Status Report of the Coal Sector in Indonesia

Pathways and barriers towards a Just Energy Transition

February 2025

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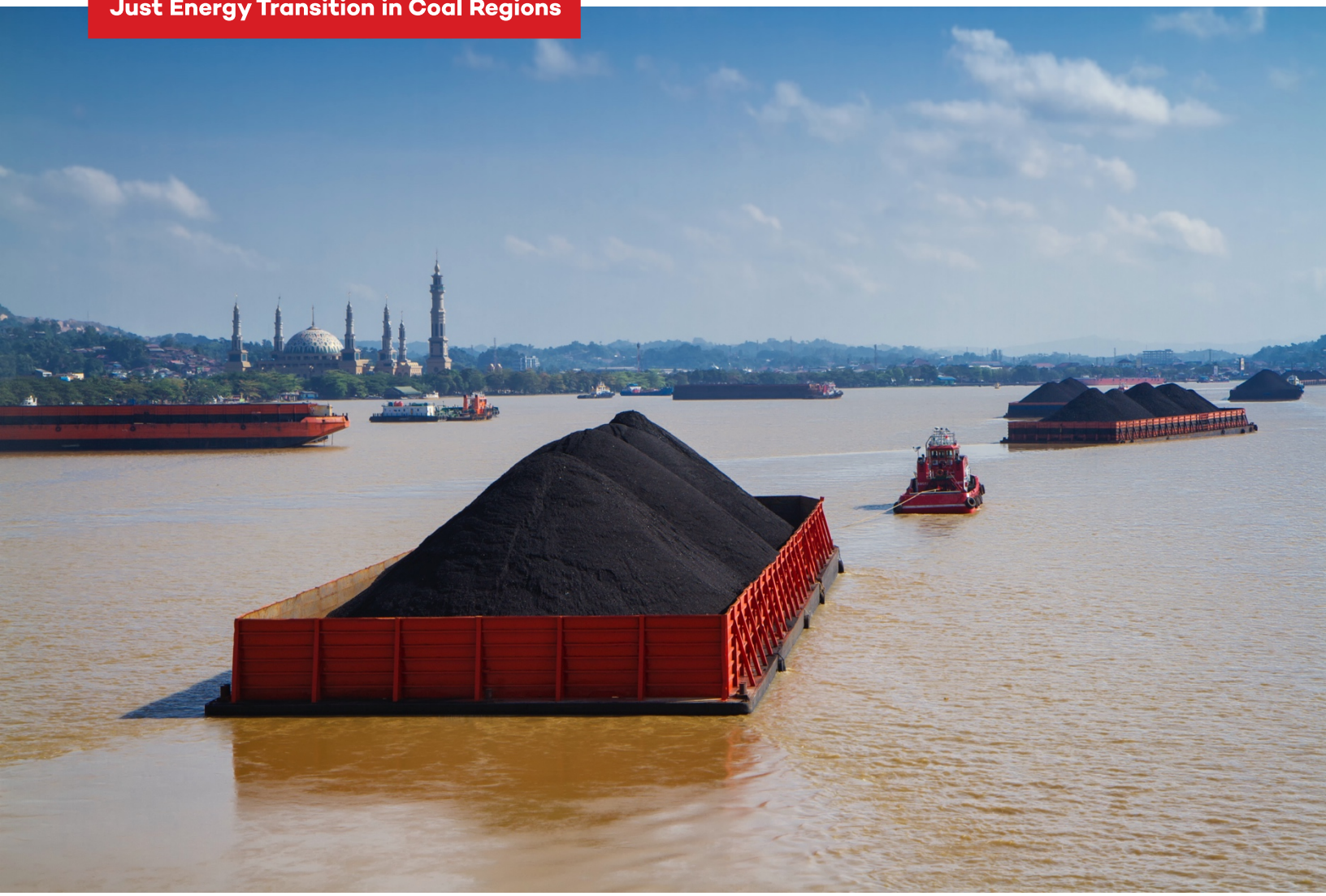
Just Energy Transition in Coal Regions



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IKI JET and its JET-CR Platform aim to support and accelerate just energy transitions away from coal to renewable energies and other sustainable economic activities in Colombia, Chile, South Africa, India, Indonesia, Vietnam, Thailand, and Mongolia.

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It aims to particularly amplify the voices of workers and communities dependent on coal showing how knowledge can work in practice. It also turns practice into knowledge by bringing local experience into global conversations and advancing just energy transition expertise.

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Executive Summary

As announced at COP26, **Indonesia aims to achieve net zero emissions by 2060** or sooner. At the same time, the country formulated **ambitious development targets** to close the gap with advanced economies by 2045. Despite the country's recent achievements, Indonesia still has a long way to go to achieve these goals, especially in the energy sector. Indonesia is currently the world's third-largest coal producer and home to large amounts of coal resources (IEA, 2022a). With a young coal fleet, a high share of coal in the energy mix and local economies in coal regions highly dominated by the mining industry, the country ranks highest in the world in terms of exposure to the effects of a coal phase out (IEA, 2024). This makes the **transition away from coal challenging, yet at the same time increases the urgency** for early strategic action.

This report **summarizes the status quo of knowledge about the coal industry in Indonesia** in the context of a foreseeable coal phase out. It also identifies current relevant **knowledge and data gaps** that can inform the research agenda in the nexus of a sustainable transition in coal regions and beyond. Two of the main coal regions, **East Kalimantan** and **South Sumatra** are analyzed more in detail. Furthermore, this report presents an overview of the **gender implications** of coal transitions in Indonesia.

Renewable alternatives have great potential in Indonesia, yet the energy system is oversupplied and incentivized to produce electricity from coal-fired power plants

Coal has been massively expanded domestically and now dominates the energy supply. The energy system in Indonesia is **characterized by a large overcapacity in electricity generation** due to overestimated electricity demand. This overcapacity is currently one of the biggest barriers to a transition to higher shares of renewables and away from coal, also due to long-term power purchase agreements (PPAs) between IPPs and PLN, which have so far hindered the early retirement of coal plants. Furthermore, recent announcements to significantly ramp up nickel processing and therefore a subsequent increase of captive coal fired power plant capacity provide a high risk for further fossil lock-in and would be detrimental to the achievement of Indonesia's climate goals.

Coal fuels the economy and state revenues, but shifting to alternatives could even improve its growth

For decades, the mining sector has played a pivotal role in fueling Indonesia's economic growth, emerging as a key driver of the nation's GDP. **In 2022, the coal sector contributed approximately 3.6% to the national GDP** (IEA, 2022a). Approximately 80% of the produced coal in Indonesia is exported, primarily to countries such as China, India, South Korea and the Philippines. Coal accounted for 11.4% of the total export value of goods in 2022, helping the country to achieve a balanced trade sum between imports and exports in the last decade.

The coal sector contributes strongly to state revenues. Over the past four years, coal revenue has averaged over IDR 31 trillion (2.17 billion USD). Additional revenue comes from a net profit-sharing mechanism that was introduced in 2021, but there is no publicly available data on its distribution among governmental levels.

Given the strong impact on state revenues, but also some additional activities such as mining companies' Corporate Social Responsibility (CSR) or Community Empowerment Program (Program Pemberdayaan Masyarakat, PPM) on a local level, Indonesia's society has benefitted significantly from the coal sector. However, at the same time, coal mining generates little value-added per output as compared to other economic sectors, which at the very least **challenges the narrative of "coal mining brings prosperity to the regions"**. This is further underpinned when the macroeconomic and socio-economic secondary costs of coal such as subsidies and costs of air pollution are also taken into account.

Jobs in the coal industry are expected to decline after 2030, but new (green) jobs can replace them

Total (formal) employment, in the coal industry is estimated between 250,000 (IESR, 2022c) and 400,000 workers (IEA, 2024). Compared to alternatives in the main coal regions and the level of education required, formal jobs in the coal sector are well paid and perceived as attractive. A potential energy transition will come hand in hand with a decline in employment in the sector along the entire coal supply chain. However, according to scenarios from several Indonesian and international and research institutions, **the transition to a green economy development path is projected to lead to a net gain in employment**, as more jobs are expected to be created than lost. Agriculture, forestry, and fishing, and manufacturing sectors are projected to expect a net growth in employment.

The ecology in coal regions is suffering and proper mining rehabilitation remains a challenge

In Indonesia coal production has led to various environmental problems, including **deforestation and degradation of soil, water and biodiversity** (Bian et al., 2010; Pratiwi et al., 2021). To counteract the negative impacts of mining, restoration efforts are therefore crucial. Reforestation is generally considered to be the best ecological and economic option (Pratiwi et al., 2021).

Under the law, reclamation of mines is a mandatory activity to be carried out at all stages of mining activities. However, there is an indication that **former mining sites are being left abandoned,** posing a severe threat to the environment and safety (Listiyani et al., 2023). In the academic discussion, the reasons for failed land rehabilitation are seen in loopholes in the legislation, but also potential limited capacity for oversight from regional authorities (Nasir et al., 2023; Wicaksono & Rahmawati, 2024).

In coal producing provinces, economic dependency is high. Solutions need to take local conditions and the strengths of the regions into account

While at the national level, the role of coal is not as significant compared to other sectors, the **coal mining regions are deeply affected by the state and activities of the industry**, not only in economic terms, but also in regards to jobs, the environment, and state revenues. For instance, in East Kalimantan, coal mining accounts for 30-35% of the GRDP (Jati, 2023a; Tate et al., 2023) and 11% of total (formal) employment (IESR, 2022c).

With a foreseeable future of declining coal demand, both East Kalimantan and South Sumatra are actively seeking alternatives. In South Sumatra, the conditions for solar PV and geothermal energy are good, and projects have been started in the region. A new energy transmission line to Java Island is currently discussed, yet financing this grid expansion is considered as challenging.

In **East Kalimantan** hopes are high that the development of the new capital, Nusantara, to provide a significant boost to the region's economic growth as well as new renewable energy projects and tourism. However, the exceptionally high share of the coal sector in the GRDP will be challenging to replace and puts the region at high risk of economic depression if coal demand drops rapidly without additional support.

For **South Sumatra**, the economic dependency is not at the same level, but still significant. The conditions for solar PV and geothermal energy are very good, and some first projects have been started in the region that could be the starting point for greater development. A new energy transmission line to Java Island is also currently discussed, yet financing this grid expansion is considered as challenging.

The transition away from coal will affect men and women differently

Although women make up only 6% of the formal coal mining workforce in Indonesia, they are also severely impacted by a coal transition that is often overlooked. As mining activities decline, women also suffer the negative impacts in the region, such as job losses in the informal sector, reduced access to basic services, and increased caregiving responsibilities, exacerbating existing inequalities. A more equitable approach to the transition is needed to empower women economically, politically, and socially, thereby contributing to overall resilience and fostering sustainable development in Indonesia.

Data and knowledge gaps

To successfully supporting the transition to a climate-neutral future, policies must provide the right incentives for the system to change. Identifying these levers require a deep understanding of the situation in the country, and even more about the subnational level in the coal regions that will be most affected by the changes and will require targeted support.

Table 1 below shows the most important data gaps and links to a possible research agenda that could be pursued to fill these data gaps. The elements highlighted in bold are especially relevant as they are either pre-requisites for essential studies or very time-critical due to the timelines of policy development processes for mid- and long-term development strategies.

Most importantly, there is an **urgent need for reliable sub-national data, such as on the characteristics of the coal labor market and of the informal sector**, but also on costs of renewable energy components. **Regional projections of the potential development of different sectors** are necessary to plan labor market and retraining measures. Studies on future domestic coal demand, the potential benefits and estimated costs of the transition can further inform policy development and the public about the pathway towards a climate neutral future.

