

Towards Just Energy Transitions: Socio-Economic and Financing Pathways in Indonesia

Just Energy Transition Series #3

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Just and Equitable Energy Transition: The Socio-Economic and Financing Pathways in Indonesia

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Abstract

Indonesia's energy transition is critical to achieving its climate targets, yet continued reliance on coal poses economic and social challenges. The early retirement of coal-fired power plants (CFPPs) threatens jobs, local businesses, and regional economies, highlighting the need for a just transition. This study assesses those socio-economic impacts through a mixed qualitative approach — policy and regulatory review, stakeholder interviews, and field visits — built around a case study of the Cirebon-1 CFPP and its coal supply chain, complemented by an interregional input-output analysis of West Java, South Kalimantan, East Kalimantan, and South Sumatra. The analysis shows that the impacts of retirement are not confined to the host province: East Kalimantan supplied Rp 3.3 trillion and South Sumatra Rp 1.9 trillion worth of coal to West Java's electricity production, so closures ripple upstream to coal-producing regions. Leveraging international finance, including the Just Energy Transition Partnership, will not be enough on its own. Public financing and programs for reskilling, vocational training, soft-landing sectors, and alternative livelihoods — coordinated across national and subnational government — can mitigate these impacts. By aligning policy, infrastructure, and social support, Indonesia can decarbonize its energy system while ensuring equitable outcomes for workers and communities in coal-dependent regions.

Keywords: just energy transition; coal phase-out; early retirement of coal-fired power plants; Cirebon-1; public financing; Just Energy Transition Partnership (JETP); socio-economic impacts; reskilling; soft-landing sectors; input-output analysis; Indonesia

1 Introduction

1.1 Indonesia Amid the Climate Crisis

The impacts of the climate crisis have been felt more intensely in the past years in Indonesia. The country's disaster agency warned that floods, which inundated many areas in 2024, remained the biggest threat in 2025.. Since 2023, more than 1,000 floods have been reported in Indonesia.¹ Within the first weeks of 2025, Bandar Lampung in Sumatra was hit by a large flood. Hundreds of homes were inundated in the province of Riau.² Floods and landslides that struck Aceh, North Sumatra, and West Sumatra beginning in late November 2025 killed more than 1,100 people — the result of extreme rainfall compounded by decades of forest loss. Bireuen Regency in Aceh recorded 411 mm of rain in a single day, exceeding its normal monthly total.³ Moreover, super El Nino is even expected in 2026, worsening the temperature increase to a level that may not have been experienced before.⁴

Indeed, 2024 was the hottest year on record, and the first one that saw average temperatures increase beyond the threshold of 1.5 °C above the preindustrial era. The connection between the increasing risk of hydrometeorological disasters and the climate crisis has been scientifically established.⁵ The preindustrial baseline is the average temperature of the Earth between 1850 and 1900, before the widespread burning of fossil fuels began.⁶ Indonesia's Meteorology, Climatology, and Geophysical Agency (BMKG) also expects the national average temperature to increase by an additional 1.3 °C between 2020 and 2049, and sea levels to rise by 0.3–0.5 cm annually.⁷ This is in spite of the Paris Agreement, signed in 2015, through which countries worldwide committed to limiting the global temperature rise to below 2 °C, with efforts to stay within 1.5 °C.⁸ While this threshold will only be considered fully crossed when the increase in temperature remains consistent across multiple years, the first of such breaches in 2024 should be regarded as a major milestone.

¹ Suhenda, D., 2025, "Floods remain biggest threat in 2025, disaster agency says," *The Jakarta Post* (January 11, 2025).

² Fadli, 2025, "Dozens of disasters strike amid wetter rainy season due to La Niña," *The Jakarta Post* (January 14, 2025).

³ Nugroho, A., 2025, "Bencana Banjir Bandang Sumatra, Pakar UGM Sebut Akibat Kerusakan Ekosistem Hutan di Hulu DAS," *Universitas Gadjah Mada* (December 1, 2025). <https://ugm.ac.id/id/berita/bencana-banjir-bandang-sumatra-pakar-ugm-sebut-akibat-kerusakan-ekosistem-hutan-di-hulu-das/> (accessed on August 14, 2026); BMKG (Badan Meteorologi, Klimatologi, dan Geofisika, Agency for Meteorology, Climatology, and Geophysics of the Republic of Indonesia), 2025a. "Extreme rainfall in Sumatra, 25–27 November 2025" (December 1, 2025). Badan Meteorologi, Klimatologi, dan Geofisika, Jakarta; BNPB (Badan Nasional Penanggulangan Bencana), 2025. "Sumatra floods and landslides situation update" (December 29, 2025). Badan Nasional Penanggulangan Bencana, Jakarta; Wu, H., et al., 2026, "Analysis of the compound disaster caused by extreme rainfall and landslides in Sumatra, Indonesia in 2025 and its implications for disaster prevention and mitigation," *Natural Hazards Research*, in press (available online March 20, 2026).

⁴ WMO (World Meteorological Organization), 2026. *Global annual to decadal climate update 2026–2030* (May 28, 2026). World Meteorological Organization, Geneva; NOAA (National Oceanic and Atmospheric Administration), 2026. "El Niño forms, expected to strengthen, say NOAA forecasters" (June 11, 2026). National Oceanic and Atmospheric Administration, Silver Spring; "BMKG warns of potential El Niño impact in second half of 2026," *ANTARA News* (April 9, 2026).

⁵ IPCC (Intergovernmental Panel on Climate Change), 2023. *Climate Change 2023: Synthesis Report*. Intergovernmental Panel on Climate Change, Geneva.

⁶ "The 2024 Annual Climate Summary: Global Climate Highlights 2024," Copernicus Climate Change Service. <https://climate.copernicus.eu/global-climate-highlights-2024> (accessed on January 14, 2025).

⁷ BMKG, 2025b. *2025: Tahun Terpanas Kedua dalam Sejarah dan Dampaknya bagi Indonesia serta Sulawesi Tengah*. Badan Meteorologi, Klimatologi, dan Geofisika, Jakarta.

⁸ UNFCCC (United Nations Framework Convention on Climate Change), 2015. Paris Agreement to the United Nations Framework Convention on Climate Change.

1.2 The Imperatives of Transitioning from Fossil Fuels to Renewables

Emissions of climate crisis-inducing greenhouse gases have been released mainly due to the burning of fossil fuels. In 2024, the annual total global emissions were estimated to be about 41.6 billion tons of carbon dioxide equivalent per year (GtCO₂e), up from 40.6 GtCO₂e in 2023. Land-use change – human activities that involve transforming the natural landscape (e.g. deforestation, urbanization) – contributed about 4.2 GtCO₂e in 2024, a significant decrease from previous years. Emissions from non-land use change – ongoing activities that do not directly alter the way the land is used, but generate emissions through its processes (e.g. combustion, industrial processes) – are expected to increase to 37.4 GtCO₂e per year in 2024, up from 36.8 GtCO₂e in 2023.⁹ Transitioning to renewable energy, on the other hand, will reduce fossil fuel combustion, lowering greenhouse gas emissions.

Coal, the most carbon-intensive energy source, remains the dominant fuel in Indonesia's electricity system. For every ton of coal burned, approximately two tons of carbon dioxide are released into the atmosphere. In 2023, the country had an electricity-generating capacity of 91 GW: 46 GW owned and operated by the State-Owned Electricity Company (Perusahaan Listrik Negara, PLN), the state-owned electricity company, and 45 GW by private independent power producers (IPPs).¹⁰ Captive power – the electricity generated and primarily used by IPPs – contributed about 11 GW in the same year, an eight-fold increase since 2013, with an additional 3.8 GW announced for construction in 2023.¹¹ Coal accounts for 69 percent of this power generation, underlining its importance to Indonesia's electricity supply and its substantial contribution to greenhouse gas emissions.¹²

To achieve its climate targets, Indonesia needs to transition its energy system to a less carbon-intensive system. The country's emissions from energy and industrial sectors were about 733 million (mega) tons of carbon dioxide equivalent (MtCO₂e) in 2023, showing an increasing trend from 281 MtCO₂e in 2000, a significant increase considering emissions intensity decreased from 1.70 tCO₂e to 0.53 tCO₂e per thousand dollars over this same period.¹³ Meanwhile, the economy grew from about \$165 billion in 2000 to about \$1.4 trillion in 2023.¹⁴ This trend shows that Indonesia's economic growth has so far remained closely linked to rising energy demand and higher absolute emissions, even as emissions intensity has declined. While efficiency improvements have reduced emissions per unit of economic output, they have not been sufficient to offset the scale of economic expansion, resulting in steadily increasing total emissions. This underscores the core challenge facing Indonesia: the economy must continue to grow to support development objectives, yet achieving climate targets requires breaking the link between growth and emissions through a rapid transition to a less carbon-intensive energy system.

⁹ Friedlingstein, P., et al., 2025, "Global Carbon Budget 2024," *Earth System Science Data*, 17(3), pp. 965–1039. <https://doi.org/10.5194/essd-17-965-2025>.

¹⁰ ESDM (Kementerian Energi dan Sumber Daya Mineral, the Ministry of Energy and Mineral Resources of the Republic of Indonesia), 2024a. *Statistik Ketenagalistrikan 2023*. Directorate General of Electricity, Ministry of Energy and Mineral Resources, Jakarta.

¹¹ Parapat, J., and K. Hasan, 2023. *Berkembangnya captive coal power: Awan gelap di cakrawala energi bersih Indonesia*. Center for Research on Energy and Clean Air and Global Energy Monitor, Jakarta and Covina.

¹² IEA (International Energy Agency), 2023a. *Indonesia Energy Mix*. International Energy Agency, Paris. <https://www.iea.org/countries/indonesia/energy-mix> (accessed on August 14, 2026).

¹³ *ibid.*

¹⁴ Roser, M., et al., 2023. "Economic Growth." *OurWorldinData.org*. <https://ourworldindata.org/economic-growth> (accessed on January 13, 2025).

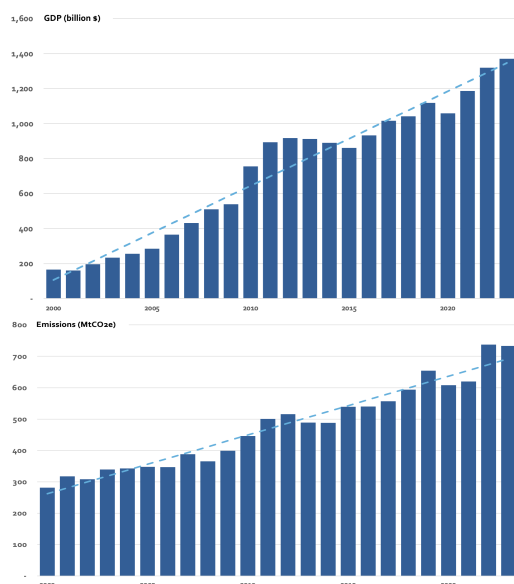


Figure 1. Indonesian economy grew (left graph), followed by the growth of emissions (right graph) between 2000 and 2023. Emissions continued to grow even though carbon intensity decreased. Source: Friedlingstein *et al.*, 2023; Rosel *et al.*, 2023.

