
GDP shares (%)											
Agriculture, forestry, and fishing	18.4	19.6	19.2	18.0	17.7	17.0	16.3	15.3	14.7	14.0	14.9
Mining and quarrying	9.5	9.9	11.4	11.0	10.8	9.6	8.1	7.5	7.4	6.7	5.6
Manufacturing	12.9	13.4	13.3	13.3	13.2	13.7	14.3	15.3	16.0	16.5	16.7
Electricity, gas, steam, and air-conditioning supply	3.0	2.9	3.0	3.2	3.6	4.0	4.2	4.3	4.5	4.8	4.7
GDP shares (%)											
Gross capital formation	35.7	29.8	27.2	26.7	26.8	27.7	26.6	26.6	26.5	26.8	27.0
Exports of goods and services	72.0	79.4	80.0	83.6	86.4	89.8	93.6	101.6	105.8	106.8	105.5
Imports of goods and services	80.2	83.5	76.5	81.5	83.1	89.0	91.1	98.8	102.5	104.7	102.7
Growth rates (% annual change)											
GDP	6.4	6.2	5.2	5.4	6.0	6.7	6.2	6.8	7.1	7.0	2.9
Agriculture	0.5	4.2	2.9	2.6	3.4	2.4	1.4	2.9	3.8	2.0	2.7
Industry	-9.9	7.6	7.4	5.1	6.4	9.6	7.6	8.0	8.9	8.9	4.0
Services	-7.7	7.5	6.7	6.7	6.2	6.3	7.0	7.4	7.0	7.3	2.3
Coal (t '000)											
Production	44 835	46 611	42 083	41 064	41 086	41 664	38 735	38 409	42 047	47 158	48 377
Exports	19 876	17 163	15 219	12 802	7 265	1 748	1 243	2 229	2 388	1 143	910
Imports	...	...	1 876	2 271	3 096	6 927	13 199	14 677	22 856	43 770	54 812
Consumption	...	...	...	...	...	...	...	...	...	...	...
Natural gas (t million)											
Production	9 402	8 480	9 355	9 751	10 210	10 660	10 610	9 866	10 010	11 043	9 650
Exports	7 917	14 121	8 973	57 178	259 127	157 723	117 580	90 938	193 691	217 980	116 219
Imports	542 282	672 957	618 776	644 093	782 705	538 418	494 691	711 265	844 626	898 528	833 190
Consumption	...	...	...	...	...	...	...	...	...	...	...
Electricity (kWh million)											
Production	91 722	101 499	115 147	124 454	140 237	157 949	175 745	191 593	209 181	227 423	232 348
Exports	56 603	79 375	28 940	177 639	98 144	92 499	91 886	83 942	88 989	181 125	116 219
Imports	298 552	300 530	158 655	221 180	142 704	142 847	135 536	109 041	170 869	187 782	173 217

... = data not available; | = marks break in series; 0 or 0.0 = magnitude is less than half of unit employed; * = provisional, preliminary, estimate

Source: (ADB 2021a).

Annex 2. Supply, use and input data of coal

▶Indonesia, supply and use of coal and lignite (2016)

	Value (million rupiah)	Share (%)
Supply of coal and lignite		
Total domestic output	381 748 510	91.7
Total imports	4 640 478	1.1
Total supply at basic prices	386 388 988	92.8
Trade margin	21 529 995	5.2
Transport margin	7 308 334	1.8
Taxes less subsidies on products	1 154 216	0.3
Total supply at purchasers' prices	416 381 533	100.0
Use of coal and lignite		
Sectors:		
Electricity	81 455 161	19.6
Cement	16 914 799	4.1
Coal and lignite	13 315 654	3.2
Other items from nonmetal materials	6 559 299	1.6
Basic chemistry except fertilizer	4 941 975	1.2
Basic iron and steel	3 123 598	0.8
Metal building materials	2 534 537	0.6
Total intermediate consumption:	141 783 761	34.1
Household consumption expenditure	0	0.0
General government consumption expenditure	0	0.0
Total final consumption:	0	0.0
Gross fixed capital formation	0	0.0
Changes in inventories	-122 647	0.0
Total gross capital formation	-122 647	0.0
Export of goods	274 720 419	66.0
Total use at purchasers' prices	416 381 533	100.0
Inputs for coal and lignite industry		
Inputs:		
Other mining and excavation services	20 396 643	5.3
Rental services and business support services	19 091 883	5.0
Transport support services	17 753 421	4.7
Coal and lignite	13 315 654	3.5
Land transportation services besides rail transportation	13 051 302	3.4
Oil and gas refinery products	11 235 067	2.9
Sea freight services	9 985 403	2.6
Starter engine	5 327 249	1.4
Real estate services	4 177 946	1.1
Total inputs	158 647 426	41.6
Gross value added at basic prices	223 101 084	58.4
Compensation of employees	40 866 331	10.7
Other taxes less subsidies on production	1 138 123	0.3
Operating surplus, gross	181 096 630	47.4
Total output	381 748 510	100.0