Table 1. Summary of data and knowledge gaps gathered in this report

	Data missing on the following level:			Analysis needed on the following level:	
Data gaps	national	sub-national	**Knowledge gaps & research agenda**	national	sub-national
Disaggregated data on state revenues from coal mining		X	**Analysis of future domestic coal demand and use in Indonesia**	X	X
			Pros and cons of inter-island grids		X

Data gaps	Data missing on the following level: national	sub-national	Knowledge gaps & research agenda	Analysis needed on the following level: national	sub-national
Disclosed data on the amount of coal subsidies	X*	X	Aggregated costs of the coal price cap mechanism for Indonesia	X	
Data on the informal coal sector: Number of jobs, income data, share of local GDP, type of jobs in the sector	X*	X	Projected economic and social costs of continued coal mining and use	X	X
Number of coal mines undergoing rehabilitation	X*	X	Impacts of a decline in coal mining on different social groups (indigenous people, rural communities, women, etc.)	X	X
Data on coal workers' characteristics (age, education, gender, share of workforce along the value chain, wages, willingness to move to other regions)	X	X**	**Scenarios about future sector development potential** under different economic diversification strategies	X	X
Data on top-soil storage process, compliance with soil storage obligations	X	X	**Projections of economic benefits of renewables** under different cost and policy scenarios		X
Number of untreated cases of AMD in mines	X	X	**Localized projections of job losses and gains** based on transition scenarios	X	X
Cost structures of renewable energy and energy storage	X	X	Impacts of coal mining in Indonesia on biodiversity and local ecosystems and human well-being.	X	X
Aggregated data on mining sector mid-to long-term economic planning	X	X**	Assessment of the quality of the mine reclamation measures	X	X
			Economic valuation of Indonesia's primary forests and ecosystem services versus coal mining		X

*Estimates available only

** Data is only available for some companies

Policy recommendations

Based on the findings of this report, including the identified data gaps and proposed research agenda, we derive the following policy recommendations (More details on each recommendation are given at the end of the full report):

- **Start now**: regional transition and economic diversification processes take decades and a coal phase-out may come earlier than what most stakeholders expect today.
- **Do not fly blind**: Indonesia needs to establish long-term data collection especially on labor market indicators to better understand the status quo of the transition and future challenges.
- **Set up targeted financial support:** Establishing a dedicated fund or another financial support for the core coal regencies would allow those regions to prepare for the transition. It is easier doing so in times when high coal rents provide governmental incomes - it becomes harder when the decline of coal mining has already started.
- **Set up coordinating governance mechanisms:** A just transition commission on the national level and a transition agency on the regional level could help to coordinate the transition process and communication between all stakeholders, which helps to improve overall governance efficiency.
- **Reform the energy policy framework**: In other coal regions around the globe, one of the first steps to get started with the transition are investments into renewables, but in Indonesia this is hardly seen due to fossil subsidies and policy framework conditions. This urgently needs to change.
- **Do not forget about the 'just' part in just transition:** dedicated measures should support the most vulnerable, e.g., via reskilling and training opportunities, strengthening education and overall living conditions.
- **Ensure proper mine rehabilitation**: Implementation and enforcement of existing laws has been lacking, but is an important precondition for economic development for local communities.
- **Make the transition gender-just:** A more equitable transition empowers women economically, politically, and socially, contributing to overall resilience and fostering sustainable development in Indonesia.

Table of Content

List of Figures

List of Tables

Abbreviations and Acronyms

ADB	Asian Development Bank
AMD	Acid Mine Drainage
BAPPEDA	Ministry of Regional Development Planning
BAPPENAS	Ministry of National Development Planning
BAU	Business as Usual
BECCS	Bioenergy with carbon capture and storage
BPDLH	Environmental Fund Management Agency
BNPB	The National Agency for Disaster Countermeasures
BPP	Average Electricity Generation Basic Cost
BPS	Statistics Indonesia
BRIN	National Research and Innovation Agency- Badan Riset dan Inovasi Nasional
BUMN	National Research and Innovation Agency- Badan Riset dan Inovasi Nasional
CCFPP	Captive Coal-Fired Power Plant
CCoWs	Coal Contracts of Work
CCS	Carbon Capture Storage
CCUS	Carbon Capture, Utilization and Storage
CFPP	Coal Fired Power Plant
CoWs	Contracts of Work
CSR	Corporate Social Responsibility
CTEI	Coal Transition Exposure Index
DACCS	Direct Air Capture Carbon Storage
DBH	Revenue Sharing Fund
DDPI	The Provincial Council on Climate Change
DEN	National Energy Council- Dewan Energi Nasional
DESDM	Energy and Mineral Resources Agency

DMO	Domestic Market Obligation
DPD	The Regional Representative Council - Dewan Perwakilan Daerah
DPR	The House of Representatives of the Republic of Indonesia
EBT	New and Renewable Energy - Energy Baru dan Terbarukan
ESDM	Ministry of Energy Mineral Sources
ETM	Energy Transition Mechanism
GHG	Greenhouse gas
GRDP	Gross Regional Domestic Product
HKPD	Financial Relationship between the Central Government and the Regional Government Law
HPP	The Cost of Goods sold
IDH	The Sustainable Trade Initiative
IIGF	Indonesia Infrastructure Guarantee Fund
IKN	Capital of the Archipelago
IPG	Gender Development Index
IUP	Mining Business License
IUPK	Special Mining Business License
JKN	National Health Insurance
KEN	National Energy Policy
KKP	Minister of Marine and Fisheries
LCDI	Low Carbon Development Indonesia
LLFA	Leasehold License of Forest Area
LTS-LCCR	Long-Term Strategy for Low Carbon and Climate Resilience
LULUCF	Land use, land-use change, and forestry
MEMR	Ministry of Energy and Mineral Resources
METI	Indonesia Renewable Energy Society
MPR	People’s Consultative Assembly

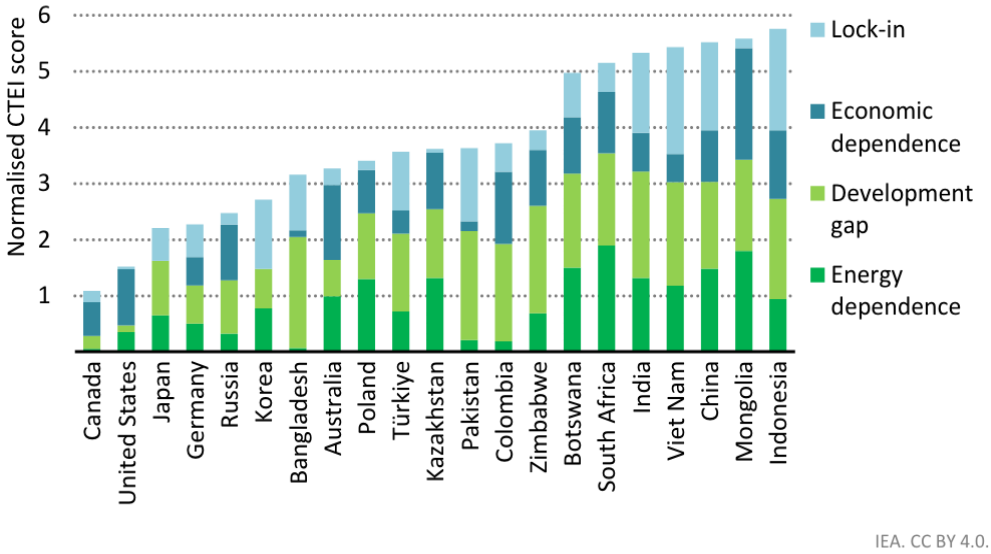
MSMEs	Micro, Small and Medium Enterprises
MSOE	Ministry of State-Owned Enterprises
NDC	National Determined Contributions
NRE	New Renewable Energy Bill
PLTP	Dry Steam Power Plants
PLTU	Steam Electric Power Plants
PNPB	National Determined Contributions
PPA	Power Purchase Agreement
PPM	Community Enforcement Program
PPU	Private Power Utilities
RPJMD	Regional Medium Term Development Plan
RPJMN	National Medium-Term Development Plan
RPJPD	Regional Long-Term Development Plan
RPJPN	Long-Term National Development Plan
RUED	Regional Energy General Plan
RUEN	National Energy General Plan
RUKN	The National Electricity Plan
RUPTL	National Electricity Supply Business Plan
UMP	Provincial Minimum Wage
UU	Acts-Undang Undang
UUD	The 1945 Constitution of the Republic of Indonesia

1 Introduction

In 2021, the Indonesian government pledged to achieve net zero emissions by 2060 and in 2023 it started to prepare a roadmap for phasing out coal by 2050. Indonesia is the world's third-largest coal producer and a major consumer of coal as well. As one of the world's fastest growing economies and the largest in Southeast Asia, Indonesia's energy needs are increasing rapidly. As such, the country's heavy reliance on coal and other fossil energy sources sits in contrast to its ambitious climate goals.

According to the IEA's Coal Transition Exposure Index (CTEI), **Indonesia ranks highest worldwide in terms of exposure to the effects of a coal phase out** (IEA, 2024). Overall, economic and energy dependence is rated medium to high compared to other countries. The IEA especially estimates a high lock-in to coal as one of the main barriers for a transition, as the coal fleet is relatively young thus resulting in higher barriers to retire those plants early. The status quo of coal presents significant challenges on the national level as well as in the region itself. In the following, the role of coal is discussed in more detail for the energy sector, the economy, employment as well as for the ecological situation in regions.

Figure 1. Indonesia scores highest in the IEA's Coal Transition Exposure Index (CTEI)



Source: (IEA, 2024)

A number of comprehensive analyses exist to aid in the understanding of Indonesia's coal sector and of the prospects for coal phase out in the context of Indonesia's net zero goals. However, there remain significant knowledge gaps in the understanding of Just Transition implications of

coal phase out in Indonesia. Moreover, the impacts of coal phase out and structural change in Indonesia's coal-mining regions, and the opportunities for their future economic and social transformation, remain poorly understood.

The **goal of this status report** is to provide a comprehensive summary of the existing data and knowledge regarding Indonesia's coal sector and specifically provide an overview of the sector in Indonesia's key coal mining regions, East Kalimantan and South Sumatra. The report maps key stakeholders and current trends, and guides the reader to additional resources that delve deeper into certain subjects. Crucially, the report distills what are the most critical knowledge gaps in the study of Just Transition for Indonesia's coal sector. Ultimately, the report aims to inform a research agenda for the transition of the energy sector and the transformation of coal regions in Indonesia as a whole.

The report unfolds in four sections: Section 1 provides a synthesis of the relevant **national context,** including Indonesia's demographics, economy, political landscape, and policy environment, with a focus on climate and coal-related policies, and identifying key stakeholders. Section 2 examines the multifaceted **role of coal** in the country, from its contribution to the energy sector, economic and labor market impacts, and environmental impact of coal mining activities. This section also reviews existing forecasts regarding coal phase-out. Section 3 focuses on **East Kalimantan and South Sumatra**, the epicenter of Indonesia's coal production, and reviews the state of knowledge regarding these regions in the context of just transition away from coal. Finally, Section 4 examines the Indonesian coal sector and national discourse through the lens of **gender and equity**.

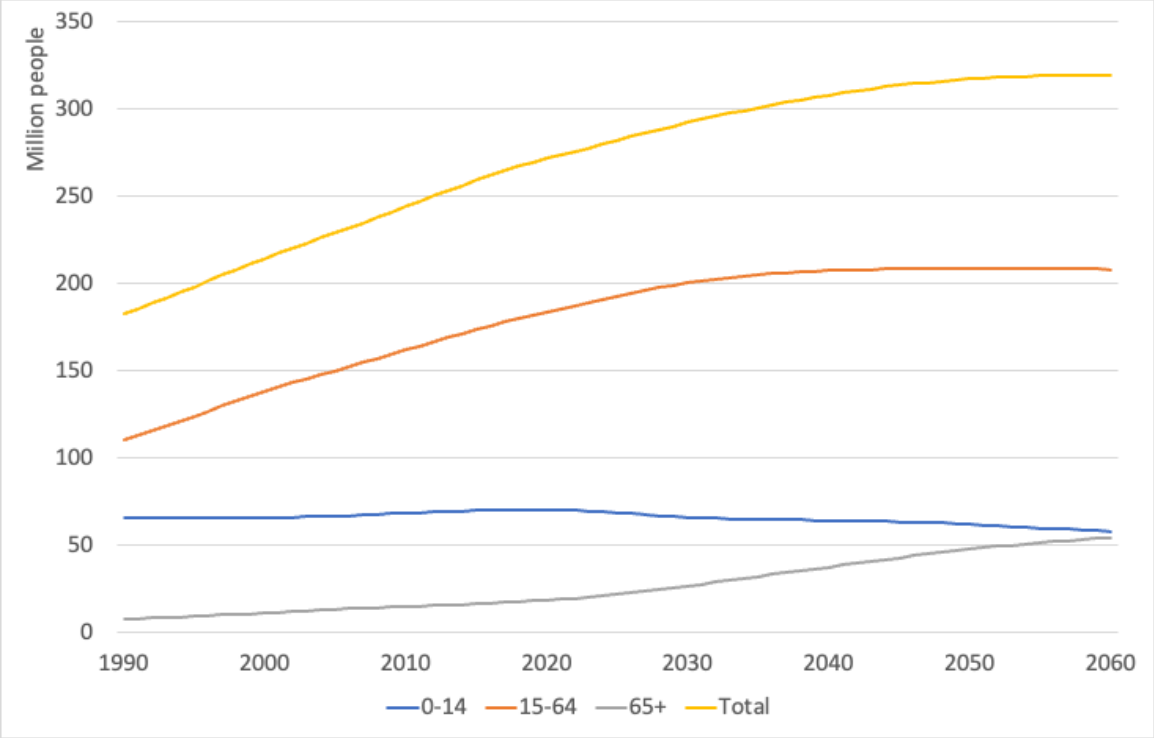
2. National context

This chapter reviews key **demographic, socio-economic** and **political** factors that influence and have been influenced by the country's coal sector and need to be considered in the context of a Just Transition away from coal. This chapter thus sets the stage for the subsequent review of knowledge around the coal sector presented in Section 3.

2.1. Demographics

With over 277 million inhabitants, Indonesia is the world's fourth most populous country and has a relatively young population, with a current median age of 30 years as compared to India with 32, or Germany with 45. Currently, Indonesians of working age (15-64) represent 68% of the population, while 26% are under the age of 14, and 6% are above 65. Despite a declining trend in population growth rate, the total population is projected to rise to over 290 million by 2030, also helped by a marked improvement in life expectancy (UNDESCA, 2022). Population growth is projected to stabilize in the 2040s (see Figure 2). Indonesia's current demographic transition offers economic opportunities but also poses challenges. These include the **need to create sufficient quality jobs to accommodate the increasing workforce and planning for the aging of the population** in the long term. Other key demographic trends include urbanization and internal migration.