Indonesia is committed to climate and energy targets and has been devising policies to achieve them. Indonesia has committed to a reduction of emissions by about 32 percent from otherwise business as usual (BAU) trajectories with its resources, and 43 percent with international cooperation by 2030 in its Enhanced Nationally Determined Contribution (ENDC). The emission targets in the ENDC includes aiming to achieve carbon neutrality by 2060 or earlier.¹⁵ The first version of the Second NDC has been submitted to the UNFCCC in 2025.¹⁶ An updated version has been prepared for submission in 2027. The government has also committed to increasing the portion of renewables in its energy mix to 23 percent in 2025 and 31 percent in 2050 as outlined in Government Regulation (Peraturan Pemerintah, PP) No. 79/2014 on the National Energy Policy, followed by Presidential Regulation No. 22/2017 on the National General Energy Plan. This commitment was strengthened by Presidential Regulation (Peraturan Presiden, Perpres) No. 112/2022.

However, while Indonesia has established a strong policy framework, the current pace of implementation has not yet matched the scale needed for the energy transition. Coal continues to dominate the energy sector, with new coal power plants being built at a steady pace. Approximately 18 GW of new coal power capacity is currently under development, which runs counter to decarbonization objectives and locks in emissions for the next few decades.¹⁷ Beyond these structural trends, the strong influence of coal industry players on the government is a large barrier in policy-making, as continuous lobbying for coal permit extensions creates favorable regulatory treatments. At the same time, PLN's rigid institutional and planning structure limits the flexibility of renewable integration. These challenges emphasize the reality that the

¹⁵ RI (the Government of the Republic of Indonesia), 2022a. Enhanced *nationally determined contribution, Republic of Indonesia* (September 23, 2022). Ministry of Environment and Forestry, Jakarta.

¹⁶ RI, 2025. *Second nationally determined contribution, Republic of Indonesia* (October 27, 2025). Ministry of Environment / Environmental Management Agency, Jakarta.

¹⁷ Global Energy Monitor, 2025. "Global Coal Plant Tracker." Global Energy Monitor, San Francisco. <https://globalenergymonitor.org/projects/global-coal-plant-tracker> (accessed on August 14, 2026).

implementation of policies in Indonesia remains lacking and will require decisive reforms to modernize the electricity system.

1.3 The Pathway to Net Zero

As a part of its net-zero roadmap, the Ministry of Energy and Mineral Resources (MEMR) has laid out a massive plan for the early retirement of coal-fired power plants (CFPPs). PP 112/2022 has provided the legal basis for the acceleration of the development and deployment of renewables. Under PP 112/2022, the development of CFPPs is forbidden except for those that have already been included in the Rencana Usaha Penyediaan Tenaga Listrik (RUPTL, or the Electricity Supply Business Plan 2025–2034) before the enactment of this regulation, and those that meet the following conditions.¹⁸ Such plants must be integrated into value-added industry, meaning they are built to supply electricity directly to industrial activities considered downstream or value-adding, such as mineral processing and smelting. They must also commit to reducing greenhouse gas emissions by at least 35 percent within 10 years of commencing operations, relative to the average Indonesian CFPP in 2021, and must cease operating by 2050 at the latest.¹⁹

Similarly, the RUPTL, PLN's most recent business plan, claimed by the government to be its greenest yet, and addresses the imperatives of transitioning to renewables. The plan identifies regional mismatches in electricity supply and demand, with some systems experiencing persistent oversupply and underutilization of existing capacity, while others face supply constraints amid rapid demand growth. Addressing these imbalances is central to the RUPTL's strategy, which prioritizes renewable energy expansion, grid reinforcement, and energy storage over large-scale fossil capacity additions. The business plan is focused on prioritizing renewable energy expansion, aiming for a 38 percent share of the energy mix by 2034 and over 70 percent in new power plant developments. As this plan is implemented, the total electricity supply is expected to expand from the current 75.0 GW to about 144.5 GW by 2034. While fossil fuels will increase from 65.9 GW to 82.5 GW, their share of the energy mix will actually decrease from 88 percent to 62 percent, and renewables will increase from 8.6 GW (12 percent) to 51.2 GW (38 percent) between 2025 and 2034. Over this same period, renewables will expand more rapidly, adding 42.6 GW (61 percent) compared with 16.6 GW (24 percent) for fossil-fueled power plants. A further 10.3 GW of electricity storage will also be built to further increase the capacity of the grid.²⁰

¹⁸ PLN (Perusahaan Listrik Negara, the State-Owned Electricity Company), 2025. *Rencana Usaha Penyediaan Tenaga Listrik 2025–2034*. Perusahaan Listrik Negara, Jakarta.

¹⁹ *ibid.*

²⁰ *ibid.*

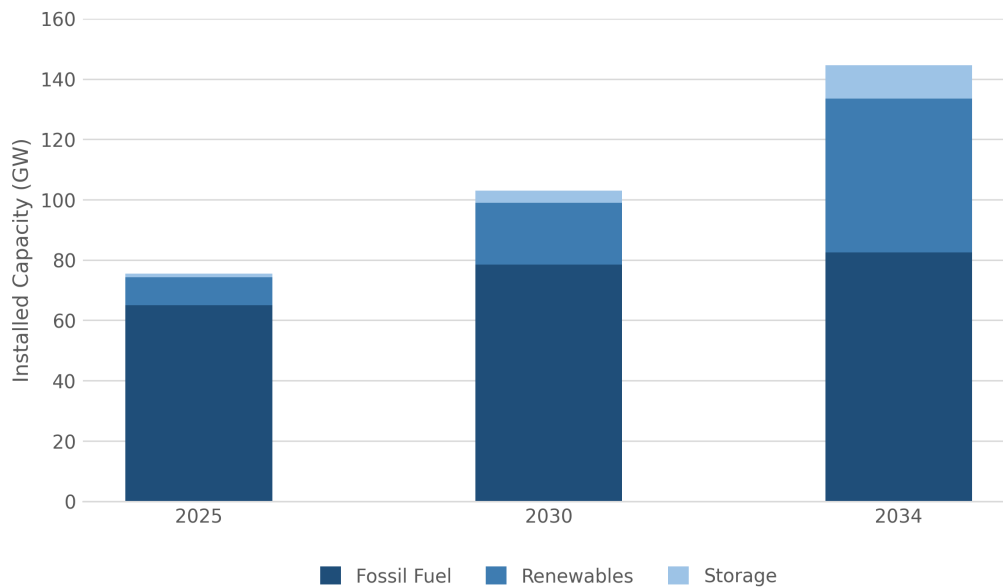


Figure 2. The whole electricity system is expected to expand, but renewables and storage are expected to expand more rapidly. New capacity additions from renewables exceed those from fossil fuels. Source: PLN, 2025.

Additionally, the Just Energy Transition Partnership (JETP) in Indonesia was launched at the G20 Summit in Bali in November 2022. This was the second JETP to be established, following the launch of South Africa's in November 2021. It was also the largest climate deal struck with one country, with an initial commitment of around \$20 billion; the first half was to be financed by the International Partners Group (IPG, a group of public financiers) and was intended to catalyze another \$10 billion from private financiers under the Glasgow Financial Alliance for Net Zero (GFANZ).²¹ In conjunction, the Comprehensive Investment and Policy Plan (CIPP) of JETP Indonesia was launched soon after, outlining the implementation and utilization of this funding.

The JETP Indonesia Secretariat acts as the coordinating body, sitting at the center of a multi-stakeholder structure. Guidance is provided by the Government of Indonesia together with the IPG, while four working groups (technical, policy, financial, and just transition) produce and update the CIPP.²² The working groups are led by international institutions; the IEA leads the Technical Group, the World Bank leads the Policy Group, the ADB leads the Financial Group, and UNDP leads the Just Transition Group.²³ This setup is designed to ensure that investment planning is both technically robust and socially inclusive, with the CIPP treated as a "living document" subject to regular review and adaptation.

As with the MEMR's net-zero roadmap, early retirement of coal-fired power plants is a strategic element of JETP. Integrated through the Energy Transition Mechanism (ETM), also introduced at the G20 summit, CFPPs can be incentivized for

²¹ "Just Energy Transition Partnership Indonesia." JETP Indonesia. <https://jetp-id.org/> (accessed on February 26, 2025).

²² JETP Indonesia, 2023. *Accelerating Just Energy Transition in Indonesia 2023*. Just Energy Transition Partnership Indonesia, Jakarta.

²³ "Indonesia Just Energy Transition Partnership (JETP)," UNDP (United Nations Development Programme), Jakarta. <https://www.undp.org/indonesia/projects/indonesia-just-energy-transition-partnership-jetp> (accessed on August 14, 2026).

early retirement or repurposing through concessional and commercial capital.²⁴ The 660 MW Cirebon Power Unit 1 CFPP is to be retired seven years early in 2035. This will require \$300 million additional investment, including to cover the losses of the stakeholders, while avoiding over 30 MtCO₂e of greenhouse gas emissions.²⁵ Cirebon Power Unit 1 is expected to be the first of many more early retirements of coal power plants.

The deployment of JETP funds, however, has been more modest than initially envisaged. As of November 2025, the total JETP financing approved has reached only \$3 billion, supporting just four projects and 46 programs. Of these four projects, two involve the development of transmission and distribution infrastructure, one is dispatchable renewable energy, and the last is variable renewable energy acceleration.²⁶ The other investment focus areas outlined in the CIPP — early retirement of CFPPs and strengthening the renewable energy value chain — have no projects so far.

An additional piece of the pathway to net-zero lies in Indonesia's abundant critical mineral reserves, which are needed to manufacture renewable energy technologies. Indonesia has an estimated 1.5 billion metric tons of nickel, 640 million tons of copper, 927 million tons of bauxite, and 1.2 billion tons of tin.²⁷ These are all vital for the development of electric vehicle batteries and carbon storage among other technologies. An enabling ecosystem could build off these reserves to drive business opportunities in the renewable energy, EV production, and sustainable decarbonization market. These abundant resources have the potential to position Indonesia as a global leader in the clean energy supply chain industry.

Ironically, sites of critical mineral mining, smelting, and manufacturing of downstream products needed in renewable energy technologies rely on CFPPs as their main electricity supply. Some 76 percent of Indonesia's captive CFPP operational capacity (8,214 MW) is dedicated to the metal industry, with a significant portion used to power nickel smelters. Further development of alternative fuels and off-grid renewables will be needed to decarbonize the metal industry in Indonesia.

These developments show Indonesia's two parallel, conflicting agendas. Acceleration of renewable energy deployment and deepening the downstreaming process of critical minerals are both key to the country's long-term decarbonization and economic competitiveness. However, they also carry structural inconsistencies that risk undermining national climate commitments. Early retirement of CFPPs may result in negative socio-economic impacts, including job displacement and regional revenue loss. On the other hand, the expansion of mineral processing offers new employment opportunities but risks perpetuating carbon-intensive industrial zones. These contrasting trajectories highlight the need for a strategy to align industrial policy with the clean energy agenda, while ensuring affected workers, communities, and local economies are not forgotten.

1.4 Objectives of the Research

The main objectives of this research are to:

²⁴ Jeffries, A., 2023, "Energy Transition Mechanism (ETM) in Southeast Asia and beyond," Presentation (October 5, 2023). Asian Development Bank, Manila.