Source: (Statistics Indonesia 2016). (Million Rupiah).

▶Viet nam, supply and use of coal and lignite (2012)

	Value (million dong)	Share (%)
Supply of coal and lignite		
Total domestic output	71 739 900	77.9
Total imports	3 900 891	4.2
Total supply at basic prices	75 640 792	82.2
Trade and transport margin	12 009 982	13.0
Taxes less subsidies on products	4 413 080	4.8
Total supply at purchasers' prices	92 063 854	100.0
Use of coal and lignite		
Sectors:		
Cement	11 205 190	12.2
Electricity generation and distribution	6 420 357	7.0
Bricks, blocks, tiles, and other ceramic goods	2 458 041	2.7
Other nonmetallic mineral products, n.e.c.	1 087 922	1.2
Products of iron and steel	883 619	1.0
Fertilizers and nitrogen products	766 480	0.8
Other food products	545 026	0.6
Paper and paper products	506 092	0.5
Total intermediate consumption	26 637 931	28.9
Household consumption expenditure	2 515 474	2.7
General government consumption expenditure	0	0.0
Total final consumption	2 515 474	2.7
Gross fixed capital formation	0	0.0
Changes in inventories	285 531	0.3
Total gross capital formation	285 531	0.3
Export of goods	62 624 917	68.0
Total use at purchasers' prices	92 063 854	100.0
Inputs for coal and lignite industry		
Inputs:		
Refined petroleum products	26 292 655	36.6
Support services to mining and quarrying	13 098 087	18.3
Rubber products	5 796 507	8.1
Fabricated metal products, except machinery and equipment	5 745 483	8.0
Electricity generation and distribution	559 845	0.8
Other passenger land transport services	493 957	0.7
Nonlife insurance and reinsurance services	461 933	0.6
Specialized construction works	395 872	0.6
Roads and construction works for roads	395 810	0.6
Total inputs	55 813 259	77.8
Gross value added at basic prices	15 926 641	22.2
Compensation of employees	11 217 479	15.6
Taxes less subsidies on production and imports	2 524 579	3.5
Taxes less subsidies on products	0	0.0
Other taxes less subsidies on production	2 524 579	3.5
Consumption of fixed capital	1 803 044	2.5
Operating surplus, net	381 538	0.5
Operating surplus, gross	2 184 583	3.0
Total output	71 739 900	100.0

Source: (ADB 2012).

Annex 3. Top ten coal producers in Indonesia

Company	Production (million tonne)	Owner	Power plant (IPP)
Kaltim Prima Coal	60	Bumi Resources (Bakrie Family)	Bakrie Power (Tj. Jati B)
Adaro	50	Tohir Family, Edward Soeryadjaja, Saratoga Investama	PLTU Batang, PLTU Tanjung (Kalsel)
Berau Coal	33	Sinar Mas Group (Widjaja Family)	PLTU Sumsel 5, Kendari 3
Kideco Jaya Agung	32	Indika Energi	Cirebon Electric Power
Arutmin Indonesia	28,8	Bumi Resources (Bakrie Family)	N/A
Bukit Asam	25.5	PT Bukit Asama (SOE)	Tj Jati A
Borneo Indobara	17.3	Sinar Mas (Widjaja Family)	PLTU Sumsel 5
Indominco Mandiri	13	Banpu Minerals (Thailand)	N/A
Antang Gunung Meratus	7.7	Baramulti Sukses Sarana, Tata Power (India)	N/A
Indoexim Colaindo	6	Gajah Tunggal Grup (Syamsul Nursalim)	N/A

Source: (IESR 2019b).