Figure 2. Population growth since 1990 and projections to 2060, including by age group



Source: custom data acquired from (UNDESCA, 2022)

Java is the most inhabited island, housing 56% of the Indonesian population despite its relatively small area (7% of the country's total). The other key population centres are Sumatra (21%), Sulawesi (7%), Kalimantan (6%), Bali-Nusa Tenggara (5%), and Maluku-Papua (3 %) (BPS Statistics Indonesia, 2022).

2.2. Economy

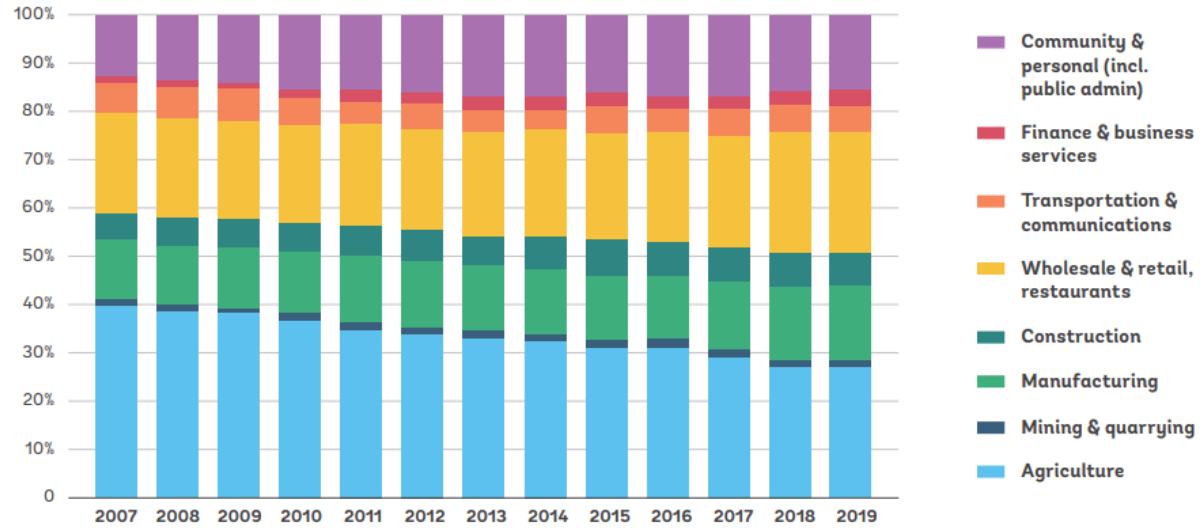
Indonesia is the fourth fastest-growing large economy in the world. Its economic transformation in the last half a century has been extraordinary, having increased its GDP per capita by approximately 10 fold since 1980, and reduced the share of the population below the national poverty line from 60% in 1970 to less than 10% today (IEA, 2022a). Indonesia's GDP per capita currently stands at US$4,788, compared to India's US$2,410 and China's US$ 12,720(The World Bank, 2024).

As a newly industrialized country, **Indonesia now faces different economic challenges** going forward: no longer an oil exporter since the early 2000s, Indonesia's economy is still highly dependent on fossil fuels. Exports of coal and natural gas accounted for 2.4% of GDP in 2021 and make up nearly 20% of net goods exports in recent years. Diversifying its economy and

in particular in the more fossil-fuel dependent regions is a high priority, alongside achieving inclusive growth and fostering its innovation and technological capacity (IEA, 2022a).

Following Indonesia's structural transformation, **services and industry play a vital role** in the current economy (Ruppert Bulmer et al., 2021). Manufacture of textiles, electronics, food processing, and other products contributes to around a quarter of GDP and employs a fifth of Indonesia's working age population (ILO, 2022a). The majority of manufacturers are MSMEs. Services represent over half of total employment and agriculture remains an important sector, with palm oil and rubber as major exports. Furthermore, tourism has emerged as a vital economic driver. The mining sub-sector accounts for only around 1% of total employment, although its level is much higher in mining regions. Key employment sectors are shown in Figure 3 below.

Figure 3. Shifting sectoral employment shares (% of total employment)



Source: (Ruppert Bulmer et al., 2021)

The labor force in Indonesia amounted to over 144 million people in 2022 (BPS Statistics Indonesia, 2022). Key characteristics of Indonesia's labor market include a high degree of **informality, a large share of low paid and low skilled jobs, and a significant gap in participation in the labor pool between men and women** (IEA, 2022a).

Vulnerable employment (where workers are less likely to have formal work arrangements, social protection, and safety nets) has improved in Indonesia in the last decades but is still rather prevalent in the agricultural sector. Vulnerable employment rates are currently higher among women than men (World Bank, 2023a). The share of informal workers in the labor force is approximately 60% (PAGE, 2023). Other key facts and figures regarding Indonesia's labor force are shown in Table 2.

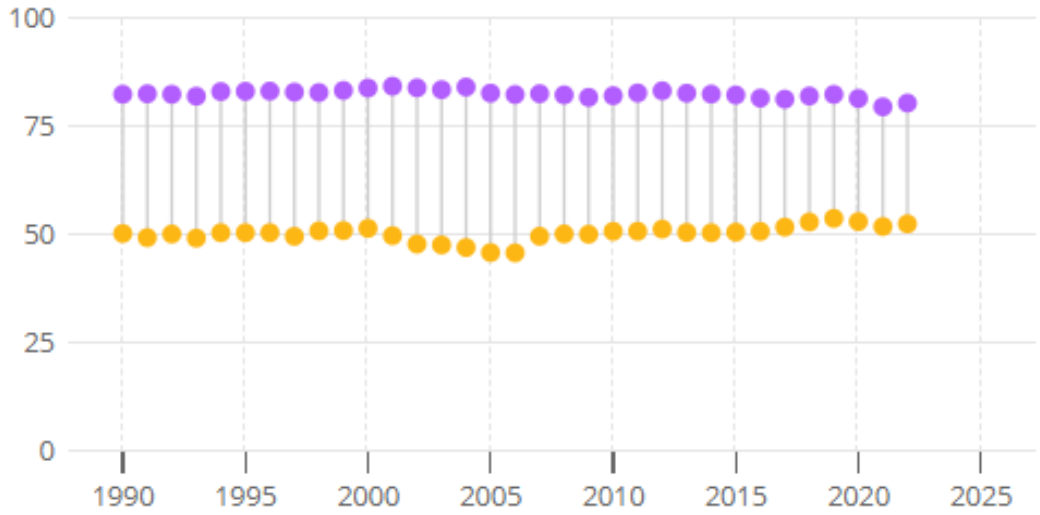
Table 2. Labor force participation, unemployment and vulnerability (%)

Category	2021
Labour force participation	
Total	67.89
Male	82.27
Female	53.34
Employment to population	63.40
Employment	
Total	6.49
Male	6.74
Female	6.11
Youth	19.55
Vulnerability	
share of youth not in employment, education, or training (NEET)	22.40
Underemployment	8.71
Informal worker	59.45
Vulnerable employment	34.50

Source: Own illustrations adapted from (PAGE, 2023)

Indonesia's flat overall female labor force participation rate over the last two decades (Figure 4) may be a result of opposing trends: growth in participation among highly educated women offset by reductions in participation at the bottom of the income distribution (OECD & Asian Development Bank, 2020). In addition, the latest statistics on the gender pay gap show that women earn on average 23% less than men (the global gender pay gap is estimated at 16%) (UN Women Indonesia, 2020).

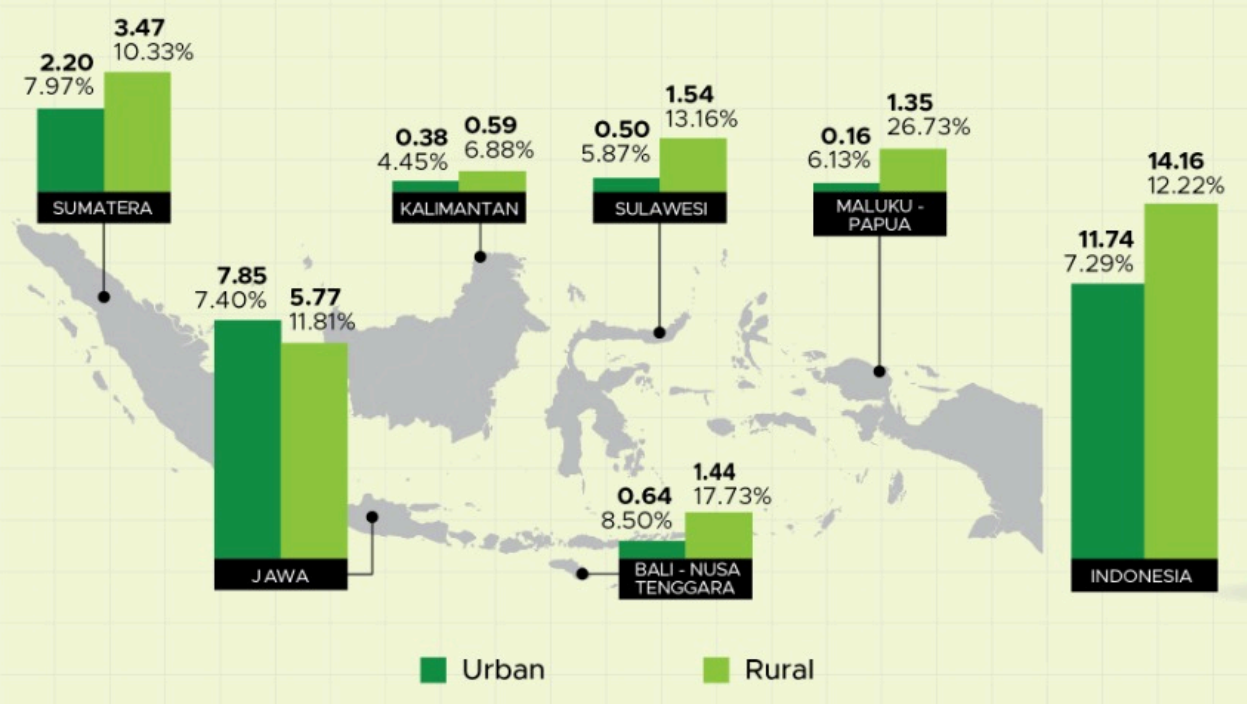
Figure 4. Labor force participation rate, by sex (% of population ages 15+) (modeled ILO estimate)



Source: (World Bank, 2023a)

While **poverty continues to drop in Indonesia in both urban and rural areas,** the rate of reduction has stagnated in recent years. The population living under Indonesia's national poverty line stood 9.5 percent in 2022 (26 million people)(World Bank, 2023b). The percentage of population living below the international poverty line (USD 2.15 per day) is currently at an all-time low of 2.5%, compared with 30.6% in 2006 (World Bank, 2022). As to the population living below the national poverty line, the share of the population considered poor was 9.4% in 2019. Urban and rural poverty rates have converged to similar levels, which means that the majority of the poor are now living in urban areas. Poverty patterns vary geographically: the highest rates are found in less populated eastern provinces (see Figure 5).

Figure 5. Number (million people) and percentage of poor population by Island

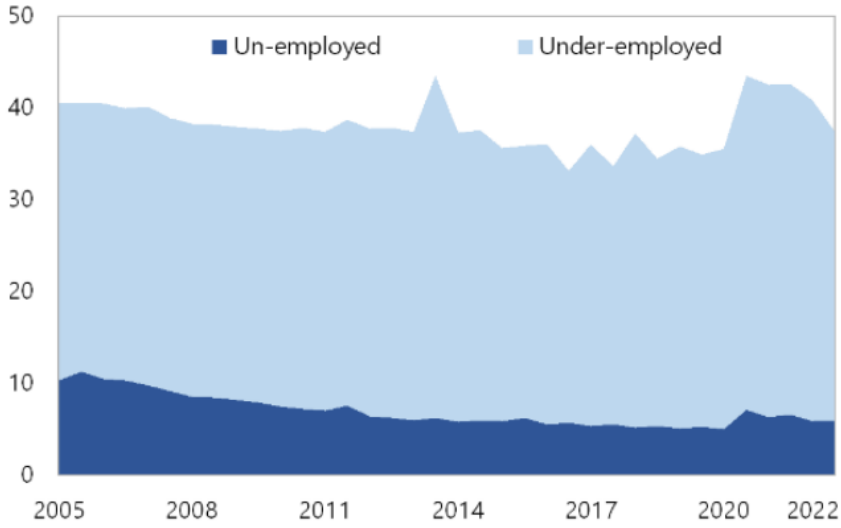


Source: (BPS Indonesia, 2023)

Despite poverty reductions, **inequality remains high in Indonesia.** The Gini coefficient increased through the 2000s up until 2013 when it reached an all-time high of 40 (The World Bank, 2024). Since then, it has slightly decreased again reaching 38.3 in 2023, which ranks Indonesia moderately high in terms of economic inequality compared to other countries (e.g., India's rate is 32.8).