²⁵ Yuan, Y., et al., 2024. *Just Transition Finance Challenges and Opportunities for the Early Retirement of Indonesia's Coal-Fired Power Plants*, SGFIN Industry Report No. 2. Sustainable and Green Finance Institute, National University of Singapore, Singapore; Rahayu, A., 2024, "Hitung-hitungan Dampak Pensiun Dini PLTU Cirebon 1 ke Ekonomi, Lingkungan, dan Sosial," *Kontan* (October 19, 2024).

²⁶ "Portfolio." JETP Indonesia. <https://portfolio.jetp-id.org/> (accessed on August 10, 2026).

²⁷ Aisyah, N., et al., 2024, "Estimating a national critical mineral security index in Indonesia using analytical hierarchy process," *Environmental and Sustainability Indicators*, 24(100510).

1. Assess the socio-economic impacts of early retirement of coal-fired power plants, specifically Cirebon-1, on local workers, communities, and the coal supply chain.
2. Analyze the roles of the national and subnational government, as well as public financial mechanisms like the Just Energy Transition Partnership, in mitigating socio-economic risks.
3. Develop actionable recommendations for public programs that will ensure a socially equitable energy transition.

1.5 Methodology

This study uses a mixed qualitative approach to assess the socio-economic impacts of the early retirement of the Cirebon-1 CFPP. It combines reviews of national and regional policies, regulations, and transition frameworks with stakeholder engagement, such as interviews with government agencies and local authorities, as well as field visits to affected regions. The insights from all these activities are combined into a case study for the Cirebon-1 CFPP and its coal supply chain to enable the identification of strategies for mitigation. The findings are then synthesized into actionable recommendations to provide a brief for a socially equitable energy transition.

2 The Socio-Economic Impacts of Energy Transition

Aside from its importance in the energy industry, coal plays a crucial role in Indonesia's domestic revenue. In 2023, coal contributed almost \$50 billion out of the \$1.3 trillion GDP of Indonesia.²⁸ East Kalimantan was the largest coal-producing province in Indonesia, contributing \$12.6 billion, followed by South Kalimantan and South Sumatra. East Kalimantan was also the province where coal was most dominant in the economy, contributing 35.8 percent of its provincial GRDP of \$35.2 billion, followed by South Kalimantan at 29.6 percent, and South Sumatra at 15.9 percent. East Kalimantan, however, also showed one of the highest per capita incomes in the country at almost \$9,000 per person, almost twice the national average. Coal GRDP per capita in East Kalimantan was also by far the highest at \$3,147, more than 17 times the national figure, and almost three times that of South Kalimantan, the second largest coal-producing province per capita.²⁹

Although the pilot project implemented under ETM would be in Cirebon, this is not a coal-producing region and will face a different set of challenges compared to the aforementioned provinces. The Cirebon CFPP plays a large role in the local economy, as it supports industrial activities, service-sector jobs, and small businesses that depend on the plant's operational spending and workforce. While there is no direct exposure to coal mining, the plant remains embedded in Indonesia's national coal value chain through its offtake arrangements, with a substantial share of coal supply sourced from East Kalimantan. As a result, early retirement of the Cirebon CFPP generates localized economic impacts in the host region while also transmitting indirect effects upstream to coal-producing provinces. This dual exposure underscores the need for a differentiated and coordinated just transition approach that addresses both downstream host-community impacts and upstream supply-chain dependencies.

²⁸ Statista, 2024a. "Gross domestic product (GDP) from coal and lignite mining in Indonesia from 2014 to 2023." Statista. <https://www.statista.com/statistics/1018571/indonesia-gdp-coal-and-lignite-mining/> (accessed on February 26, 2025).

²⁹ BPS (Badan Pusat Statistik) Provinsi Sumatera Selatan, 2025, GRDP at current market prices in sub categories 2022–2024. Badan Pusat Statistik, Jakarta; BPS Kalimantan Selatan, 2025, Produk Domestik Regional Bruto atas Dasar Harga Berlaku menurut Lapangan Usaha di Provinsi Kalimantan Selatan. Badan Pusat Statistik, Jakarta; BPS Kalimantan Timur, 2025, Produk Domestik Regional Bruto atas Dasar Harga Konstan 2010 menurut Lapangan Usaha di Provinsi Kalimantan Timur. Badan Pusat Statistik, Jakarta.

	Indonesia	East Kalimantan	South Kalimantan	South Sumatra
GRDP/GDP (\$ million)	1,371,000	35,275	17,662	41,281
GRDP/GDP per capita (\$)	4,876	8,797	4,171	4,644
Coal mining GRDP/GDP (\$ million)	49,356	12,620	5,220	6,562
Coal mining share of GDP/GRDP (percent)	3.6	35.8	29.6	15.9
Coal GRDP per capita (\$)	176	3,147	1,233	738

Table 1. The role of coal in Indonesia's economy and in the provinces most dependent on coal, 2023

Reducing and eventually eliminating CFPPs will affect Indonesians socio-economically. Currently, about 400,000 workers are making their livelihoods in the CFPP sector. To mitigate the impact on these workers and others indirectly benefiting from the industry, CFPPs should be retired and phased out gradually to prevent large-scale job loss all over the country. The forward and backward linkages of the CFPPs' supply chain will also be affected, and the local economy around the CFPP sites will be especially vulnerable to the impacts. Among them, local micro-, small-, and medium-sized enterprises (MSMEs) and the informal economy will be most affected. According to a 2024 study by the Center of Economic and Law Studies (CELIOS), without proper planning and preparation, the three early retirement pilot projects, including the Cirebon-1 CFPP, will lead to an estimated Rp 4 trillion (~\$250 million) loss in national GDP, over 14,000 workers unemployed, over 3,000 people falling into poverty, and a loss exceeding \$250 million for local business owners.³⁰

However, energy transition to renewables will lead to net job creation. Around the world, more people work in the clean energy sector today than in 2019 due to the global shift toward renewables. Over this period, about 4.7 million jobs were created in the clean energy industry, bringing the total workforce to 35 million by 2023.³¹ Meanwhile, fossil fuel industries employed about 32 million people globally in 2023.³² Modeling suggests that an average of 7.5 full-time jobs is created for every \$1 million invested in renewables, compared with only 2.7 jobs in fossil fuel-based energy industries.³³ Likewise, large hydro generates 3.8 times, small hydro 3.2 times, geothermal 2.8 times, and solar photovoltaics 2.5 times more jobs per electricity output than coal.³⁴ Decarbonizing Indonesia's electricity sector may directly create approximately 5.9 million jobs per year, which is about 2.8 million more than business-as-usual scenarios. These jobs are primarily driven by the expansion of solar photovoltaic projects, particularly in construction and installation. Despite potential job losses from retiring coal-fired power plants, the net impact is expected to generate 1.12 million jobs by 2030, and between 7.1 and 12.2 million jobs by 2050, encompassing

³⁰ Adhinegara, B.Y., et al., 2024. "Studi kasus pada PLTU Cirebon-1, PLTU Pelabuhan Ratu, dan PLTU Suralaya," *Antisipasi Dampak Ekonomi Pensiun Dini PLTU Batu Bara*. Center of Economic and Law Studies (CELIOS) and Yayasan Indonesia CERAH, Jakarta.

³¹ IEA, 2023b. *World Energy Employment 2023*. International Energy Agency, Paris.

³² IRENA (International Renewable Energy Agency) and ILO (International Labour Organization), 2023. *Renewable Energy and Jobs: Annual Review 2023*. International Renewable Energy Agency and International Labour Organization, Abu Dhabi and Geneva.

³³ Garrett-Peltier, H., 2017, "Green versus brown: Comparing the employment impacts of energy efficiency, renewable energy, and fossil fuels using an input-output model," *Economic Modelling*, 61, pp. 439–447.

³⁴ Grafakos, S., et al., 2020. *Employment assessment of renewable energy: Power sector pathways compatible with NDCs and national energy plans*, GGGI Technical Report No. 12. Global Green Growth Institute, Seoul. <https://gggi.org/report/employment-assessment-of-renewable-energy-power-sector-pathways-compatible-with-ndcs-and-national-energy-plans/> (accessed on August 14, 2026).

direct, indirect, and induced employment.³⁵ In the electricity sector, PLN's RUPTL for 2025–2034 is projected to create more than 1.7 million jobs — about 837,000 in generation and 881,000 in transmission, substations, and distribution — of which 91 percent of the generation jobs fall in the green-jobs category.³⁶

While the expansion of renewable energy is expected to create new employment, these gains do not automatically offset job losses in the coal-fired power sector. As CFPPs are retired and phased out, workers in the plants will face job losses, even though the renewable energy sector is expected to create a net increase in employment. Overall, there will be substantial restructuring in the job market, with some sectors experiencing job growth while others face a decline. Employees of the CFPP and its supply chain will be most affected, as an input-output analysis shows that there may be up to 500,000 jobs lost per year by 2050 directly and indirectly in the CFPP sector, while about 1.2 million to 1.4 million new jobs are created per year in other areas.³⁷ This highlights a key aspect of energy transition: while the net impact is positive, the distribution of employment effects is uneven across sectors, regions, and skill levels. The mismatch between the location, timing, and skill requirements of jobs lost versus jobs created underscores the need for coordinated policies to manage labor reallocation, reskilling, and local economic adjustment.³⁸

The current policy and regulatory framework, while ambitious, does not yet fully account for socio-economic consequences. Although there are mentions of just transition being an important requirement within the current framework, these references remain non-binding and largely aspirational, without explicit requirements. Displaced CFPP workers and affected local communities are at risk of economic hardships, undermining the social sustainability of the energy transition. A strengthened framework is required alongside the phase-out of CFPPs to ensure that the consequences of these early retirements are mitigated properly, especially in coal-dependent sectors.

2.1 Development of “Soft-Landing” Sectors in the Region

A soft landing refers to slowing an economy enough to reduce inflation without triggering a recession.³⁹ In the case of Cirebon-1, the power plant's early retirement will cause massive unemployment and demand reduction. To prevent a recession, strategic sectors that can provide a “soft landing” to this economic disruption must be identified.

Agriculture has been recognized as an effective sector that absorbs the downturns of other sectors during times of crisis. During the COVID-19 pandemic, when similar mass unemployment occurred, the agriculture industry in Indonesia was able to absorb the largest workforce compared to other sectors. In 2020, the first year of the pandemic, the industry employed more than 38 million workers, a significant

³⁵ Halimatussadiah, A., et al., 2024. *Employment Impacts of Energy Transition in Indonesia* (August 2024), LPEM FEB UI Working Paper No. 202481. Institute for Economic and Social Research (Lembaga Penyelidikan Ekonomi dan Masyarakat, LPEM), Faculty of Economics and Business, Universitas Indonesia, Depok.

³⁶ PLN, 2025, *op. cit.*

³⁷ Halimatussadiah, A., et al., 2024, *op. cit.*

³⁸ ILO (International Labour Organization), 2023. *Green jobs and just transition policy readiness assessment in the energy sector in Indonesia*. International Labour Organization, Geneva; NewClimate Institute and IESR (Institute for Essential Services Reform), 2023a. *Walking the tightrope of Indonesia's energy transition: Boosting jobs or leaving coal communities behind?* (November 8, 2023). NewClimate Institute, Cologne, and Institute for Essential Services Reform, Jakarta; Mark, E., et al., 2024, “Spatial-temporal dynamics of structural unemployment in declining coal mining regions and potentialities of the 'just transition,'” *Energy Policy*, 195(114338).