Annex 4. Coal production and consumption in Indonesia and Viet Nam

▶Indonesia

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total energy supply	27 978	78 133	82 143	33 787	38 628	65 192	90 444	75 459	125 327
Production	319 190	346 943	385 899	458 463	435 743	427 280	456 000	461 000	548 000
Imports	55	41	78	509	2 273	2 813	3 564	4 352	5 358
Exports (-)	291 061	267 787	304 051	424 325	410 083	366 970	369 576	389 538	429 061
Stock changes (-)	206	1 064	-217	860	-10 695	-20 69	-456	355	-1030
Losses	2	0	0	2	3	3	3	4	4
Final consumption	27 147	33 804	29 291	17 546	6 500	7 938	9 487	9 892	27 428
Consumption for non-energy uses	19	0	0	74	0	1247	0	0	0
Consumption by manufacturing, construction and non-fuel mining industry	27 128	33 804	29 291	17 472	6 500	6 691	9 487	9 892	27 428
Consumption by chemical and petrochemical industry	6 365	7 931	6 872	419	156	117	578	661	1 712
Consumption by iron and steel industry	223	278	241	1 637	609	728	96	75	3 295
Consumption by other manuf., const. and non-fuel ind.	20 540	25 595	22 178	15 416	5 735	5 846	8 813	9 156	22 421
Energy industries own use	186	0	0	276	332	365	341	1 707	2 137
Transformation	27 643	44 491	53 026	60 619	66 391	71 558	75 347	80 866	95 758
Transformation in electricity, combined heat and power (CHP) and heat plants	27 395	44 310	52 816	60 466	66 258	71 517	71 517	77 504	91 800
Transformation in electricity plants - autoproducers	9 315	15 066	17 301	19 799	21 704	19 500	1 187	2 537	4 020
Transformation in electricity plants - main activity producers	18 080	29 244	35 515	40 667	44 554	52 017	70 330	74 967	87 780
Transformation in blast furnaces	75								
Transformation in briquetting plants	153	163	174	120	95	19	105	112	187
Transformation in coke ovens	20	18	36	33	38	22	3 725	3 250	3 771

Unit: 000 metric tonnes

Source: UN Statistics.

▶Viet Nam

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total energy supply	22 346	28 040	24 607	26 494	33 203	39 174	38 405	36 574	44 699
Production	43 940	44 984	40 512	39 655	41 086	41 664	38 735	38 409	42 047
Imports	0	0	627	621	42	551	1 139	97	2 842
Exports (-)	19 876	17 163	15 219	12 808	7 265	1 748	802	1 521	190
Stock changes (-)	1 718	-219	1 313	974	660	1 293	667	411	
Final consumption	18 296	19 964	16 561	16 143	15 047	14 908	12 099	13 528	17 981
Consumption by manufacturing, construction and non-fuel mining industry	15 461	16 952	13 391	12 973	11 687	11 313	8 324	9 598	14 125
Consumption by chemical and petrochemical industry		694	1 043	1 226	1 379	1 374	434	967	1 316
Consumption by other manuf., const. and non-fuel ind.	15 461	16 258	12 348	11 747	10 308	9 939	7 890	8 631	12 809
Consumption by other	2 835	3 012	3 170	3 170	3 360	3 595	3 775	3 930	3 856
Consumption by commerce and public services	650	691	727	727	771	825	866	902	1 110
Consumption by households	2 150	2 284	2 404	2 404	2 548	2 726	2 863	3 007	2 726
Consumption in agriculture, forestry and fishing	35	37	39	39	41	44	46	21	21
Transformation	8 960	10 869	11 374	13 699	17 088	22 599	26 192	23 968	29 193
Transformation in electricity, CHP and heat plants	8 960	10 869	11 374	13 699	17 088	22 599	26 192	23 968	29 193
Transformation in electricity plants - autoproducers	209	262	275	411	513	678	786	1 045	1 273
Transformation in electricity plants - main activity producers	8 751	10 607	11 099	13 288	16 575	21 921	25 406	22 923	27 920

Unit: 000 metric tonnes

Source: UN Statistics.