Unemployment rates are currently at 5.9% (2022), having consistently dropped over the last two decades, except for a peak during the Covid-19 pandemic (Figure 6) (International Monetary Fund, 2023). However, as previously noted, there is a large part of the working population under short-term contracts or in informal employment. Therefore, the declining unemployment rate has to be read with caution (OECD & Asian Development Bank, 2020).

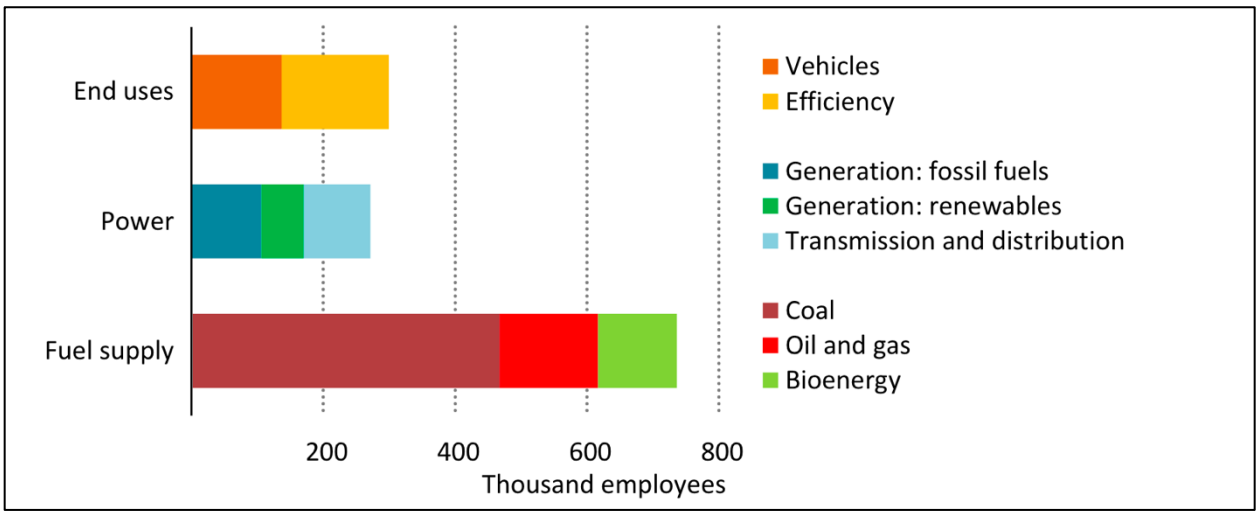
Figure 6. Comparison between unemployment and under-employment rate between 2005 and 2022.



Source: (International Monetary Fund, 2023)

In 2019, **1% of the Indonesian workforce (about 1.3 million people) was employed in the energy sector**. In addition, 230,000 people are employed indirectly in energy end use (Figure 7). For further insights into employment in the coal sector, see section 4.3 below.

Figure 7. Energy-related employment by sector in Indonesia, 2019



Source: (IEA, 2022a)

2.3. Governance system

Indonesia is a unitary state (as opposed to a federal system), but there has been significant decentralization of the governance system in recent decades. Indonesia is divided into 38 provinces. While the central government maintains control over areas such as national security, monetary policy, and justice, provinces oversee sectors like public works, healthcare and education.

Elections every five years determine the President, Vice-President, People's Consultative Assembly (MPR), and local legislative bodies. The MPR functions as the highest legislative body, comprising the People's Representative Council (DPR) and the Regional Representative Council (DPD). This governance structure aims to balance national cohesion with regional diversity.

After the elections in 2024, there are 48 ministries in Indonesia. Key institutions of relevance for the governance of the coal sector at national level are:

- Ministry of Energy and Mineral Resources, Kementerian Energi dan Sumber Daya Mineral
- Ministry of Finance, Kementerian Keuangan (Kemenkeu)
- Ministry of Environment, Kementerian Lingkungan Hidup
- Ministry of Forestry, Kementerian Kehutanan
- Ministry of National Development Planning, Badan Perencanaan Pembangunan Nasional (BAPPENAS)
- Ministry of Industry, Kementerian Perindustrian (Kemenperin)

Indonesia's strategic planning at national level is currently articulated in the **National Long-Term Development Plan** (RPJPN 2005-2025), which is implemented in four phases. For each phase, a **National Medium-Term Development Plan (RPJMN)** outlines the strategic basis for all Indonesian ministries and government agencies, consisting of action plans for Indonesian ministries for the specific period (BAPPENAS, 2024).

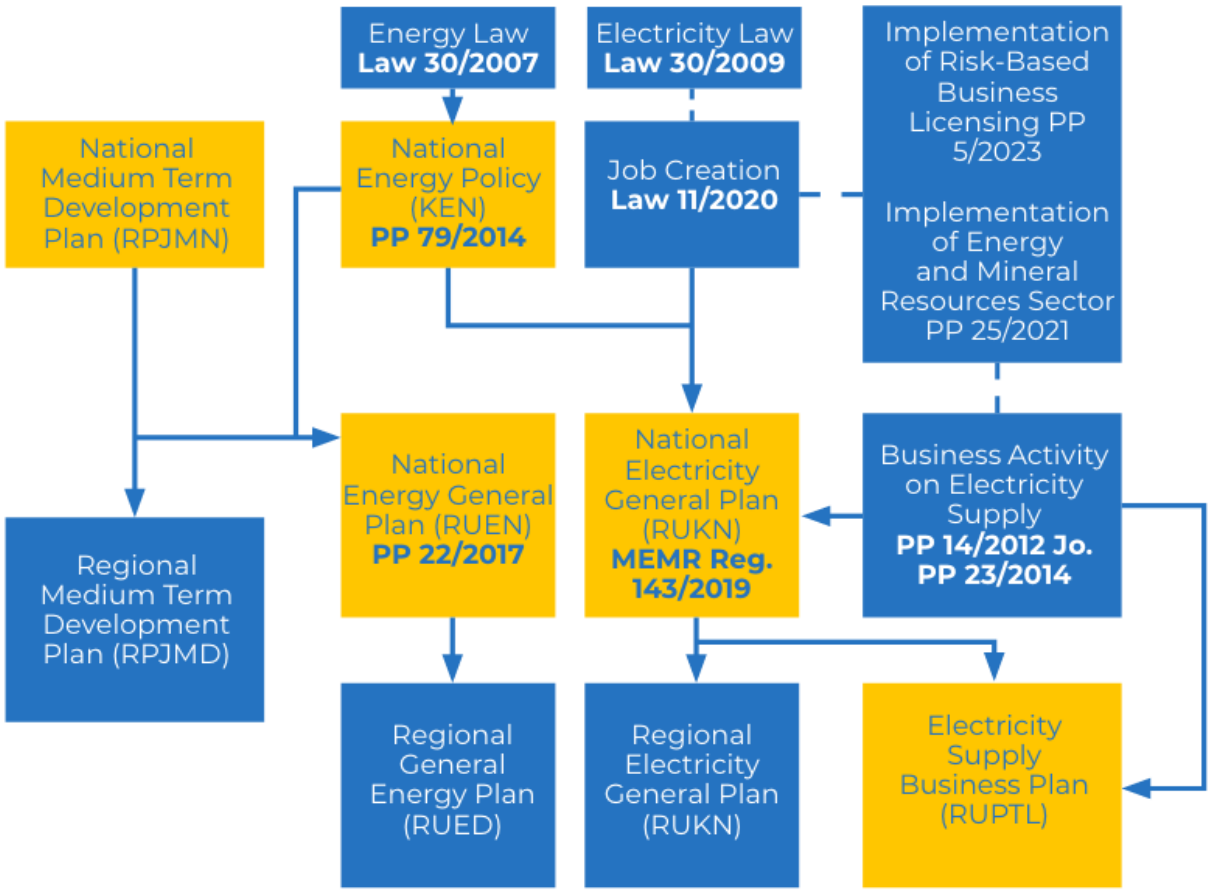
The current RPJMN aims to incorporate both the Sustainable Development Goals (SDGs) and gender perspectives into its framework. For instance, it considers improving environmental health as a key agenda, with the narrative of Low Carbon Development as a guiding principle to achieving strategic targets. The RPJMN should serve as the foundation to achieve **Indonesia's Vision for 2045**, which in turn serves the basis for the currently drafted **National Long-Term Development Plan 2025-2045** (BAPPENAS, 2024), which draws the picture of a sovereign, developed, just and prosperous nation through economic transformation driven by regional development.

The following sections delve into three policy areas: energy, climate, social protection and employment, and review key legal frameworks, institutions and strategies that shape the governance of each particular area in Indonesia. They are followed by an overview of current governance challenges in the country. Together, these set the scene for a deeper analysis of the governance of coal and just transition in Indonesia.

2.4. Transition-related policies

Indonesia's energy policy framework consists of several policy packages and strategy documents based on the aforementioned plans, with many currently under revision to be adapted to new economic development objectives in the next phase of the RPJPN. Figure 8 provides an overview of the regulatory framework for the energy sector.

Figure 8. Indonesia's Regulatory Framework for Energy and Electricity Planning



*Yellow boxes: under revision or drafting process; gray box: intended to be drafted.

Source: (IESR, 2023b)

Central to the energy transition, and inherently the future of the coal sector, are the **National Energy Policy** (Kebijakan Energi Nasional, KEN), the **National Energy Generation Plan** (Rencana Umum Energi Nasional, RUEN), the **National Electricity General Plan (RUKN**), and the new **Renewable Energy Law** (see figure 8). Other older laws, such as the Energy Law 30/2007 and Electricity Law 30/2009 are still in effect and shaping the framework conditions of the energy transition. Furthermore, some laws are also providing the legislation for very specific aspects that are directly or indirectly relevant for the transition, such as the Implementation of Risk-Based Business Licensing PP 5/2023 and the Implementation of Energy and Mineral Resources Sector PP 25/2021 mining law.

The National Energy Policy (KEN) are the main pillar of Indonesia's sector policy. The nation's long-term strategic vision for energy policies is provided by the KEN, which was last revised in 2014. In 2017, the National Energy Plan (RUEN) was published as an elaboration and implementation plan of KEN, offering more detailed planning and targets. According to the National Energy Plan (RUEN), renewable energy is targeted to make up 23% of the energy mix by 2025 and at least 31% by 2050. Meanwhile, the share of coal in the energy mix is expected to peak at 30% by 2025 and then decrease to 25% by 2050 (Presidential Regulation No. 22, 2017).

A revised version of the KEN or RPP KEN is currently being developed, to address Indonesia's recent global emission reduction commitments and energy sector developments. This revision plans to increase renewable capacity to 58-61% by 2050 and 70-72% by 2060 (IESR, 2024). However, the 2025 renewable energy target has been reduced to 17-19%, reflecting slower-than-anticipated progress in renewable energy development. The revised KEN will also add nuclear as one of its new energy sources to increase its energy supply stability (MEMR, 2024).

As the current strategy for the energy sector, the **National Energy Plan** (RUEN), entails the following main objectives:

- Increase the share of renewables in total energy supply (TES) to 23% in 2025 and 31% in 2050, based on TES of more than 16 exajoules (EJ) in 2025 and 42 EJ in 2050.[1]
- To achieve per capita electricity consumption of 2500 kWh per capita by 2025 and to 7 000 kWh by 2050.
- Decrease the final energy intensity of the economy by one percent per year in the 2015-25 period.[2]

[1] Please note that MEMR and IEA apply different approaches to account for the share of renewables in total energy supply (IEA, 2022a), in particular regarding geothermal and traditional use of biomass. The IEA energy balance for Indonesia shows a share of 24 percent renewables in total energy supply for 2021 (IEA, 2023b). This report follows the MEMR accounting approach.

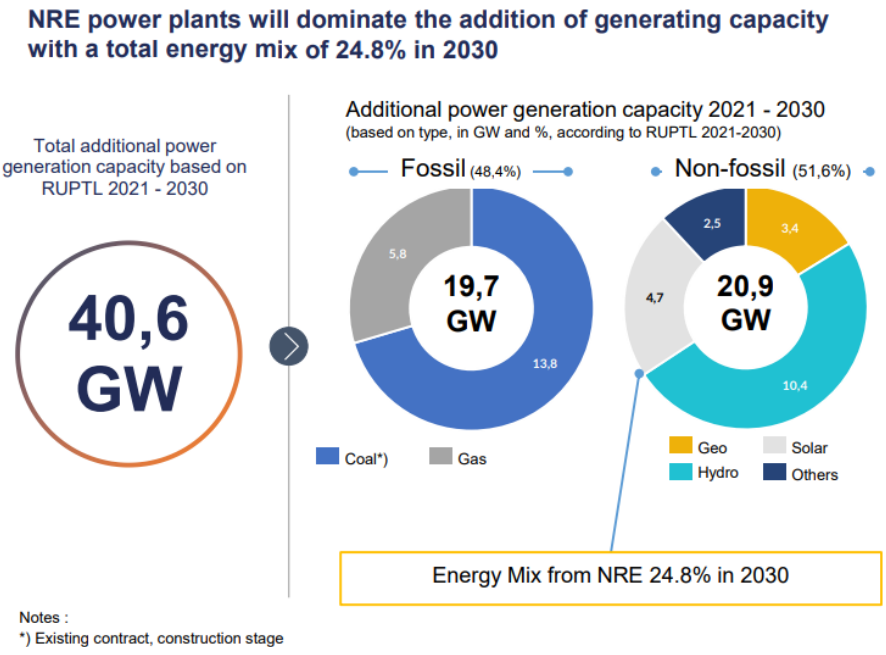
[2] In 2021, Indonesia's total energy supply amounted to more than 10 EJ, renewables accounted for 12% of it (MEMR Indonesia, 2023). Electricity consumption was less than 1 000 kWh per capita. The total final energy intensity of GDP

- Continue to use coal as a domestic source for energy production and reduce its export to zero by 2045 (PwC, 2018).