³⁹ Ianova, E., et al., 2024. “Delivering a soft landing: a historical perspective of monetary policy cycles,” ECB (European Central Bank, Frankfurt am Main) (September 25, 2024). European Central Bank, Frankfurt am Main. <https://www.ecb.europa.eu/press/blog/date/2024/html/ecb.blog20240925~bec0a9ffbe.en.html> (accessed on August 14, 2026).

increase on pre-pandemic years.⁴⁰ While agriculture has demonstrated a strong capacity to absorb displaced workers in the past, the incomes and job quality it provides are generally not comparable to those associated with coal-fired power plants. Employment in agriculture is typically more informal, lower paid, and subject to seasonal and productivity constraints, making it an imperfect substitute for industrial employment. As such, agriculture's role in the context of CFPP retirements is best understood as a short-to medium-term livelihood buffer rather than a like-for-like replacement. Its viability as a sustained livelihood pathway depends on targeted support to raise productivity, promote value-added activities, and integrate displaced workers into higher-income agri-business and rural industrial value chains.

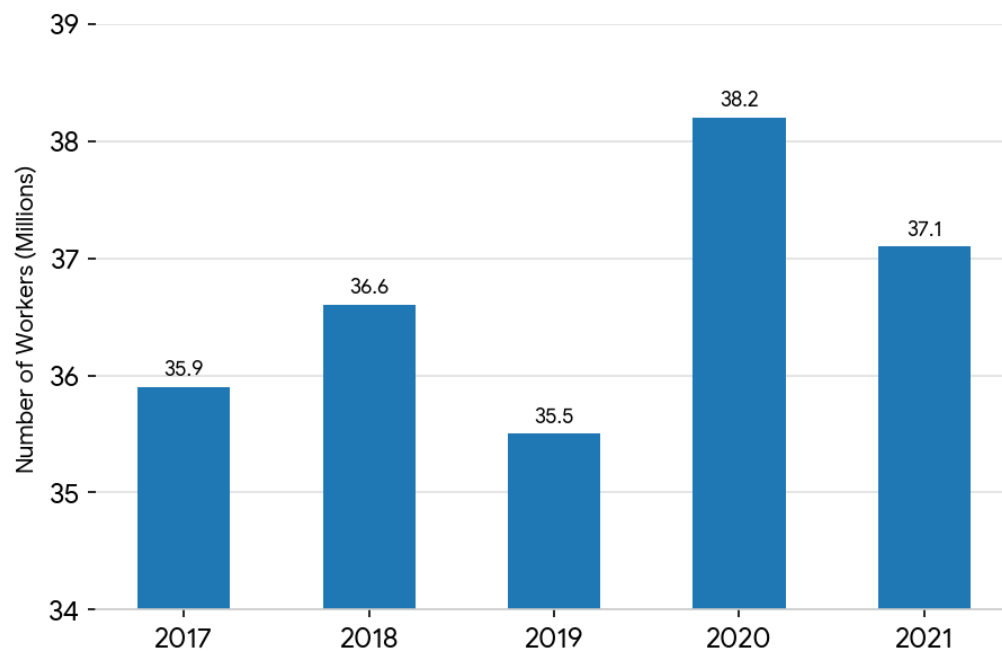


Figure 3. Number of Workers in the Agriculture Industry, 2017–2021 (spanning the COVID-19 pandemic). Source: Sepriani and Yuliawati, 2022, *op. cit.*

Microbusiness has also been identified as a key sector that contributes significantly to the resilience of the local and regional economies during hardship. Microbusinesses have more flexibility and adaptability compared with larger firms. During the pandemic, these microbusinesses showed more resilience than larger businesses, with their values decreasing less than those of large firms.⁴¹ In Indonesia, there were about 66 million MSMEs in 2023 (99 percent of the total number of businesses) providing employment to 117 million workers (97 percent of total employment) and contributing Rp9,580 trillion (about \$600 billion) or 61 percent of the GDP.⁴² However, employment and self-employment within MSMEs are generally characterized by lower and more volatile incomes, higher informality, and limited access to social protection compared to coal-sector jobs. While these sectors can mitigate

⁴⁰ Sepriani, W., and Yuliawati, 2022, "Penyerapan tenaga kerja oleh sektor pertanian," *Jurnal Samudra Ekonomika*, 6(1), pp. 11–19.

⁴¹ Wood, J., 2023, "Europe's small businesses proved resilient to COVID-19 pandemic disruption," WEF (*World Economic Forum*). <https://www.weforum.org/stories/2023/01/europe-smes-business-resilience-covid-19/> (accessed on March 3, 2025).

⁴² "UMKM," KADIN (Indonesian Chambers of Commerce and Industry). <https://kadin.id/data-dan-statistik/umkm-indonesia/> (accessed on January 21, 2025).

short-term unemployment following CFPP closures, large-scale transitions into low-productivity microbusinesses risk downward income mobility for affected workers, reduced local purchasing power, and broader productivity losses. Ensuring that MSMEs function as viable soft-landing sectors therefore requires targeted public intervention to support business upgrading, market access, and formalization, rather than relying on absorption alone.

Digital transformation has enabled MSMEs to gain better access to markets.

MSME actors have increasingly adopted online marketplaces and social media in digital marketing, enabling them to reach beyond local demand. A variety of enabling apps, such as digital banking platforms, have allowed MSMEs to continue to grow, even through the COVID-19 pandemic. This digitalization allows businesses to serve consumers in other regions, reducing their dependence on local markets and mitigating the economic impact of CFPP retirements.

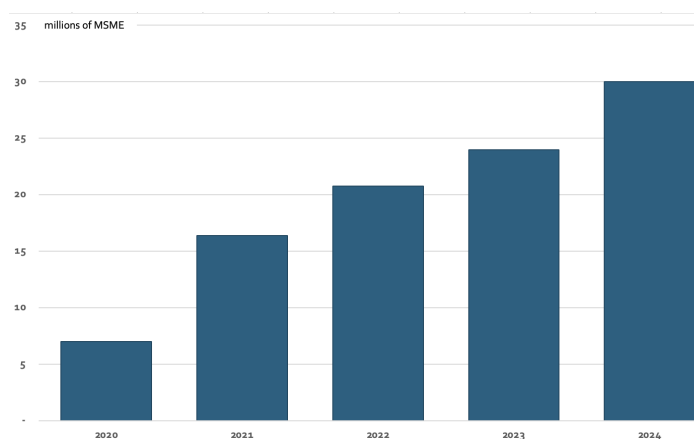


Figure 4. The number of MSMEs that are already digitally connected in Indonesia is increasing rapidly.

Labor unions, particularly those representing workers in state-owned enterprises like PLN, are deeply concerned that the early retirement of coal-fired power plants (CFPPs) threatens job security and long-term livelihoods.

Historically, unions have resisted energy sector reforms when they perceived them as undermining stable employment or reducing worker protections. From their perspective, the transition to renewable energy and the development of “soft landing” sectors such as agriculture and microbusinesses must be accompanied by concrete guarantees, whether in the form of severance, retraining programs, or pathways into alternative employment. Without such assurances, unions are likely to view the energy transition as an imposed cost on workers rather than a shared national project. This concern was evident during the shutdown of the Jenepono CFPP Units 1 and 2 in July 2025, when workers and labor unions staged protests demanding larger compensation packages and guaranteed employment opportunities for those laid off.⁴³

Meaningful engagement with labor unions is therefore essential to the success of a just energy transition.

Including them in policy discussions not only helps address their concerns but also ensures worker voices are embedded in solutions, from reskilling initiatives to the development of new economic sectors that can absorb displaced workers. A strategy that treats unions as partners, rather than as obstacles, can help build trust, reduce resistance, and align labor movements with broader national

⁴³ “Krisis Batubara Picu PHK Ratusan Karyawan di PLTU Jenepono, Persoalan Pesangon Jadi Sorotan,” *IndoBisnis* (July 17, 2025).

goals of a just and inclusive energy transition. Including other affected communities, women, Indigenous people, and other vulnerable groups in the discussion will create a bottom-up approach that allows citizens' lived realities to shape the energy transition.⁴⁴

2.2 Decoupling Regional Economies from Coal

In regions where coal or CFPPs dominate the economy, nationwide phase-out of coal may be socio-economically detrimental if not managed properly. In areas where coal royalties and associated industries dominate, the early retirement of CFPPs and the gradual decline in coal demand risk creating economic stagnation, unemployment, and social discontent. To avoid this, policies must focus on diversifying local economies through investment in alternative sectors such as agriculture, fisheries, sustainable tourism, renewable energy, and MSMEs. Such diversification requires not only financial resources but also strong institutional support, capacity building, and infrastructure development to create new sources of growth that are resilient and sustainable in the long term. First, a comprehensive economic diversification plan must be developed, involving stakeholders and community participation. Second, Proceed Sharing Funds (DBH), as seen in Table 2 below, and Corporate Social Responsibility (CSR) programs must be utilized to finance the transformation process.⁴⁵

Public financing to decouple regional development from coal may be addressed through the reference under Law No. 1/2022. The law provides an opportunity to foster synergy, for example, through joint elaboration of the General Policy for the Regional Income and Expenditure Budget and the Priority for the Temporary Upper Limit of Budget (Kebijakan Umum Anggaran Pendapatan dan Belanja Daerah dan Prioritas Plafon Anggaran Sementara, KUA-PPAS). It also opens the opportunity to increase the competence of human resources, as well as the organization and bureaucracy that manage the regional government's finances. The law specifically stipulates, among others, the provision of funds for regional governments from the central government, sourced internally within the region, and from sources other than the central government. This includes, among others, loans, bonds, *sukuk*, and endowment funds.⁴⁶

Financing Modalities	Potential for decoupling regional development from coal sectors	Amount in 2025
Regional Transfer (Transfer ke Daerah, TKD).	Fiscal support to maintain public services and temporary financial assistance to impacted workers	Rp 900 trillion
Proceed Sharing Fund (Dana Bagi Hasil).	Temporary wage support for affected workers and subsidies for local businesses	Rp 192 trillion
General Fund Allocation (Dana Alokasi Umum, DAU).	Fund vocational training programs for reskilling of workers	Rp 446 trillion
Specific Fund Allocation (Dana Alokasi Khusus, DAK).	Non-physical DAK for reskilling programs Physical DAK for local infrastructure projects, creating temporary construction jobs	Rp 183 trillion
Village Fund (Dana Desa)	Create programs that encourage rural entrepreneurship (agriculture, fisheries, etc.); fund	Rp 71 trillion

⁴⁴ Shalati, S.N., and A. Budiono, 2025. "Indonesia's Coal Retirement Roadmap: How the new regulation can ensure a truly just transition," *Knowledge Hub, Just Energy Transition in Coal Regions* (June 25, 2025). <https://www.jetknowledge.org/insights/indonesia-coal-retirement-roadmap-how-new-regulation-can-ensure-truly-just-transition/> (accessed on August 14, 2026).

⁴⁵ Simanjuntak, U., and K. Hasjanah, 2023. "Mitigate the Impact of the Energy Transition in Coal-Producing Regions with Economic Transformation." IESR, Jakarta (September 1, 2023).