No data is available for the Philippines

Annex 5. Thermal electricity production (total and by source)

▶Indonesia

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total thermal production	142 752	160 593	173 957	192 591	199 993	240 698	201 209	251 766	260 211
Brown coal	13 965	0							
Fuel oil	4 866	7 526	4 722	3 501	1 936	1 581	1 666	1 535	2 065
Gas oil/ diesel oil	27 115	27 259	25 073	21 708	21 237	13 004	10 282	9 642	9 484
Hard coal	63 707	94 053	106 320	122 825	134 050	165 455	149 917	187 645	202 868
Liquid biofuels				0	724	657	1 226	720	0
Natural gas	32 819	31 219	37 379	43 488	41 346	58 694	35 732	51 687	45 186
Non-renewable waste	0	15	15	20	18	10	0		
Other oil products						557	568	504	608
Renewable municipal waste	0	15	15	20	18	10	0		
Solid biofuels	280	506	433	1 029	664	730	1 818	33	
Share of hard coal (%)	44.6	58.6	61.1	63.8	67.0	68.7	74.5	74.5	78.0

Unit: Kilowatt-hours, million

Source: UN Statistics.

▶The Philippines

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total thermal production	49 986	49 588	52 594	55 811	57 845	62 292	70 519	73 554	77 885	85 395
Bagasse	45	250	524	502	130	329	708	992	1 083	1 015
Brown coal	17 609	19 371	21 738	26 309	33 054	36 686	43 303	46 847	51 932	57 890
Fuel oil	4 525	2 338	3 055	3 181	3 630	4 011	3 450	2 820	1 450	1 840
Gas oil/ diesel oil	1 626	863	950	1 184	2 225	2 300	3 136	2 276	2 014	2 220
Liquid biofuels	58	12	33	42	50	50	50	50	50	50
Natural gas	26 105	26 696	26 246	24 515	18 690	18 878	19 854	20 547	21 334	22 354
Non-renewable waste	9	29	24	39	33	19	9	11	11	13
Renewable municipal waste	9	29	24	39	33	19	9	11	11	13
Solid biofuels	45	250	524	502	130	329	708	992	1 083	1 015
Share of brown coal (%)	35.2	39.1	41.3	47.1	57.1	58.9	61.4	63.7	66.7	67.8

Unit: Kilowatt-hours, million

Source: UN Statistics.

▶Viet Nam

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total thermal production	67 303	63 061	64 710	68 536	78 439	105 979	116 244	109 354	128 576
Fuel oil	2 196	937	224	252	252	970	1 188	378	117
Gas oil/ diesel oil	1 214	812	148	172	263	191	722	322	141
Hard coal	19 690	22 429	24 855	27 192	34 602	56 601	68 211	67 558	86 463
Natural gas	44 148	38 827	39 426	40 862	43 263	48 147	46 055	41 020	41 729
Solid biofuels	55	56	57	58	59	70	68	76	126
Share of hard coal (%)	29.3	35.6	38.4	39.7	44.1	53.4	58.7	61.8	67.2

Unit: Kilowatt-hours, million

Source: UN Statistics.

Annex 6. Key technical skills requirements in Viet Nam's solar PV and wind power sectors

Value chain	Relevant jobs and occupations	Technical skill requirements
Planning and projection/ development	■ Project planners ■ Project managers ■ Electrical engineers ■ Industrial engineers ■ Lawyers ■ Meteorologists (wind and solar assessment) ■ Geologists	■ Plant design, engineering and architecture ■ Project management ■ Bid drafting and pricing; site selection and leasing ■ Financial modelling ■ Contract design and negotiation
Construction and installation	■ Electrical engineers ■ Electronic technicians ■ Mechatronic technicians ■ Civil engineers ■ Structural engineers ■ Logistics managers ■ Installers and crane managers	■ Site engineering (civil, electrical and mechanical) ■ Plant design and architecture ■ Structure erection (wind towers) ■ Power plant construction ■ Grid work (integration and connection) ■ Land surveying ■ Project management ■ Logistics management
Operation and maintenance	■ Service technicians specialised in RE sectors ■ Mechatronic technicians ■ Data analysts	■ Fault management ■ System monitoring and control ■ Performance data analysis and management ■ Mechanical repairs and equipment management

Source: (Okunlola et al. 2019) (Survey results).