Based on the National Energy Plan from 2017, there are also *sectoral* and *regional* planning documents, such as:

The **Electricity Supply Business Plan** (Rencana Umum Penyediaan Tenaga Listrik) (RUPTL) of PLN for the period 2021 until 2030 is the central document for the nation's electricity system's development. It elaborates investment plans as well as power plant construction plans. The RUPTL plans capacity additions in a total volume of 40.7 GW until 2030. Thereby, renewable energies shall make up for more than half of the additions. Around 10 GW hydro, 5 GW solar PV, 3 GW geothermal and 2.5 GW other renewables are foreseen. Coal is targeted to account for one third of the new capacities (14 GW) and gas for additional 6 GW (PT PLN, 2022b). PLN and the governance announced that no new coal capacity should be developed after the current pipeline to 2030. Additionally, the government and PLN are developing a new RUPTL for 2024-2033. This revised plan aims to increase renewable energy capacity from 21 GW to 33 GW, raising the share of renewables in the energy mix from 52% to 76% (MEMR Indonesia, 2024a). PLN has announced a target to add 45 GW of renewable energy capacity in the next decade under RUPTL 2024-2033. This plan supports the government's goal of reaching 100 GW of total power plant capacity by 2040, with renewables making up 75% of the mix (V. N. Setiawan, 2024).

Figure 9. Additional power capacity based on RUPTL 2021-2030



Source: (PT PLN, 2022b)

(not counting the traditional use of biomass) has already fallen by around two percent per year over the last decade (IEA, 2022a). (See also chapter 6.1.1 on key energy trends in the last two decades.)

The **National Electricity General Plan** (Rencana Umum Ketenagalistrikan Nasional 2019-2038) is implemented under the Ministry of Energy and Mineral Resources Decree no. 143/2019. The RUKN has laid out the long-term targets for the electricity sector. According to current reports, it is evident that the progress in RE development has not met the target of MEMR 2022, which was aiming at a 15.7% increase, but only achieved 12.3%. The RUKN plan for the period 2019-2038 anticipates an annual growth in electricity demand of approximately 6.9%, with a significant emphasis on meeting the needs of the industrial sector, followed by households, businesses, public facilities, and transportation. Given that the electricity sub-sector accounts for 40% of the total CO_2 emissions from the energy sector, there is a pressing requirement to fulfill this demand through renewable energy sources (Climate Transparency, 2023). The Ministry of Energy and Mineral Sources recently published a draft of the newest RUKN 2024-2060 with updated national electricity policies, long-term projections, and development plans for a sustainable energy system through 2060. According to the plan, electricity demand is expected to grow significantly from 482 TWh (1,713 kWh per capita) in 2024 to 1,813 TWh (5,038 kWh per capita) by 2060, with the largest share of 43% being consumed by the industrial sector. Overall, the National Electricity Master Plan (RUKN) 2024-2060 targets 73.6% renewable energy generation by 2060 and a total electricity of 443 GW, supported by 34 GW of energy storage capacity (MEMR Indonesia, 2024b).

Renewable energy policy

The **Presidential decree No. 112 of 2022** on the accelerated development of renewable energy for electricity supply was passed in 2022 by the Government of Indonesia. The regulation aims at reducing greenhouse gas emissions as well as increasing investments in the renewable energy sector in order to achieve the renewable targets set by the RUEN and KEN (23% of renewable energy share in total energy supply by 2025 and 31% by 2050). It provides different measures to promote the deployment of renewable energy by establishing a competent regime for renewable energy sources and also improving the negotiation process to reach a pricing agreement. As part of the decree, there was also an exception for renewables on income tax formulated: Independent producers of renewable energy can reduce their taxable income up to 30% of the amount invested. This can only be applied when the investor has been operating from 5 to 15 years and is valued at least IDR 1 trillion. Furthermore, the presidential regulation instructs the Minister of Energy and Mineral Resources to provide a roadmap for an accelerated phase out of existing CFPPs and prohibits the development of new coal fired power plants, yet with several exceptions such as on captive plants (Presidential Regulation No. 112 of 2022, 2022).

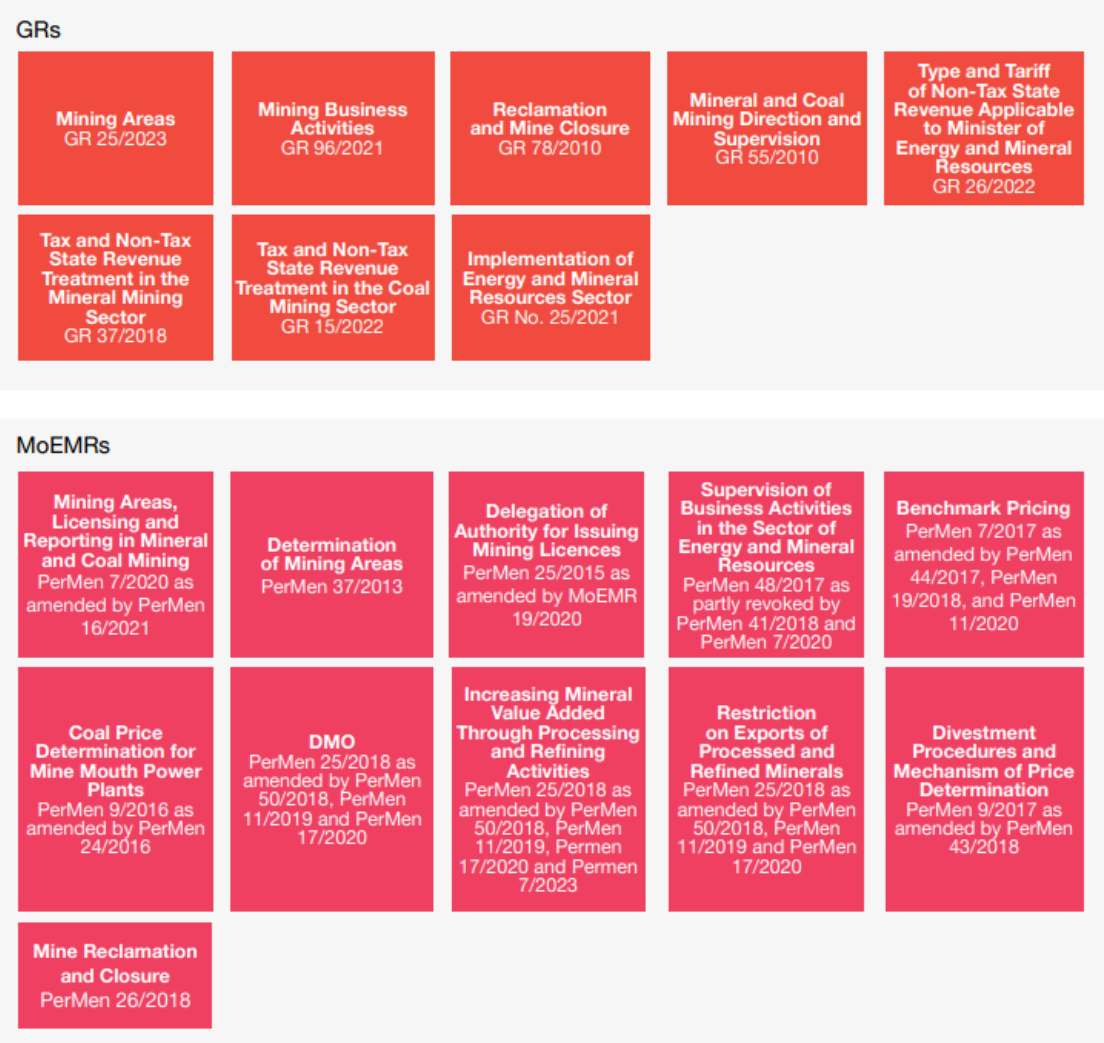
The Indonesian government is in the process of passing a **New Renewable Energy Law (NRE)**, officially known as *Rancangan Undang Undang tentang Energi Baru dan Terbarukan* (RUU EBT). A wide range of measures are introduced through the bill such as dedicating financial measures to achieve green energy targets, as well as formulating the framework for

related research and development support. The reduction of red tape is also a priority since currently many regulations at regional and national level overlap and are not coherent (Hasan & Rahmansyah, 2022).

Mining policy

Coal mining activities are mainly governed under regulated by **Law No. 3 of 2020** on the Amendment of **Law No. 4 of 2009 on Mineral and Coal Mining ("Mining Law")** of 2009. This shift, introduced under the 2020 Amendment, aims to provide greater clarity and certainty for investors, particularly through the conversion of Contracts of Work ("CoWs") and Coal Contracts of Work ("CCoWs") into Special Mining Business Licences (IUPK) for the continuation of operations and shifted the authority of issuing mining licenses from provincial to the national level. To implement the Mining Law, several additional have been introduced, providing detailed administrative guidelines (see Figure 10) (Law No. 3 of 2020 on Mineral and Coal Mining, 2020).

Figure 10. Overview of the present regulatory framework for mining in Indonesia



Source: (PwC, 2023b)

Furthermore, also the **Law No. 2 of 2022 on Job Creations** ("Job Creations Law") plays an important role for energy policy making as well as the mining law specifically, as it amends it by adding a new article on royalty imposition for coal and revises an article regarding sanctions (PwC, 2023b).

Part of the mining sector regulation is a **domestic market obligation (DMO)** to guarantee a security of supply for energy and to keep prices stable. The DMO dictates that a portion of the coal extracted must be reserved for the domestic consumers. Annually, a specific percentage of DMO is set out by MoEMR. According to the latest issue, MoEMR Decree No. 267.K/MB.01/MEM.B/2022 on 21st November 2022, related to "Coal Domestic Market Obligation" (KepMen 267/2022), coal companies must sell a minimum of 25% of the coal production domestically at a maximum price of USD 70 per tonne of coal (PwC, 2023b). This

regulation is heavily criticized by environmental organizations and climate advocates, as it effectively works as a market intervention in form of a subsidy that encourages PLN to continuously invest into coal-fired power plants and makes renewable energy artificially less competitive (read more in the economy chapter).

Climate policy

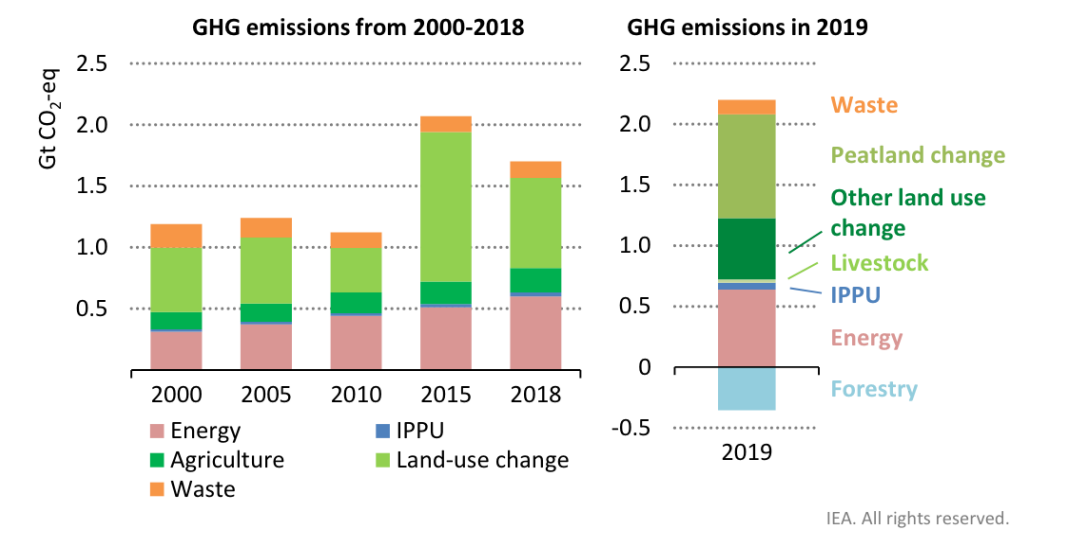
In 2021, Indonesia submitted its revised **National Determined Contribution** (NDC), along with a long-term vision in the form of the **Long-Term Strategy for Low Carbon and Climate Resilience 2050** (LTS-LCCR) to the UNFCCC. Indonesia restated its unconditional commitment to reduce the CO_2 emissions by 29% in 2030 relative to its business-as-usual baseline. This also included a reduction target of up to 41% in 2030, conditional and with assistance from global actors. The updated NDC sets targets for the shares of fuels in the energy mix which is 77% share of fossil fuels in 2025, comprising 25% oil, 30% coal and 22% gas. Also, by 2050 a reduction of the fossil fuel share to 69% (20% oil, 25% coal and 24% gas). The Indonesian government is formulating the *National Grand Energy Strategy* to incorporate the set targets in the latest NDC with energy policy planning (IEA, 2022a).