⁴⁶ RI, 2022b. Undang-Undang No. 1/2022 tentang Hubungan Keuangan antara Pemerintah Pusat dan Pemerintahan Daerah.

	cooperative-based employment programs for laid-off workers	
Regional Debt (Pinjaman Daerah)	Provide grants for MSMEs that are struggling with lower local spending	-
Regional Bond (Obligasi Daerah)	Create new industrial zones that can absorb the ex-coal workers into alternative industries	-
Regional Sukuk (Sukuk Daerah)	Finance sharia-compliant microfinance programs for local businesses, and provide funding for business diversification grants	-
Financing Synergy (funds sourced regionally or from other sources utilized to finance nationally or regionally prioritized programs).	Programs from JETP, PLN, or other local state-owned companies can be aligned to provide job or funding opportunities; also encourages public-private partnerships for industrial decarbonization, creating new employment opportunities	-
Regional Endowment Fund.	Annual funding for job creation and local business development programs	-

Table 2. Summary of financing modalities provided for regional governments to decouple their development from coal sectors according to Law No. 1/2022.

Ecology-based Fiscal Transfer (EFT) has been applied in Indonesia over the past five years with encouraging results. EFT is a way for the provincial government to receive additional financial resources upon achieving ecological indicators beyond the subnational boundaries.⁴⁷ Strong green leadership is key for local governments to build economic resilience against the potential impacts of CFPP retirements. Effective leadership can drive the adoption of environmental policies, support green infrastructure projects, promote environmental education, and maximize the use of local resources.

The phase-out of CFPPs and declining coal demand will reduce regional revenues, royalties, and employment. Regions with high coal dependency, such as East Kalimantan, South Kalimantan, and South Sumatra, will be most affected. Renewable energy, agriculture, fisheries, and tourism can partially compensate for the economic loss, but in most cases not on the same scale as coal production. An example can be seen in East Kalimantan, where the local government is trying to grow the tourism industry in the area through national parks, as well as building more palm oil and biodiesel facilities to replace coal in the future; however, according to one coal mine manager, this will not be remotely sufficient.⁴⁸ This mismatch may result in short-term fiscal gaps, reduced local government budgets, and delayed public investment, particularly if replacement sectors are not yet fully operational.⁴⁹ To mitigate these risks, public financing mechanisms, including DBH, CSR funds, central transfers, loans, bonds, and sukuk under the framework of Law No. 1/2022, will be critical, alongside strong institutional capacity and infrastructure support to accelerate the development of alternative economic activities and stabilize regional economies.

2.3 Reskilling

As an economy with a carbon-intensive energy system, transitioning to renewables may lead to several socio-economic changes. The most immediate impact is job losses in the CFPP sector and its key supply chain, such as in the coal supply sector (coal mines). Job losses present an additional challenge, as displaced

⁴⁷ Mumbunan, S., et al., 2012. *Ecological fiscal transfers at the provincial level in Indonesia*, UFZ Discussion Paper No. 06/2012 (March 2012). Helmholtz-Zentrum für Umweltforschung GmbH – UFZ, Leipzig. <https://www.econstor.eu/bitstream/10419/55837/1/687842077.pdf>

⁴⁸ Mafira, T., and S. Muluk, 2019. *From digging to planting: A sustainable economic transition for Berau, East Kalimantan* (August 27, 2019). Climate Policy Initiative, Jakarta; the statement by a coal mine manager was acquired in a discussion during a site visit in East Kalimantan by one of the authors.

⁴⁹ See, for example, Syarawie, M.M., 2025, "Perlahan 'Lepas' dari Batubara, Pemprov Kaltim Bidik Pertumbuhan Ekonomi 7 Persen pada 2026," *Bisnis.com* (November 18, 2025).

workers may struggle to find new employment that matches their existing skill sets. This challenge is compounded by a broader labor market constraint: the share of Indonesians not in employment, education, or training (NEET) remains high, at about 21.4 percent in 2023. This figure shows the percentage of people aged 15–24 who are not in productive activities. While Indonesia's NEET percentage is slightly lower than the Philippines' 21.8 percent, the highest in Southeast Asia, it is still significantly above Singapore's 6.8 percent, the lowest in the region.⁵⁰ These labor market conditions underscore the critical role of reskilling and workforce development programs in ensuring that displaced coal-sector workers can access new opportunities in renewable energy, manufacturing, and other emerging industries. However, the current reskilling pipeline may not yet be sufficient in scale or alignment to fully address the mismatch between jobs lost and jobs created.

MEMR has begun to address the issue of the shift in job requirements due to the energy transition. It has published a human resource development roadmap, specifically relating to “green jobs” alongside energy transition, in collaboration with the Ministry of Manpower, the Ministry of Education, and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) in May 2025. The roadmap includes the definition and classification of green jobs, skill mapping and workforce transitional pathways, and institutional coordination and labor market alignment. The ministry states that in 2025 approximately 4 million people work in green jobs, and this number will increase to 5.3 million in 2029. Meanwhile, the number of jobs that can be turned “green” is 56 million in 2025 and 72 million in 2029.⁵¹

The Kartu Prakerja (Pre-employment Card) Program may be the most strategic reskilling program to provide a safe landing to workers who lose their jobs due to the energy transition. Launched in 2022 through Presidential Regulation No. 113/2022 and followed by Regulation of the Coordinating Minister of Economic Affairs No. 17/2022, the aim of the Pre-employment Card Program is to empower job seekers (“Pre-employment Card holders”), especially those who have just lost their jobs, with new skills and competence. In 2024, it obtained a budget allocation of Rp 4.8 trillion (\$300 million). The 2021 program effectiveness review shows that it has reached the target beneficiaries. The majority of the beneficiaries of the program were from the informal sector, and about 84 percent had no prior training. All of them reported useful and positive experiences after the training program, acknowledging increased competence, raising awareness of the importance of training, and creating new habits. After the training, the beneficiaries maintained or improved their working status even when the COVID-19 pandemic caused a recession. About 35 percent of the beneficiaries who were unemployed when registering for the program had already been previously employed either as workers (18 percent) or entrepreneurs (17 percent).⁵²

A report mentions that the share of participants working rose from 39 percent at registration to 55 percent about two months after completing the program; within that,

⁵⁰ “ILOSTAT database.” ILO, Geneva. <https://ilostat.ilo.org/data/> (accessed on January 21, 2025).

⁵¹ Bappenas (Kementerian Perencanaan Pembangunan Nasional, the Ministry of National Development Planning), 2025. *Peta Jalan Pengembangan Tenaga Kerja Hijau Indonesia: Langkah Strategis Masa Depan Berkelanjutan dan Inklusif* (April 29, 2025). Kementerian Perencanaan Pembangunan Nasional, Jakarta.

⁵² “Hadapi Tantangan Masa Depan Ketenagakerjaan Global, Program Kartu Prakerja Merupakan Program yang Paling Siap dan Sudah Operasional.” Kementerian Koordinator Bidang Perekonomian, Jakarta. <https://ekon.go.id/publikasi/detail/4253/>; Prakerja (Manajemen Pelaksana Program Kartu Prakerja), 2021. “Sepertiga Penerima Kartu Prakerja yang Sebelumnya Menganggur Sudah Bekerja” (October 11, 2021). Manajemen Pelaksana Program Kartu Prakerja, Jakarta. <https://www.prakerja.go.id/artikel/insight/sepertiga-penerima-kartu-prakerja-yang-sebelumnya-menganggur-sudah-bekerja> (both accessed on August 14, 2026).

some participants became employees, and some became entrepreneurs.⁵³ However, there are contrasting findings from broader surveys, such as a 2024 survey suggesting that around 40 percent of program alumni were employed one year after training, with 60 percent still unemployed, among a large sample of approximately 17.5 million alumni.⁵⁴

Kartu Prakerja has evolved since its early implementation. Rather than issuing a physical card, the program now provides a 16-digit code to each participant, which can be used as a payment method for certified training programs. During the COVID-19 pandemic, Kartu Prakerja functioned as a semi-social assistance scheme, but it is currently being transformed back into a business-as-usual program, emphasizing sustainable skills development for workers in both the formal and informal sectors. This evolving structure positions the program as a key mechanism to facilitate the reskilling of coal-sector workers and support a just transition during Indonesia's energy transformation.

Vocational education is another reskilling opportunity. Out of Rp 97.7 trillion (\$6 billion) of the total budget for education, vocational education received about Rp 6.01 trillion (\$375 million), about 6.15 percent of the total. The strategy for vocational education includes strengthening the vocational high school centers of excellence, collaboration with business and industrial sectors, upskilling and reskilling of trainers and other vocational educational workers, certification of competence for vocational high schools and universities, provision of matching funds and competitive vocational funds, development of vocational university centers of excellence, work-skills and entrepreneurship education, and provision of operational assistance and infrastructure for vocational universities.⁵⁵ One such program is the *Balai Besar Pengembangan Penjamin Mutu Pendidikan Vokasi* (BBPPMPV) by the Ministry of Education, not only for education and training but also to enhance the quality of education in business and industrial sectors.

Leading universities and polytechnics have committed to contributing as training providers. Representatives from Bandung State Polytechnic, Indonesia University of Education, Jember State Polytechnic, the Centre for Development and Quality Assurance of Vocational Education in Mechanical and Industrial Engineering, Surabaya State Electronics Polytechnic, and Bandung Polytechnic of Energy and Mining have each contributed to shaping a cooperation framework that emphasizes the importance of synergy, both among institutions and with industry associations.⁵⁶ By involving leading universities and polytechnics as training providers, the program benefits from institutional expertise, structured curricula, and quality assurance mechanisms, while fostering stronger links between education providers and industry. This cooperation enhances the effectiveness of the Kartu Prakerja program and other government workforce initiatives by ensuring that training is relevant, up-to-date, and aligned with the evolving demands of the green and energy transition sectors.

Workers' development and vocational education programs were also carried out under the Ministry of Manpower. In the 2024 budget, the ministry allocated Rp 2.53 trillion for worker development and Rp 2.1 trillion for vocational education and

⁵³ Kamalina, A.R., 2024, "Gen Z dan Milenial Jadi Mayoritas Penerima Kartu Prakerja, Efektif Bantu Cari Kerja?" *Bisnis.com* (October 3, 2024).

⁵⁴ "60 Persen Alumni Kartu Prakerja Masih Menganggur, Pemerintah Sebut Angkatan Kerja Meningkatkan Tajam," *NTBSatu* (January 24, 2024).

⁵⁵ "Pagu Anggaran Kemendikbudristek Tahun 2024 Naik menjadi Rp97,7 Triliun," Ministry of Education, Culture, Research, and Technology (September 1, 2023). <https://www.kemdikbud.go.id/main/blog/2023/09/pagu-anggaran-kemendikbudristek-tahun-2024-naik-menjadi-rp977-triliun> (accessed on January 20, 2025).