Annex 7. List of occupations of each stage of the renewable energy value chain stage, education fields, and skills level

			Skills Level		
Value Chain Stage	**Occupation**	**Education Fields**	**High**	**Medium**	**Low**
Equipment manufacture and distribution (EM&D)	Factory Workers and technicians	Technicians		x	x
	Industrial engineers	Engineering	x		
	Administrative personnel	Management	x		
	Marketing and sales personnel	Management	x		
	Logistics experts	Engineering & Logistics and Quality Assurance	x		
	Quality control experts	Engineering & Logistics and Quality Assurance	x		
	Health and safety experts	Health and Safety	x		
	Regulation and Standardization experts	Management	x		
	Chemical Engineers	Engineering	x		
Project development (PD)	Legal Energy regulation, real estate and taxation experts	Law	x		
	Financial Analyst	Finance	x		
	Electrical, Civil, Mechanical, and Energy engineers	Engineering	x		
	Logistic experts	Engineering & Logistics and Quality Assurance	x		
	Environmental experts	Engineering & Natural Sciences	x		
	Health and safety experts	Health and Safety	x		

Source: (GGGI 2020).

			Skills Level		
Value Chain Stage	**Occupation**	**Education Fields**	**High**	**Medium**	**Low**
Construction and installation (C&I)	Construction workers and technical personnel	Technicians		X	X
	Civil engineers and foremen	Engineering	X	X	
	Health and safety experts	Health and Safety	X		
	Electrical and mechanical engineers	Engineering	X		
	Environmental Experts	Engineering & Natural Sciences	X		
	Quality-control Experts	Engineering & Logistics and Quality Assurance	X		
Operation and maintenance (O&M)	Construction workers	N/A			X
	Safety experts	Health and Safety	X		
	Industrial, electrical and telecommunication engineers	Engineering	X		
	Operators	Technicians		X	
	Technical Personnel	Technicians		X	
	Administrative and Accountant personnel	Management	X		
	Environmental experts	Engineering & Natural Sciences	X		
	Lawyers, experts in energy regulation	Law	X		
	Management	Management	X		
Others (I.E. Transportation and Storage)	Logistic experts	Engineering & Logistics and Quality Assurance	X		
	Quality Control agents	Engineering & Logistics and Quality Assurance	X		
	Administrative personnel	Management	X		
	Shipping agents	Management	X		
	Loading staff	N/A			X
	Truck drivers	N/A			X

Source: (GGGI 2020).

Annex 8. Labour market challenges and applicable active labour market policies

Labor market challenge	Applicable active labor market policy	Illustrative costs per beneficiary in middle-income countries	Average impact on probability of employment		
			Short term	Medium term	Longer term
Frictional unemployment *displaced workers need assistance to access existing demand*	• **Employment services** • Labor exchanges • Vocational counseling • Mobility assistance	$15–$30 (for labor exchanges)	☑	☑	☒
Structural unemployment *displaced workers lack relevant skills and need retraining to succeed*	• **Education and training** • Institutional training • On-the-job training • Comprehensive programs with both institutional and on-the-job training	$250–$1,000 (for institutional training) $700–$2,000 (for comprehensive programs)	☑	☑☑☑	☑☑☑
Lack of labor demand *there are no jobs regardless of the skills the displaced workers have or may acquire*	• **Small business support and subsidized employment** • Small business support • Wage subsidies • Public works programs	$500–$3,000 (for business support) $300–2,400 (for subsidized employment)	☒	☒ (for public works programs)	☑

Source: Authors based on Betcherman et al. (2007) Card, Kluve and Weber (2017) and Fretwell (2017)

Notes: ☒ denotes an impact on a program beneficiary's probability of employment of less than 0.05 standard deviations, ☑ an impact of 0.05 to 0.1 standard deviations and ☑☑☑ an impact of at least 0.1 standard deviations, all according to the meta-analysis by Card, Kluve and Weber (2017).

Source: (Cunningham and Schmillen 2021).

A just energy transition in Southeast Asia: The impacts of coal phase-out on jobs

This report discusses the need to ensure a just transition while phasing out coal, examining the cases of Indonesia, the Philippines, and Viet Nam. A just transition away from coal is indispensable and it can bring untapped opportunities for quality jobs that are green and decent. Yet transitioning from coal into other economic activities is on THE policy agendas OF THE THREE COUNTRIES only to varying degrees due to the dependency on coal to meet growing energy demands. The report sets out a framework of cooperation for a Just Energy Transition in partnership with national, regional, and local actors to work TOGETHER to mitigate the negative socio-economic effects of coal phase-out and to maximize its transformative opportunities for mining communities to foster a better future.

International Labour Organization

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