In the updated NDCs, Indonesia aims to reduce the total emissions to 2034 $MtCO_2$-eq (unconditional) or to achieve 1683 $MtCO_2$-ew (conditional target with help of international support) by 2030. This includes target emissions for coal, oil, gas and power of 1355 $MtCO_2$-eq (unconditional) or 1223 $MtCO_2$-eq (conditional) according to a business-as-usual perspective of 1669 $MtCO_2$-eq by 2030 (Indonesia Green Growth Programme, 2021).

Box 1: Sources of greenhouse gas emissions in Indonesia

Indonesia's CO_2 emissions from the energy sector have hit 600 Mt in 2021, doubling since 2000. The majority of the increase, 70%, comes from coal. In terms of the per person emissions, Indonesians are at two tonnes which accounts for half of the global average emissions. In 2019, the total net GHG emissions were 1.8 Gt CO_2-eq. The rise in CO_2 also aligns with economic growth, with emissions doubling while GDP increased two-and-a-half times. Coal is the main contributor, as three-quarters of the emission spike generates from coal. In 2021, the energy sector emitted 600 million tonnes, with the power sector responsible for 40% and transport and industry for one quarter. Road transport alone has contributed to 90% of the CO_2 emissions of the transport sector (IEA, 2022a).[3]

Figure 11. Total greenhouse gas emissions by sector, 2000-2019



Source: (IEA, 2022a, p. 39)

The development of an **emission trading system (ETS)** for the power generation and industry sector is one of the main policies by the government to meet the NDC targets. The presidential regulation 98/2021, was signed in October 2021. It is an extension of the Government Regulation on Environmental Economic Instruments and it gives a first mandate for emission and waste permit trading systems. The rollout of the policy started in 2023 with 100 MW of coal plants and continues until 2028 to cover all coal plants above 25MW (including

[3] The large number of two/three-wheel vehicles have low emission intensity but it accounts for almost half of the total CO2 emissions from passenger transport even though these vehicles have lower emissions per kilometer compared to cars.

captive power) and other types of fossil-based power plants. However, what kind of effects the ETS will have in Indonesia is yet to be seen.

Additionally, a **carbon tax** was passed under the Law on the Harmonization of Tax Regulations and is one of the major climate policy instruments. At times of writing, the carbon tax scheme remains under process. The aim of the carbon tax is to give incentives for cleaner alternatives, which ultimately should contribute to achieving the goal of reducing greenhouse gas emissions by 29% in 2030 as stated in the NDC. Additionally, the Government of Indonesia has planned to use carbon taxes to increase funds for investing in environmentally friendly technologies (IRENA, 2023).

Social and labor market policies

While energy policies are foremost relevant for the transition of the coal sector, to realize a just transition as foreseen in Indonesia's long-term development plans, it is necessary to also take different forms of social protection policies into account.

Existing social protection policies comprise the Jaminan Kesehatan Nasional (JKN, national health insurance) under which 203 million people (around 70% of the population) are covered. There is also a public pension scheme called Jaminan Pensiun (JP) for formal employment. Poor households are entitled to a number of complementary social protection programs (e.g. a rice subsidy, conditional cash transfers, student scholarships) (OECD, 2019).

The **most important recently introduced labor-market instruments are the minimum wage and severance pay**. According to the OECD, both instruments are however poorly implemented: minimum wages often do not hold and only a small minority of workers receive full severance pay when they lose their jobs.

The newly enacted Omnibus Law has introduced, among other changes, a Job Loss Security program (JLS). The regulation introduces an unemployment benefit scheme which provides cash stipends and training to recently unemployed workers. Only employees who are already registered with the Workers Social Security program are eligible. It is the task of employers to enroll any new employees into the program (OECD, 2019).

Active labor market policies are not implemented in Indonesia at a significant scale. On the local level, some specific Village Funds often employ poor and unemployed individuals, which shares some features of public works programs. The same accounts to Corporate Social Responsibility (CSR), or Community Enforcement Program (PPM) initiatives from companies that in some regions offer social protection measures or support for the local labor market.

Box 2: Multilateral international partnerships and platforms

The **Just Energy Transition Partnership (JETP)** agreement between Indonesia and the International Partners Group (IPG), as well as the Glasgow Financial Alliance for Net-Zero (GFANZ). This alliance aims to mobilize a substantial USD 21.5 billion in funding (mostly loans) to facilitate a just transition to clean energy, which includes provisions for the early retirement of coal power plants.

As a part of the recent **G20 Summit, B20 Indonesia** was hosted by the Indonesian Chamber of Commerce and Industry also known as the Kamar Dagang dan Industri Indonesia or KADIN. This brought together identification of the most urgent issues currently facing and to formulate solutions from a business outlook. The three core sectors which need to be addressed are accelerating green transition, promoting inclusive growth and creating equitable access to healthcare. One of the fundamental pillars of policy recommendations of the B20 Energy, Sustainability and Climate (ESC) Task Force is the want of an enhanced cooperation on an international level to make sure that there is an acceleration of the energy transition, which at the same time addresses the energy security and affordability concerns for all nations (PwC, 2023b).

The **Provincial Council on Climate Change** multi-stakeholder forum also known as the MSF has leadership on the local level which has increased the ownership sentiment among the participants. The MSFs are organized with the intention of increasing interaction between stakeholders and an inclusive environment for decision making. Some of the drawbacks of MSFs have been that they may undermine the importance of participation and fail in arriving at middle ground in times of conflict (CIFOR, 2023).

2.5. Criticism of the current regulatory framework

Despite recent changes in legislation and initiatives such as JETP and ETM, climate advocates and studies have criticized that the **policy framework is largely insufficient to reach climate targets, and laws being sometimes detrimental to existing other legislation** leading to an inconsistent framework, and in turn to ineffective distribution of resources hampering growth both in an economic and socio-economic sense.

Most notably, the Climate Action Tracker rates Indonesia's policy framework and targets "critically insufficient" to reach the goals pledged under the Paris Agreement, which is in fact a downgrade compared to a previous assessment due to revealed plans for new captive coal power capacities (CAT, 2024) (see box 2). The existing national energy plan (RUEN) as well as RUPTL currently put too much focus on electricity production from coal-fired power plants. **Reforms in energy subsidies** and the incentives for coal production provided within the domestic market obligation and the PPAs that require PLN to receive energy from independent power

producers in non-flexible long-term service contracts are main barriers for the transition, and also effectively preventing investments into renewables (IESR, 2022b; Sambodo, 2023; Stockholm Environment Institute (SEI), 2023). The NRE Bill itself has been criticized that it rates non-sustainable alternative coal uses such as coal gasification, coal liquefaction as renewable energy sources (Sambodo, 2023; Simanjuntak, 2023) and that no plans for hydrogen and synthetic fuels have been put in place yet (IESR et al., 2021).

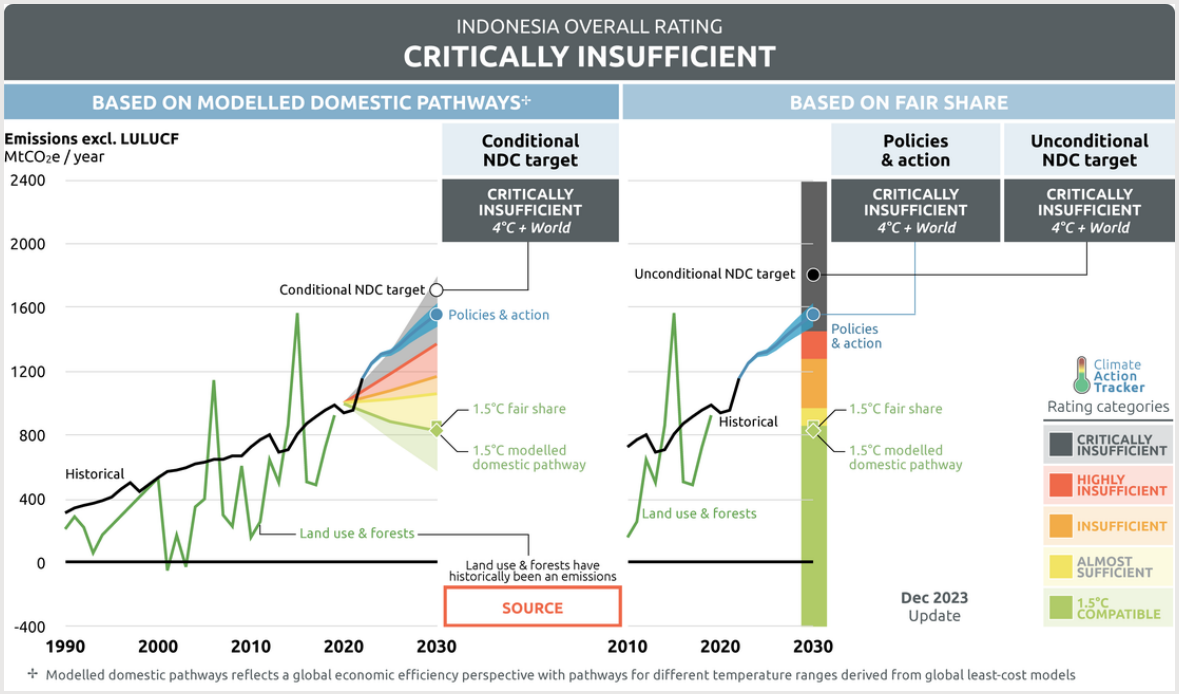
Another form of criticism that is being raised is that **new laws or amendments have not been used to close loopholes** and strengthen Indonesia's energy transition goals and environmental efforts, **but may even have weakened them**. For instance, article 54 of the renewed mining law grants miners larger concessions and automatic renewal of mining contracts for up to 20 years irrespective of whether companies have fulfilled their environmental obligations (Law No. 3 of 2020 on Mineral and Coal Mining, 2020). Additionally, in article 22 it is stated that mining companies are no longer obliged to provide reporting annually, which may reduce transparency and accountability (PWYP Indonesia, 2024). Critics have furthermore argued that **article 39 of the law removes the requirement for land rehabilitation guarantee funds** in the licensing procedure (Kartikasari, 2024)(see also chapter 7 on Ecology). Additionally, the regulation introduces Priority Special Mining Business License Areas for religious community organizations, which since have been controversially discussed (Tempo, 2024).

Overall, there remains a need to increase the effectiveness of governance, especially through the fight against corruption: Despite efforts in the last decades, Indonesia still ranks 34 of 100 in the international Corruption Perception Index, which is also below the average of Asia Pacific countries (Transparency International, 2024). Improving policy consistency is another main aspect for making governance more effective, both on vertical coordination between local, regional and national level as well as horizontal between ministries and topics such as employment and industry development (Boessner et al., 2023).

Box 3: Climate Action Tracker rates Indonesia's targets and policies as overall 'critically insufficient'

Indonesia updated its NDC in September 2022, improving its unconditional target from 29% to 32% below its business-as-usual scenario (BAU), and its conditional target from 41% to 43% below its BAU, including emissions from land use, land use change and forestry (LULUCF). However, the Climate Action tracker rates both targets and policies as "critically insufficient" and states that Indonesia needs to overachieve these by 23–38% with the policies it has implemented (CAT, 2024). The plans for the electricity sector are not aligned with the goals of the 1.5°C global warming limit, for which unabated coal-fired power in Indonesia should be no more than 10% in 2030 and be phased out by 2040 (IEA, 2021; IPCC, 2018).

Figure 12. Projected GHG emissions based on NDC targets and policies in Indonesia



Source: (CAT, 2024)

3. Key Stakeholders

The coal sector is a multi-stakeholder system with complex relationships. The identification and mapping of key stakeholders is essential to facilitate dialogue and co-operation towards a sustainable future. Encouraging all parties and sectors engaged in the energy transition process to actively participate is necessary for the element of *Justice* in the process (GIZ, 2023). By mapping the actors involved in the sector, we can gain a better understanding of the challenges and the opportunities for change. Furthermore, in order to strike a fair balance between their competing interests (e.g., investors versus local communities, national governments versus regional governments) and to minimize the negative impacts of the transition, it is essential to regulate the interactions between them. Considering the political and socio-economic contexts, it is possible to identify three main groups of actors involved in the coal sector.

Political actors

The first key stakeholders in the coal sector are **ministries and other government actors** at the national level. They set the government policies and frameworks that regulate the coal sector. In addition, the government is responsible for safeguarding both national and global interests and generating tax revenue and foreign exchange from mining investments. Furthermore, the public administration plays a role since it is responsible for the implementation phase (GIZ, 2023). Then, other government actors at the regional level have to implement the policies set at the national level. However, provincial governments may not have the capacity and resources to implement national policies. This creates friction between the parties.

The **international community** plays a role in supporting the Just Transition process, providing benchmarks, road maps, frameworks (GIZ, 2023). Moreover, many organizations support initiatives and different other actors to increase effective communication.

Economic actors

Economic operators are generally those with general economic/market interests in the coal sector. They can be divided into five different categories: 1) utilities and coal industry, 2) renewable energy companies, which have a strong stance to support JET leveraging their role in the transition process, 3) employers and business membership organizations, 4) alternative industry and business models, and 5) circular economy and sustainable business actors (GIZ, 2023).