⁵⁶ Nababan, H.F., 2025. "Indonesia-Jerman Bidik Kerja Sama Energi Hijau dan Peningkatan SDM," *Kompas* (June 18, 2025).

training.⁵⁷ The Ministry of Manpower provides competency certifications based on *Standar Kompetensi Kerja Nasional Indonesia* (SKKNI), which is a national standard for working competence in Indonesia. This allows workers to obtain work training with standards that are accepted nationally.⁵⁸

The Ministry of Energy and Mineral Resources has planned collaborations with state-owned and privately owned companies during the Human Capital Summit 2023. Pertamina will provide reskilling and upskilling through overseas training sessions and on-the-job training to support the implementation of clean, renewable energy. IEA and ERIA will develop capable human resources through education and research scholarships. State-owned companies, through MIND-ID, and international organizations such as OECD and the World Bank also have strategies to level up the skills of the State Civil Apparatus through training with local and international companies. The Mentari project, a joint program by the ministry and the British Embassy, will also support human capital development through *Badan Pengembangan Sumber Daya Manusia* (BPSDM), a regional governmental body that focuses on human resource development.⁵⁹

Aside from the public sector, the private sector also has to contribute to the reskilling/upskilling of its workers. Some mining companies in Indonesia have already taken steps to retrain their workers in alternative sectors, recognizing that long-term business sustainability requires preparing employees for opportunities beyond mining. For example, several firms have introduced programs to equip workers with skills in agriculture, entrepreneurship, renewable energy, and community-based economic activities, enabling them to adapt to new livelihoods as resource extraction declines. Such initiatives not only help reduce the social and economic risks of job displacement but also demonstrate how private sector engagement can complement government policies and educational institutions in building a workforce capable of thriving in a diversified economy.

2.4 Relocation

Renewable energy power plants will create more jobs than coal-fired power plants, but in other locations. Although a direct transition for workers who have lost their jobs in CFPPs to renewable power plants seems straightforward, the geographic landscape of Indonesia proves to be a challenge. As of 2023, most of Indonesia's IPP and PLN-owned CFPPs are located on the islands of Java and Sumatra, while the majority of captive power plants are located in Sulawesi and Maluku.⁶⁰ Coal production is also concentrated in East Kalimantan, South Kalimantan, and South Sumatra.

In contrast, the country's vast renewable energy potential is spread across different regions. Indonesia's renewable resources are unevenly distributed across the archipelago, and each is concentrated where its underlying geology or climate favors it. Geothermal potential, roughly 23 GW, follows the Ring of Fire, running through Sumatra, Java, Bali, Nusa Tenggara, and Sulawesi. Hydropower, at about 95 GW, is concentrated in North Kalimantan, Aceh, West Sumatra, North Sumatra, and Papua, where terrain and rainfall converge. Solar is by far the largest resource at some 3,294 GW and is available nationwide given Indonesia's equatorial position, though radiation

⁵⁷ DPR (Dewan Perwakilan Rakyat, the House of Representatives of the Republic of Indonesia), 2024. *Kumpulan Analisis Siklus Pembahasan Nota Keuangan dan RAPBN 2024: Mitra Komisi IX*. Dewan Perwakilan Rakyat, Jakarta.

⁵⁸ "Tentang SKKNI," Kementerian Ketenagakerjaan Republik Indonesia, <https://skkni.kemnaker.go.id/tentang-skkni/kelembagaan> (accessed on March 4, 2025).

⁵⁹ "Kementerian ESDM Selenggarakan High Level Human Capital Summit di JCC Senayan," BPSDM ESDM (Badan Pengembangan Sumber Daya Manusia Energi dan Sumber Daya Mineral) (March 21, 2023). <https://bpsdm.esdm.go.id/posts/2023/03/21/kementerian-esdm-selenggarakan-high-level-human-capital-summit-di-jcc-senayan/2429> (accessed on March 4, 2025).

⁶⁰ Parapat and Hasan, 2023, *op. cit.*

levels are highest in East Nusa Tenggara, West Kalimantan, and Riau. Wind potential of about 155 GW is concentrated where speeds exceed 6 meters per second — East Nusa Tenggara, South Kalimantan, West Java, South Sulawesi, Aceh, and Papua. Bioenergy, at roughly 57 GW, is distributed throughout the country, drawing on primary crops together with forestry, plantation, and industrial waste.⁶¹

The geographical shift in employment needs will require workers of the coal and CFPP industry to relocate permanently to other regions. Relocation will require additional financial resources to find a new place to live and adjust to the new area's culture and cost of living. Referencing past projects such as Indonesia's new capital city project, most workers are unwilling to relocate as they do not want to live far away from their families. This means mass relocation of workers who lost their jobs due to the retirement of CFPPs is highly unlikely; reskilling workers for jobs in other industries therefore appears much more feasible.

A comprehensive Just Transition approach is needed to support the regions impacted by energy transition projects. According to the Asian Development Bank (ADB), a subnational level of Just Transition approach for the Energy Transition Mechanism requires consideration of the availability of alternative employment, economic diversification, and the impacts on central and local government budgets. Investments are then prioritized in the social sector to create the conditions needed to absorb the impact of the energy transition.⁶²

3 Case Studies

3.1 The Early Retirement of CFPP in Cirebon

Early retirement of the 660 MW Cirebon Unit 1 will result in job losses for its employees. Cirebon-1 is owned by PT Cirebon Electric Power (CEP), a joint venture between companies from Japan, South Korea, and Indonesia. It has been operating since 2012, producing 5 TWh yearly, and is contracted to continue supplying electricity until 2042. It is now scheduled to retire seven years early, in 2035. Currently, a total of 472 workers are directly or indirectly involved at Cirebon-1, which can be classified as follows:⁶³

- PT Cirebon Electric Power employs 20 workers for administrative functions.
- PT Cirebon Power Services has 205 staff for operation and maintenance.
- 247 individuals outsourced from three outsourcing companies.

Manufacturing is Cirebon's largest industrial sector. It was the main driver of the regional economy during the pandemic and continued to expand afterwards, contributing significantly to regional GDP in 2020–2021. In 2023, more than 30.6 percent of the working population in Cirebon worked in the manufacturing industry.⁶⁴ As such, this industry can act as the main “soft landing” sector in the region. With programs from the Bank of Indonesia (BI) to focus on developing more MSMEs in Cirebon and plans to penetrate the export market through the opening of Cirebon Port, demand for labor is expected to increase.⁶⁵

⁶¹ ESDM, 2024b. *Potential of new and renewable energy in Indonesia as of June 2024* (August 7, 2024). Ministry of Energy and Mineral Resources, Jakarta; Puspitarini, H.D., 2021, “Beyond 443 GW: Indonesia's infinite renewable energy potentials” (October 25, 2021). IESR, Jakarta. <https://iesr.or.id/en/pustaka/beyond-443-gw-indonesias-infinite-renewable-energy-potentials/> (accessed on August 10, 2026).

⁶² Jeffries, A., 2023, *op. cit.*

⁶³ ADB (Asian Development Bank), 2024. *Cirebon Energy Transition Mechanism Pilot Project: Preliminary just transition assessment* (February 2024). Asian Development Bank, Manila.

⁶⁴ BPS Kabupaten Cirebon, 2025a, Percentage of working population by main industry in Cirebon Regency 2022–2023 (accessed on March 3, 2025). Badan Pusat Statistik, Jakarta.

⁶⁵ Ashri, A., 2023, “Adequate infrastructure, Cirebon's superior products have the potential to expand exports,” *Kompas* (November 23, 2023).

In terms of the region's reliance on the power plant, Cirebon-1's contributions are not significant. The CFPP's 660 MW capacity is connected to the Jawa-Bali-Madura grid, so its output can be readily covered by other grid-connected power plants. The Jawa-Bali-Madura interconnection experienced a peak load of 42,636 MW in 2024, which shows that Cirebon-1's contribution to the grid is not significant.⁶⁶ In terms of economic impact, the electricity generation in Cirebon makes up less than 0.2 percent of the region's gross domestic product.⁶⁷ This emphasizes that the most significant impact of closure will be on workers' livelihoods rather than on energy supply or the power grid. It is not, however, the only major impact.

Aside from its contracted employees, the retirement will also affect the coal supply chain, the local town economy, and the surrounding district of Cirebon.

The plant's exclusive port facility, which receives up to 12,000 tons of coal daily, along with associated logistics infrastructure such as trucks, transfer areas, and barges, will see reduced activity, affecting coal transport and supply businesses. Approximately 100 vendors, mostly in Cirebon, currently provide essential goods and services, including diesel oil, road maintenance, scientific services, chemical supplies, catering, and vehicle rentals. These businesses will experience a decline in demand, threatening their revenue and sustainability. The local cement industry, which relies on Cirebon-1 for fly and bottom ash, will also face supply disruptions.⁶⁸ Moreover, informal businesses, such as food stalls and housing providers catering to plant workers, will suffer income losses as their customer base diminishes.

3.2 Coal Mines in East Kalimantan

The retirement of Cirebon-1 CFPP will indirectly affect demand for coal from its suppliers. The plant's main suppliers are located in East Kalimantan, specifically in Paser Regency and Kutai, both of which are heavily reliant on coal mining as a driver of local economic activity. Under Indonesia's Domestic Market Obligation (DMO), coal producers are required to allocate at least 20 percent of their total production to meet domestic demand at a government-regulated price.⁶⁹ This means that the closure of Cirebon-1 not only reduces the immediate demand for coal but also amplifies the impact on suppliers: every unit of lost domestic demand represents five times that amount in total production capacity, since only one-fifth of output is permitted for domestic sales. As a result, mining companies may be forced to either find new domestic buyers in an already saturated market or redirect greater volumes to export markets, which are subject to fluctuating prices and rising competition.

In East Kalimantan, where coal is strongly tied to the local economy, regional development must be decoupled from coal mining to sustain the transition. With 35.8 percent of its regional GDP coming from coal mining, the phasing out of CFPPs will eventually lead to a significant loss in regional income. By 2030, the coal demand, domestically and internationally, will decrease by around 30 percent.⁷⁰ Developing a strategy beyond coal requires strengthening strategic sectors such as agriculture, manufacturing, and the informal economy by improving access to financing and systematically improving human resources capacity.

A study by the Institute of Essential Services Reform (IESR) shows the dependency of the Paser region on coal. The Benefit Sharing Fund (Dana Bagi

⁶⁶ PLN, 2024. *Statistik PLN 2024*. Perusahaan Listrik Negara, Jakarta.

⁶⁷ BPS Kabupaten Cirebon, 2025b, PDRB Kabupaten Cirebon menurut Lapangan Usaha (accessed on March 3, 2025). Badan Pusat Statistik, Jakarta.

⁶⁸ *ibid.*

⁶⁹ Siagian, A.W., and Haykal, 2024, "Kebijakan energi nasional: Analisis domestic market obligation batu bara dan energi terbarukan," *Majalah Hukum Nasional*, 54(1), pp. 1–22.

⁷⁰ Glen, 2024, "Ekonomi Kaltim Terancam: Batu Bara Diperkirakan Habis dalam Lima Tahun," *IniBalikpapan* (December 20, 2024).