Finally, **funding agencies** are fundamental in providing financial support to governments and other stakeholders. They increase capacity, effectiveness, and redevelopment. They are divided

into three categories: development banks, international JET foundations and national JET foundations (GIZ, 2023).

Societal actors

Many **civil society actors** are involved in engagement activities, both at national and regional levels. They aim at influencing the sector and supporting communication by providing networks with related actors (GIZ, 2023). There is also a growing presence of **gender actors** involved in the transition process. Activities such as Women in Mining and Energy, Indonesian Women's Coalition and Women in Geothermal (WING) Indonesia Association suggest an increasing presence of women in the decision-making process (Fiscal Policy Agency of the Ministry of Finance of Indonesia, 2022). Among the stakeholders which aim to hamper the JET, PERHAPI, a mining professional association, is the only one identified (GIZ, 2023).

Trade unions and workers are fundamental actors since they are directly affected by JET. With the support of the International Labour Organisation (ILO), their presence at the table has been strengthened through various initiatives and consultation forums. For example, at the Trade Union Summit in early 2022, five national trade union confederations signed a joint commitment on the involvement of workers' organizations in the skills development and lifelong learning agenda (ILO, 2022b). However, they have assumed a neutral view on JET, suggesting that they will support the transition if there will be measures which protect the affected workers and prioritize the creation of new decent jobs (GIZ, 2023).

Then, among the **communities** involved, there are the urban, the rural and the indigenous communities. Engagement of the communities results pivotal to consider the risks and impacts and ensure a fair transition process. However, the legal framework of the coal sector created in 2020 does not include the communities as legal actors, and therefore, it does not protect their legal interests (Ángel et al., 2023). These gaps in the regulations threaten the involvement of all the parties in the management of the coal in the country.

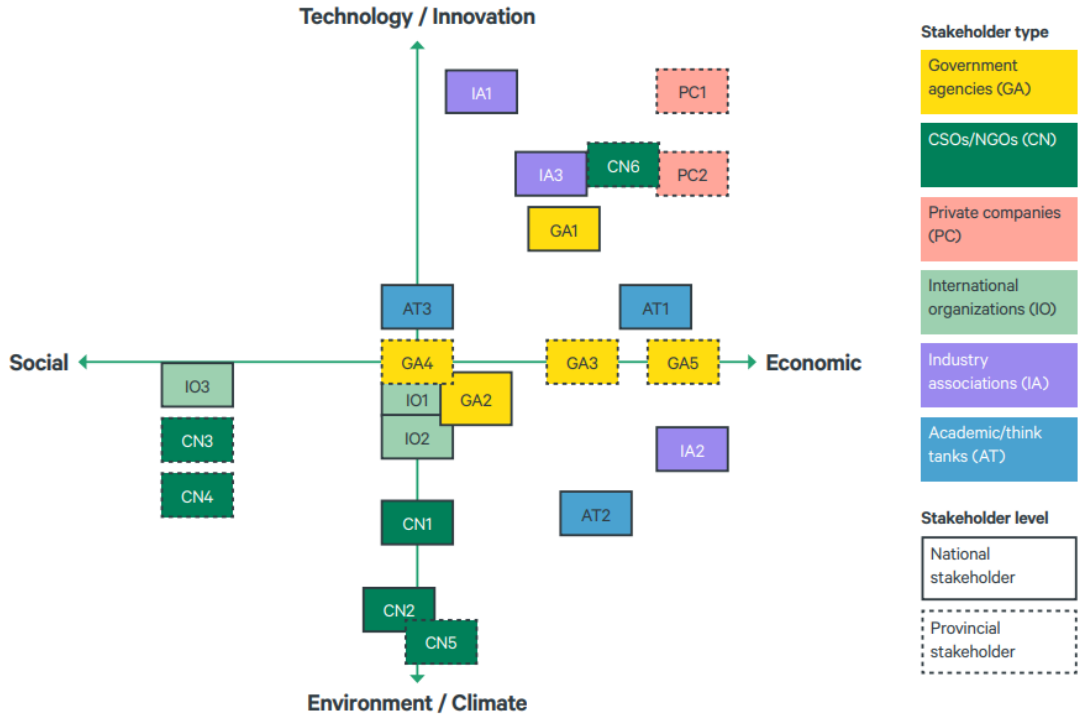
Finally, many **knowledge actors**, such as research institutes, academia, and the media, are present on the ground to shape the coal sector in Indonesia and support JET for the several research opportunities the transition could bring. However, an analysis conducted by GIZ (2023) came to the conclusion that they are not key stakeholders in the process (GIZ, 2023). In the energy sector, for example, they are described as secondary stakeholders, meaning that they are involved in JET without having much influence on the decision-making process (Saladin Islami & Adity, 2020). **Please refer to the annex for an overview of key stakeholders**.

Stakeholder and public perceptions around Just Transition

A number of recent studies delve into the perceptions and attitudes of Indonesian stakeholders and the general public towards the energy transition and coal phase out.

Much of the stakeholder and public debate about coal revolves around how much will be exported and how much will be consumed domestically (Atteridge et al., 2018). There is however growing discussion around coal phase out and what it would look like. Stakeholders have diverging visions on coal phase out, and on what a Just Transition means (Boessner et al., 2023). Moreover, Just Transition is framed differently by different stakeholders (Figure 13): Certain actors such as government agencies frame coal phase out primarily as an economic issue, prioritizing the discussion of employment and tax revenue impacts. Other stakeholders, particularly civil society, frame it as a social and environmental issue.

Figure 13. Just transition framing of national and local stakeholders in Indonesia



Source: (Boessner et al., 2023)

As to public perceptions, the **energy transition and renewable energy are not mainstream topics in public discourses in Indonesia**. An analysis of media outlets in 20219 found that Indonesia was the only country in Southeast Asia where the framing of coal was consistently positive (Climate Tracker, 2020). Articles emphasized the quintessential role of coal for the nation's economy, despite its potential environmental harms. The controversial coal

mining omnibus law was debated from the perspective of transparency and democracy, rather than in terms of the environmental impacts of coal mining. Indonesian media discusses renewables as a general concept, without specific insights into its role in the country's energy future. As a result, awareness about renewable energy and low-carbon alternatives to coal is still scarce, and this affects people's behavior towards coal (Jati, 2023c). Awareness on the economic and employment impacts of the energy transition remains low as well (Jati, 2023b). Some sources state that public discourse on energy transition is viewed as an exclusive debate where most of civil society is unable to participate (Hasjanah & Soraya, 2023).

A recent survey also highlights lack of awareness about the JETP (Just Energy Transition Partnership), with 76% of respondents unaware of it (CELIOS & Unitrend, 2023) . Additionally, the survey indicates that awareness is higher among urban and suburban residents with middle to high incomes. Despite the low awareness, the public does seem to perceive coal as the biggest challenge in energy transition. Younger Indonesians appear to be more concerned about the importance of energy transition, indicating a generational shift in attitudes towards environmental topics. On the other hand, women express heightened concerns about the potential negative impacts of coal transition, including household electricity disruptions, job loss, and relocation.

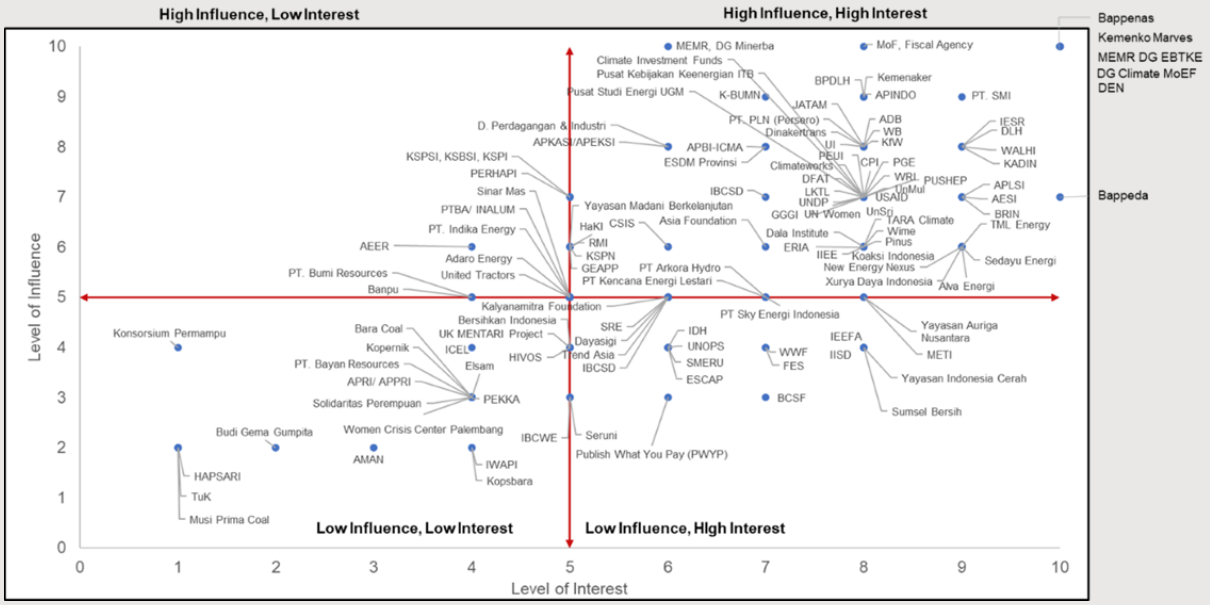
A survey of attitudes around renewable energy in East Kalimantan (Yayasan Mitra Hijau, 2023) reveals that the public perceives the coal transition as intrinsically linked with broader environmental and conservation concerns.

Box 4: Key Stakeholders in East Kalimantan and South Sumatra

According to a mapping of stakeholders relevant for the energy transition in East Kalimantan and South Sumatra performed by GIZ, the main parties involved at the regional level are the provincial government apparatus, the regency or municipality, and the same group of entities operating at the provincial level together with representative local workers, trade unions, coal companies, media, private sector, universities and NGOs.

Generally, the analysis underlined that regional authorities have a limited role in transition-related policy development processes, especially for mining permit and control. As the primary implementers of the national policies are chosen by the central government, the regional state apparatus is however an important negotiating partner in the just transition process. According to GIZ, international organizations are not present at a significant scale in either region. However, NGOs, community/vulnerable groups, funding agencies and knowledge actors are partially represented (GIZ, 2023).

Figure 14. Map of stakeholders in East Kalimantan and South Sumatra



Source: (GIZ, 2023)

The full overview table of the stakeholders in the two regions East Kalimantan and South Sumatra can be found in the annex of this report.

4. The role of coal for the energy sector

Indonesia is currently the third-largest producer of coal globally and home to one of the largest coal resources in the world (IEA, 2022b). Coal production in Indonesia has steadily increased over the last two decades (see figure 15), driven by domestic demand and international export markets (read more on the role of coal for the economy).

Its dual role as both consumer and producer of coal highlights the complex dynamics of Indonesia's coal industry, as it navigates the challenges of balancing domestic energy security with global market demands. Its export orientation also makes the Indonesian coal industry highly vulnerable as it is largely dependent on the development of global power plant trends, particularly in the major export destinations. Domestically, coal is used particularly in electricity generation and industrial production (IEA, 2022b; MEMR Indonesia, 2023).

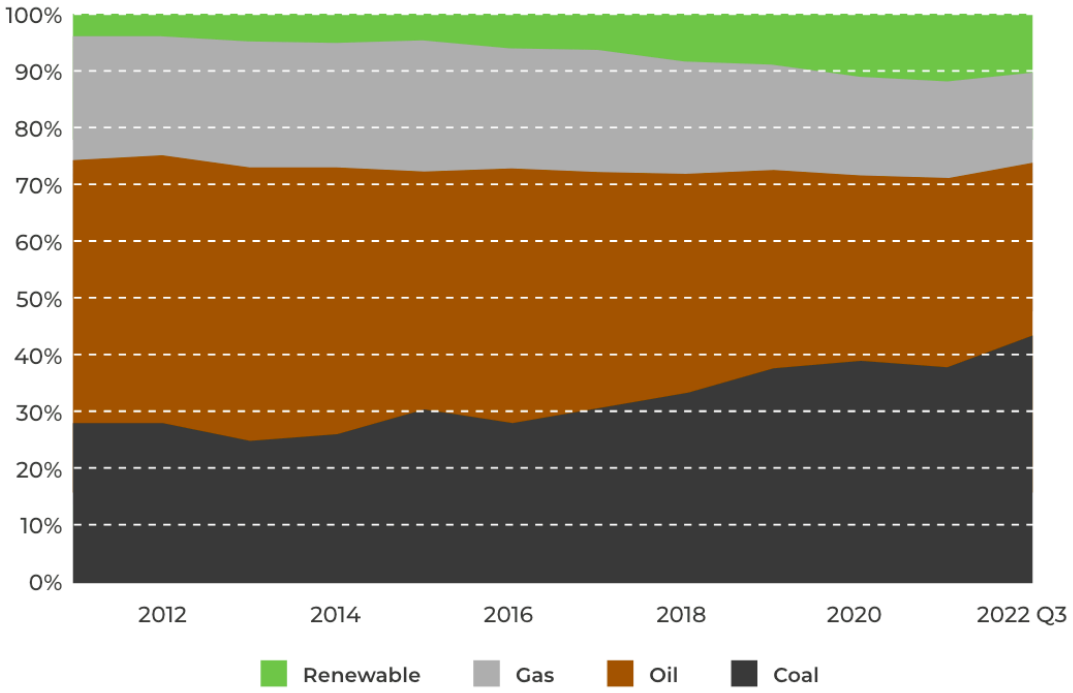
4.1. Key energy trends in the last two decades

Since 2000, Indonesia' total primary energy demand has risen by about one-and-a-half-times, from around 6 500 petajoules (PJ) in 2000 to almost 10 765 PJ in 2022 (IEA, 2022a, p. 30).