Hasil, DBH) generated from coal mining accounts for 27 percent of the Paser Government's total annual revenue. In this area, the coal mining industry has also contributed 50 to 70 percent of the area's GRDP. However, only 20 percent of the added value is allocated to workers, while 78 percent becomes company surplus. While CSR programs are planned to support the economic transformation of the region using the DBH as its main source of funding, there remains a significant gap between the enormous economic value generated by the coal mining industry and its limited contribution to workers' incomes.⁷¹

3.3 Learning from Cases Around the World

The European Union's (EU) Just Transition Fund is helping Poland phase out its coal industry by 2049. As the most carbon-intensive economy in the EU, over 85 percent of Poland's energy mix relies on fossil fuels, with coal taking up 79 percent of the country's electricity production. Additionally, Poland is the EU's largest coal producer, responsible for 97 percent of its "hard coal" production. As such, there will be a significant impact when its remaining coal mines are scheduled to be shut down by 2049.⁷² The European Commission has adopted five programs for Just Transition away from coal in five regions in Poland, worth €3.85 billion in total. The fund will be used to diversify the local economy by investing in small and medium enterprises (SMEs) in the green sector, restoring environmental damage from mining activities, reducing energy bills of local citizens through the energy efficiency of buildings, and retraining current fossil fuel workers with new skills in renewable and climate-neutral industries.⁷³ Additionally, the Polish government and the Polish trade union representatives have agreed to relocation, early retirement packages, and severance pay for the coal miners.⁷⁴

The Sawahlunto Region in West Sumatra, Indonesia, was once one of the largest coal mining areas in what was then known as the Dutch East Indies. Developed by the Dutch during their colonial rule, its production peaked in 1930, when its 600,000-ton output supplied 90 percent of the colony's energy needs.⁷⁵ Starting in 2008, the mayor of Sawahlunto turned the coal mine into a geopark, attracting tourism to the area. It was designated a UNESCO World Heritage Site in 2019. Attractions and tourism activities related to geology, flora, and fauna can be found in the geopark.⁷⁶ Some residents have shifted their source of income to showcasing *songket* weaving or *wayang* performances, traditional cultural arts, for tourists.

4 Input-Output Analysis

An input-output analysis was conducted for West Java, South Kalimantan, East Kalimantan, and South Sumatra. The input-output analysis illustrates the flow of

⁷¹ Hapsari, A., et al., 2023. *Just transition in Indonesia's coal producing regions: Case studies Paser and Muara Enim* (September 1, 2023). Institute for Essential Services Reform, Jakarta.

⁷² Kardaś, S., 2023, "From coal to consensus: Poland's energy transition and its European future," *Policy Brief*. European Council on Foreign Relations, Berlin.

⁷³ "EU Cohesion Policy: €3.85 billion for a just transition toward climate neutral economy in five Polish regions," Press Release, European Commission IP/22/7413 (December 5, 2022). https://ec.europa.eu/commission/presscorner/detail/en/ip_22_7413 (accessed on August 11, 2026).

⁷⁴ "Poland's just transition for coal workers," *IEA Policies Database*, policy no. 17726 (last updated August 2, 2023). <https://www.iea.org/policies/17726-polands-just-transition-for-coal-workers> (accessed on August 11, 2026).

⁷⁵ Arsa, D., 2018, "The fall of Sawahlunto: Studi tentang pengaruh gejolak ekonomi-politik global terhadap perkembangan sebuah kota lokal, 1930–1940an," *Khazanah: Jurnal Sejarah dan Kebudayaan Islam* 8(15), pp. 49–64.

⁷⁶ "Pertama di Asia, Museum Situs Lubang Tambang Soero Sawahlunto Paling Disukai Wisman," Sawahlunto City Government Tourism, Youth, and Sports Office (2024). <https://sawahluntotourism.sawahluntokota.go.id/baca/pertama-di-asia-museum-situs-lubang-tambang-soero-sawahlunto-paling-disukai-wisman> (accessed on March 13, 2025).

economic value from coal-producing provinces to electricity consumers in West Java and other regions. Specifically, it shows how coal mined in East Kalimantan and South Sumatra feeds into electricity generation in West Java, supporting, among others, agricultural demand. By quantifying these flows, the analysis highlights the interconnectedness of regional economies and identifies which provinces are most directly exposed to economic impacts from early CFPP retirement. The analysis draws on Indonesia's 2016 Interregional Input-Output data.⁷⁷ West Java is the province where the Cirebon-1 power unit is located, while South Kalimantan, East Kalimantan, and South Sumatra are Indonesia's largest coal-producing provinces. The summary of the input-output table can be found in Appendix A.

The table underscores a strong link between West Java's electricity sector and coal mining in East Kalimantan and South Sumatra. The data shows that East Kalimantan contributed Rp3.3 trillion worth of coal from its mines toward West Java's electricity production, while South Sumatra contributed Rp1.9 trillion, out of total coal production of Rp22.1 trillion and Rp9.8 trillion respectively. With the early retirement of the Cirebon-1 power plant, this demand will decline considerably, affecting coal production levels. This will eventually affect the local economies of these mining regions, in addition to the power plant region.

While West Java is Indonesia's largest electricity-producing province, the Cirebon-1 CFPP itself represents only a portion of the total generation capacity. Being Indonesia's most populated province and having the largest industrial areas, West Java produces and consumes a large amount of electricity. This can be seen in the data, where industrial electricity consumption is Rp47.6 trillion and household consumption Rp13.5 trillion, far more than the other provinces. Nevertheless, the plant is linked to local value chains and industrial electricity consumption, and its closure will require careful planning to ensure an alternative power supply and maintain economic activity.

The agriculture sector is highly dependent on electricity, with a total consumption of Rp26 million across the four provinces. As coal power is phased out, alternative energy sources will be essential to meet industry demand. With plans to further expand the agricultural sector, the need for additional electricity-generating capacity will become even more critical.

Most of Indonesia's coal is exported internationally. The three coal-producing provinces export a total of Rp233 trillion worth of coal, far more than Indonesia consumes domestically. Indonesia's coal economy is therefore more dependent on the international market than on the domestic one. India and China are the largest importers of Indonesian coal.⁷⁸ Although most Indonesian coal is exported internationally, domestic consumption by plants such as Cirebon-1 creates significant indirect linkages to mining provinces. As global coal demand declines due to net-zero targets in major importing countries, these domestic linkages become increasingly important for understanding the social and economic exposure of both producing and consuming regions, reinforcing the need for targeted support in a just transition.

Key takeaways from the input-output analysis include: (i) coal flows from mining provinces to electricity generation and industrial sectors create strong economic interdependencies; (ii) CFPP retirements have localized impacts in the host province but ripple upstream to coal-producing regions; (iii) alternative electricity generation is required to sustain industrial and household demand; and (iv) declining international coal demand

⁷⁷ BPS, 2021. *Tabel Interregional Input-Output Indonesia Tahun 2016 Tahun Anggaran 2021*. Badan Pusat Statistik, Jakarta.

⁷⁸ Statista, 2024b. "Export volume of coal Indonesia 2023, by country of destination," Statista. <https://www.statista.com/statistics/1382813/indonesia-coal-export-volume-by-country-of-destination/> (accessed on March 27, 2025).

heightens the urgency of planning coordinated regional interventions for affected economies. This analysis provides a quantitative basis for prioritizing regions and sectors in transition planning and for designing policies that address both upstream and downstream impacts.

5 Currently Available Public Funding

5.1 Government Partnerships

The Indonesian government has been looking to partner with international and national organizations to raise funding for the energy transition. In addition to the \$20 billion JETP fund, the Indonesian government is also collaborating with the World Bank Group and ADB to develop the Climate Investment Funds Accelerating Coal Transition (CIF-ACT) to formulate investment plans and Strategic Environment and Social Assessment (SESA) plans. The investment plan was developed in 2022 and endorsed soon after, with the intention that initial implementation occurs between 2023 and 2025, aiming to accelerate the early retirement of up to 2–3 GW of CFPP capacity by 2030. Although the plan itself was set up as a long-term operational program (up to 2047), most of the retirement activities are frontloaded to 2023–2025 to align with JETP and CFPP retirement ambitions. The funding for this program is expected to be about \$500 million, most of which will be allocated to the early retirement plans of CFPPs. 5 percent will be used for governance to formulate relevant regulations, 25 percent for the people and communities identified by SESA to be impacted by the energy transition, and 70 percent for infrastructure development and repurposing of retired CFPPs.⁷⁹ The \$500 million is far from sufficient on its own; it is intended only as a catalytic financing envelope, unlocking larger pooled funds and blended finance for the transition. The required funding for retiring coal plants by 2030 is estimated to be on the order of \$4–5 billion. Additional renewables or grid upgrades could raise the total financing needs to tens of billions by 2040 or beyond.⁸⁰ As a development finance institution (DFI), PT Sarana Multi Infrastruktur (SMI) provides public financing that can be chosen by local governments according to their needs, such as regular local government financing, program financing, financing to local institutions (local government-owned companies and public service agencies at the national and local levels), and sharia public financing.⁸¹ SMI is positioned as a financing intermediary, blending the CIF-ACT concessional loans with other resources, such as government investment funds, and commercial senior and subordinated debt.⁸²

Thus far, CIF-ACT funding has primarily supported the planning and institutional groundwork for Indonesia's coal transition rather than large-scale plant retirements. It has enabled the development of socio-economic impact assessments, just transition frameworks for workers and communities, and the design of blended finance structures such as the Accelerating Coal Retirement Facility (ACRF). These efforts have strengthened the capacity of PLN, local governments, and other stakeholders to manage early retirements, assess social impacts, and coordinate

⁷⁹ Theresya, J., 2023, *Mengoperasikan keadilan di dalam konsep transisi energi berkeadilan di Indonesia* (October 2023). Indonesia Research Institute for Decarbonization, Jakarta.

⁸⁰ Simanjuntak, U., 2025, "Retreat from early CFPP retirement risks stalling Indonesia's green energy transition," IESR, Jakarta. <https://iesr.or.id/en/retreat-from-early-cfpp-retirement-risks-stalling-indonesias-green-energy-transition/> (accessed on August 14, 2026).

⁸¹ "Pembiayaan Publik," SMI (PT Sarana Multi Infrastruktur). <https://www.ptsmi.co.id/pembiayaan-publik> (accessed on November 23, 2024).

⁸² BKF (The Fiscal Policy Agency of the Ministry of Finance of the Republic of Indonesia), 2023. *CIF Accelerating Coal Transition (ACT): Indonesia Country Investment Plan (IP) Revision*. Badan Kebijakan Fiskal, Jakarta.

financing. However, actual deployment of funds to finance widespread CFPP closures remains limited.⁸³

5.2 Government Programs

In addition to partnerships, the Indonesian government also has programs that can be redirected toward energy transition. Some of these programs are related to the reskilling or upskilling of workers, which can be funneled toward the workers of the fossil fuel mining and electricity generation industry who may lose their jobs, while others are related to the development of soft-landing sectors to help absorb these workers. Below are a few examples of the domestic programs, with the full details in Appendix B:

- Jaminan Kehilangan Pekerjaan (Job Loss Insurance) provides financial support to workers who lose their jobs due to industrial restructuring, including retraining allowances and temporary income support. This program can directly assist displaced coal and power plant workers during the transition period.
- Kartu Prakerja (Pre-employment Card) is a national reskilling and upskilling program that empowers unemployed or underemployed workers with vocational training and entrepreneurship support. The program has successfully helped participants gain employment or start small businesses, and it could be targeted to fossil fuel sector workers to prepare them for jobs in renewable energy or other sectors.
- Platform SiapKerja is a digital platform that connects job seekers with training opportunities and employment, allowing displaced workers to identify and access skills development and job matching programs efficiently.
- Kopdes Merah Putih (Cooperative Development Program) supports the growth of microbusinesses and cooperatives, offering training, funding, and technical assistance. This program can help absorb workers into soft-landing sectors and promote entrepreneurship as an alternative livelihood.
- Food Estate Program expands agricultural production areas and provides employment opportunities in agribusiness, logistics, and processing, which can serve as a source of employment for workers transitioning from coal and electricity sectors, as agriculture has historically absorbed large numbers of displaced workers during economic disruptions.

6 Conclusion

Key Findings are as follows:

- The retirement of Cirebon-1 CFPP will have significant socio-economic impacts, particularly on the plant's employees and local businesses in the coal supply chain.
- Reskilling and soft-landing sector programs are critical to support workers left jobless by the retirement of the power plant. Agriculture, MSMEs, and renewable energy are the most likely absorbers.
- Coordination across national and subnational governments — between ministries, local authorities, and financial institutions — is essential to implement policies that are socially equitable and do not conflict with each other.
- Public funding and transition support mechanisms are necessary to address the short-term economic changes and maintain stability within the affected regions.

The early retirement of the Cirebon-1 CFPP represents both a significant challenge and a unique opportunity to demonstrate a just and equitable energy

⁸³ CTC (Coal Transition Commission), 2024. *Accelerating Coal-to-Clean Energy Transitions: First Report and Recommendations of the Coal Transition Commission*. Coal Transition Commission, London, Brussels, Berlin, and Singapore.

transition in Indonesia. To ensure that the process minimizes socio-economic disruption while promoting sustainable development, a coordinated approach involving multiple stakeholders is essential. Targeted reskilling and retraining programs are critical to prepare displaced workers for emerging sectors, including renewable energy, agriculture, and MSMEs. National programs such as Kartu Prakerja, SiapKerja, and Job Loss Insurance can be strategically aligned to provide practical skills, employment pathways, and temporary income support, while the Ministry of Cooperatives and SMEs can support the expansion of MSMEs through grants, technical assistance, and incentives, enabling these enterprises to absorb additional workforce. Ministry of National Development Planning (Bappenas), MEMR, and the Ministry of Manpower need to be coordinated, possibly through a joint task force, to align essential programs, reduce duplication, and ensure efficient use of public resources.

Private sector engagement is equally important. Companies in the energy, industrial, and critical minerals sectors can play an active role by employing retrained workers, repurposing retired CFPP infrastructure, and creating new industrial opportunities. Public-private partnerships, tax incentives, and co-investment schemes can help scale workforce absorption and foster the development of green industries. At the regional level, local governments should integrate transition-specific economic planning, identifying growth sectors beyond coal and ensuring economic resilience. Initiatives such as the Food Estate program and expansion of agriculture can provide alternative employment opportunities, while regional hubs for training and innovation can serve as centers of excellence for implementing just transition strategies.

Financing mechanisms, including CIF-ACT, JETP, and PT SMI funds, must be leveraged not only to support early CFPP retirement and renewable energy deployment but also to provide social protection, including income support, unemployment benefits, and healthcare. Transparent monitoring and reporting will be crucial to ensure that these funds achieve maximum impact. Indonesia's energy transition should also be linked to the development of critical minerals and clean technologies such as batteries and electric vehicles, creating high-skill employment opportunities and long-term economic value for the country.

Given Indonesia's parallel energy transition paths, policymakers should adopt a holistic, integrated approach by aligning coal phase-out plans with renewable energy expansion, grid reinforcement, and strategic development of the domestic critical minerals industry. This approach ensures that the transition not only reduces carbon emissions but also strengthens national industrial capabilities and supply chain resilience.

Finally, CFPP retirement schedules should be coordinated with renewable energy expansion and grid upgrades to maintain electricity reliability and prevent local shortages or industrial disruptions. Coordinated action among Bappenas, MEMR, the Ministry of Manpower, financial institutions, and academic partners can align programs, reduce duplication, and optimize the use of public resources. By prioritizing reskilling, economic diversification, private sector engagement, strategic financing, and grid readiness, policymakers can ensure that the transition not only safeguards the livelihoods of affected workers but also strengthens local economies and advances Indonesia's climate and industrial objectives. The Cirebon-1 retirement can thus serve as a replicable model for future coal plant retirements, demonstrating how proactive planning and integrated strategies can achieve a socially and economically just transition to a low-carbon energy system.

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Appendix A. Input-Output Table Summary

(million Rp)	Output	West Java			South Kalimantan			East Kalimantan			South Sumatra			Total
Input		Coal Mining	Electricity Generation	Agriculture	Coal Mining	Electricity Generation	Agriculture	Coal Mining	Electricity Generation	Agriculture	Coal Mining	Electricity Generation	Agriculture	
West Java	Coal Mining	-	-	-	-	-	-	-	-	-	-	-	-	0
	Electricity Generation	-	47,600,817	9,077	1,100	3,092	1	1	12	-	4	672	-	47,614,775
	Agriculture	-	920	4,446,274	-	-	-	-	-	2,624	-	4	5,357	4,455,179
South Kalimantan	Coal Mining	-	-	-	46	1,395,192	-	-	-	-	-	-	-	1,395,238
	Electricity Generation	-	959	-	938,904	2,623,565	1,728	-	2	-	1	103	-	3,565,261
	Agriculture	-	-	-	-	14	688,878	-	-	14,013	-	-	-	702,905
East Kalimantan	Coal Mining	-	3,299,494	1	128	52,051	-	17,061,879	1,724,599	5,062	206	22	5	22,143,447
	Electricity Generation	-	1,315	-	235	650	-	212,257	4,057,718	4,831	9	142	-	4,277,156
	Agriculture	-	-	679	-	-	2,919	-	87	1,300,376	-	-	-	1,304,061
South Sumatra	Coal Mining	-	1,863,997	1	144	51	-	93	6	4	5,390,450	2,538,557	2,021	9,795,323
	Electricity Generation	-	27,170	5	4,782	13,424	9	9	54	-	61,401	10,597,780	10,431	10,715,065
	Agriculture	-	-	58,467	-	-	-	-	-	-	-	64	3,075,879	3,134,409
Domestic Input		-	47,601,737	4,455,351	1,100	3,092	1	1	12	2,624	4	676	5,357	
International Import Input		-	555,440	749,031	3,766,870	360,287	185,658	3,581,583	96,105	333,750	2,042,640	52,308	458,107	
Interprovincial Import Input		-	5,192,934	59,153	944,240	4,084,946	693,533	17,274,238	5,782,467	1,324,286	5,452,067	13,136,667	3,088,336	
Total Input		-	53,350,110	5,263,534	4,712,209	4,448,325	879,192	20,855,822	5,878,583	1,660,659	7,494,711	13,189,652	3,551,799	
Gross Added Value		-	7,754,510	100,381	60,430,959	305,014	(169,916)	167,393,949	(262,763)	8,119,093	6,315,394	1,181,434	14,074,696	
Total Input		-	61,104,621	5,363,915	65,143,168	4,753,339	709,277	188,249,771	5,615,820	9,779,752	13,810,106	14,371,085	17,626,495	

(million Rp)		Total Domestic Demand				
		Household	Non-Profit Organizations	Government	Gross Fixed Capital Formation	Inventory Changes
West Java	Coal Mining	-	-	-	-	-
	Electricity Generation	13,489,846	-	-	-	-
	Agriculture					
South Kalimantan	Coal Mining	1	-	-	1	72,810
	Electricity Generation	1,187,633	-	-	85	-
	Agriculture					
East Kalimantan	Coal Mining	9,457	-	-	446,902	-103,514
	Electricity Generation	1,337,084	-	-	1,228	-
	Agriculture	1,965,379	-	-	6,267,138	233,916
South Sumatra	Coal Mining	27,800	-	-	3,367	39
	Electricity Generation	3,655,374	-	-	213	-
	Agriculture	3,596,905	-	-	10,705,447	-453,994

Exports		
Interprovincial Export	International Export	Total Export
-	-	-
-	-	-
	908,736	908,736
-	63,675,118	63,675,118
-	360	360
-	6,372	6,372
-	165,753,479	165,753,479
-	352	352
-	9,258	9,258
-	3,983,576	3,983,576
-	434	434
-	643,727	643,727

Total		
Total Domestic Demand	Final Demand	Total Output
-	-	-
13,489,846	61,104,621	61,104,621
908,736	5,363,915	5,363,915
63,747,930	65,143,168	65,143,168
1,188,077	4,753,339	4,753,339
6,372	709,277	709,277
166,106,324	188,249,771	188,249,771
1,338,664	5,615,820	5,615,820
8,475,691	9,779,752	9,779,752
4,014,782	13,810,106	13,810,106
3,656,021	14,371,085	14,371,085
14,492,086	17,626,495	17,626,495

Appendix B. Available Government Programs

Program	Government Unit	Funds	Description
Jaminan Kehilangan Pekerjaan (JKP)	- Ministry of National Development Planning - Social Security Administrator for Employment		A social security system for workers who have recently lost their jobs. It can be in the form of cash, career counseling, or training. Historically, people have chosen cash most of the time. However, the system is designed for business-as-usual scenarios rather than for the energy transition.
Kartu Prakerja	- Coordinating Ministry for Economic Affairs - Ministry of Finance - Ministry of National Development Planning - Ministry of Manpower - Ministry of Industry - Ministry of Education and Culture - Ministry of Home Affairs	Rp 4.8 trillion	Rather than a physical card, it is a 16-digit code given to everyone who signed up for the program. The workers can then use this as a payment method for certified training. During the COVID-19 pandemic, the system was a semi-social assistance scheme; it is now being transformed into a normal business-as-usual scheme.
Platform SiapKerja	Ministry of Manpower	-	A platform that supports the Indonesian workforce through training and information about job vacancies in the country and abroad. It is used in conjunction with Kartu Prakerja to allow workers to attend complimentary training sessions.
Sekolah Menengah Kejuruan (SMK) / Vocational High School	Ministry of Primary and Secondary Education	Based on DAU, split toward every district	A formal education equivalent to secondary school, but specifically designed to equip students with practical skills for immediate employment after graduation.
Vocational Studies	Ministry of Higher Education, Research, and Technology	Based on DAU, split toward every district	It is a formal education at the higher education level, designed to equip students with specialized practical skills and industry-specific knowledge. Graduates are awarded Diploma degrees.

	Human Resources Development Agency of Energy and Mineral Resources		Some universities have partnered with international organizations to enhance their renewable energy technology vocational programs. For example, the Swiss State Secretariat has supported four polytechnics by providing laboratory equipment and technical assistance.
Teaching Factory (TEFA)	- Ministry of Primary and Secondary Education - Ministry of Higher Education, Research, and Technology	-	A vocational education model that is applied to both secondary and higher education level vocational studies. It integrates production-based learning with industry standards, aiming to bridge the gap between theoretical knowledge and practical skills needed in the real world. The Teaching Factory guide was released by the Directorate General of Vocational Studies in 2024.
Koperasi Desa Merah Putih	- Ministry of Cooperatives - Regional Government (governors, mayors, regents, and village heads)	Rp 210-350 trillion	This village cooperative is a national program created to provide financial aid to villagers. A government-approved funding program will reduce the need to rely on illegal online loans. State-owned banks are tasked to give an initial loan of Rp 5 trillion to each village cooperative, which will be used for building supporting assets.
Food Estate	- Ministry of Agriculture - Ministry of Defence - Coordinating Ministry for Food Affairs	Rp 124.4 trillion	A program for developing food production, integrating agriculture, plantations, and animal husbandry. While an early version of this initiative was introduced in 1984, the current Indonesian government plans to significantly expand its scale, making it a key priority under the new administration. hectares of farmland in Merauke, Papua, Kalimantan, and Sumatra are to accommodate this expansion, and collaborations with Singapore are issued to enhance farming technologies and food security. The additional farmland will create employment opportunities, helping to absorb displaced workers affected by the energy transition.



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