As the national GDP increased by more than two-and-half-times in the same period, the country achieved a relative decoupling of GDP and energy demand. Major improvements (reduction) in energy intensity were largely driven by the substantial replacement of the very inefficient traditional use of biomass for residential cooking by LPG and electricity. In addition to that, the energy intensity of the Indonesian economy improved by almost a quarter from 2000 to 2021, even if the shift away from traditional biomass combustion is not taken into account. Over the last decade, total final energy intensity of GDP has even fallen by around two percent per year (not counting the traditional use of biomass). At the same time, Indonesia managed to provide almost 100% of households with access to electricity (compared to around 50% in 2000) (IEA, 2022a, p. 30,31,40) and 85% with clean cooking (IEA, 2023c). Despite Indonesia's significant progress in energy accessibility, challenges remain in rural electrification and reliability of energy access (IESR, 2023a).

Indonesia's energy mix is primarily made up of fossil fuels, namely coal, oil and gas. Their share in the primary energy mix decreased only slightly from more than 95% to around 90% between 2012-2022 (IESR, 2022b; MEMR Indonesia, 2023).

Figure 15. Primary energy mix in Indonesia by source, 2011-2022



Source: (IESR, 2022b, p. 24) with reference to (MEMR Indonesia, 2023)

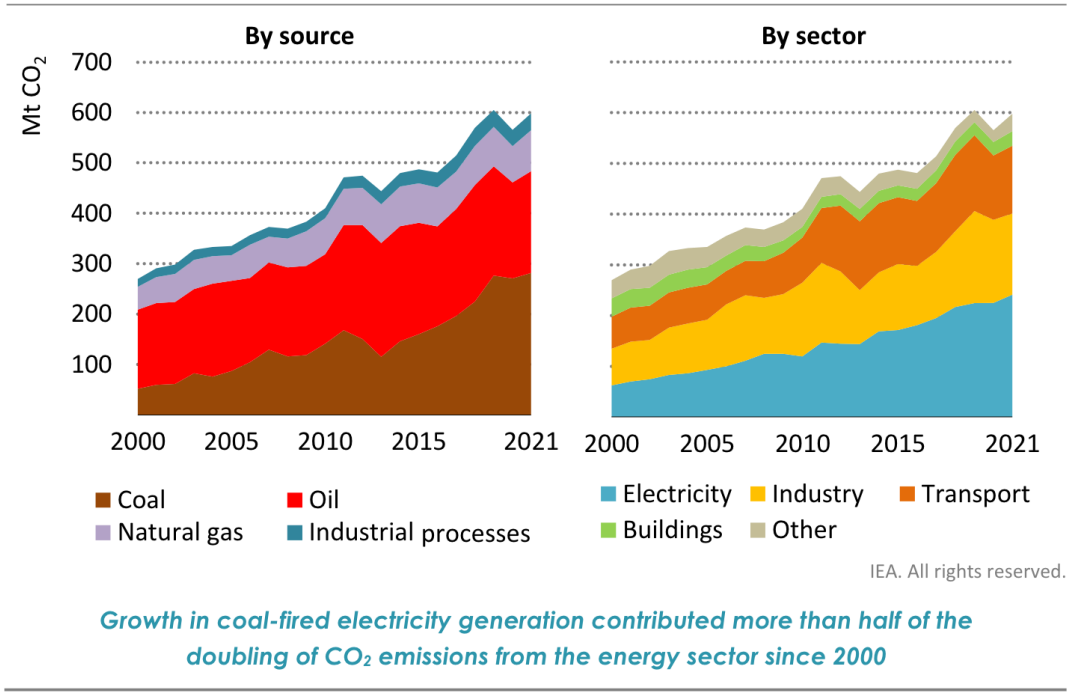
Nevertheless, the country's energy landscape has changed considerably over the last two decades: Coal has been massively expanded (both in absolute and relative terms) and now dominates the energy supply with a share of around 40%. In contrast, the share of oil has fallen strongly to about 30% in 2022 (in absolute terms, oil consumption grew slightly). Natural gas remained comparatively stable, accounting for almost 14% in 2022(IESR, 2022b, p. 24; MEMR Indonesia, 2023).

The (slight) increase of renewable energies in the primary energy mix is mainly due to the rapid expansion of biodiesel in transport.[4] Fueled by massive increase of palm oil production and fostered by mandatory blending rates, subsidies and pricing mechanisms, biofuels accounted for more than 10% of final energy consumption in the transport sector in 2021. This is one of the highest shares in the world. As the MEMR sees the use of bioenergy as an energy diversification measure it aims to further maximize its use, both as liquid biofuel, for co-firing in existing coal-fired power plants and for waste-to-energy plants (IEA, 2022a, p. 34,42).

[4] Please note that MEMR and IEA apply different approaches to account for the share of renewables in total energy supply (IEA, 2022d), in particular regarding geothermal and traditional use of biomass. The IEA energy balance for Indonesia shows a share of 24 percent renewables in total energy supply for 2021. This report follows the MEMR accounting approach.

CO_2 emissions from the energy sector more than doubled over the last twenty years. This trend was not only caused by the increased total quantity of energy demand as the growing share of coal also boosted the CO_2 emission intensity of total energy supply (IEA, 2022a, p. 31,35,36).

Figure 16. Energy sector CO_2 emissions in Indonesia, 2000-2021



Mt CO_2 = million tonnes of carbon dioxide; Other includes agriculture and other fuel transformation

Source: (IEA, 2022a, p. 36)

4.2. Electricity generation mix

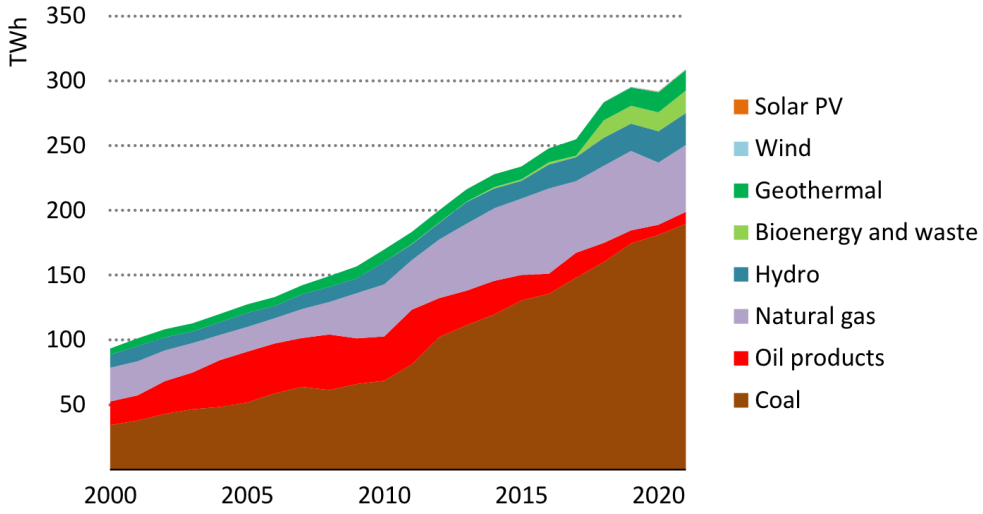
The sharp rise in coal demand has been driven by the electricity sector. Coal-fired generation rose more than five-times from around 35 TWh in 2000 to nearly 205 TWh in 2022, contributing almost two-thirds to Indonesia's total electricity generation (IEA, 2022a, p. 34). These numbers strongly highlight the country's current heavy reliance on coal for meeting its electricity demand.

Nevertheless, renewable energies have gradually gained traction: **Electricity generation from hydro, bioenergy and geothermal increased by nearly four-times over the last two decades**. Together, they provided almost one fifth of total electricity production (65 TWh) in 2022. Solar and wind contribution on the other hand is negligible, accounting for less than 1 TWh of electricity production(IEA, 2022a, p. 34; IESR, 2023b, p. 1). Overall renewables deployment must be stated as particularly lagging: In 2023, only 1 GW additional capacity was

installed (IESR, 2023b, p. 1). In order to still reach the government's target of increasing the share of renewable energies in the primary energy mix to 23% by 2025 (see chapter 4 on energy and climate governance), an additional 13 GW of renewable energy capacity would have to be installed within the next two years (IESR, 2023c).

62% of Indonesia's electricity is generated by the state-owned electricity company PLN. The remaining 38% are produced by Independent Power Producers (IPPs) and Private Power Utilities (PPUs)(PT PLN, 2024).

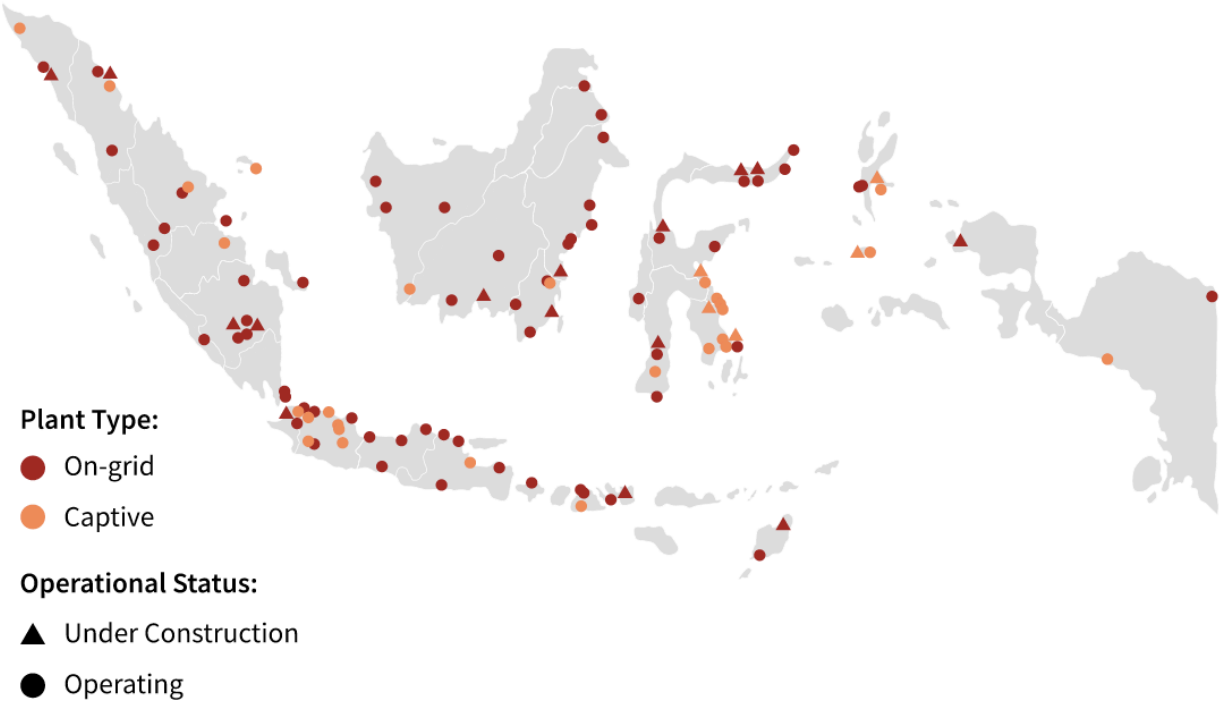
Figure 17. Electricity generation mix in Indonesia by source, 2000-2021



Source: (IEA, 2022a, p. 34)

As of May 2022, Indonesia has 86 coal-fired power plants with a total installed capacity of 40.2 GW. Of these, 26 plants with a capacity of 12.5 GW are owned by PLN, and 32 CFPPs with a capacity of 18.5 GW are run by Independent Power Producers. The remaining plants are off-grid captive plants, mainly for large industrial use (see Figure 18).

Figure 18. Indonesia's existing and under construction coal-fired power plants



Source: (Center for Global Sustainability & IESR, 2024)

It has to be noted that Indonesia's CFPP fleet is very young, with the majority being built after 2010. Also important is that coal plants were largely owned by PLN in the past, whereas lately there is an increasing share of independent power producers and most recently captive plants for industrial production e.g., of the metal industry (see economy chapter). This also changes the regional distribution of power plants. While historically, there is a strong focus on Java, new (captive) power plants are also built in Sumatra and Sulawesi e.g., to support local industrial development like e.g., nickel mining and smelting.

4.3. Overcapacity in fossil electricity production

Indonesia is grappling with an electricity generation overcapacity causing an economic burden of IDR 16 trillion (USD 1.2 billion) in 2021. This overcapacity is primarily due to state-owned electricity company PLN's overestimation of electricity demand. In 2019, the actual rise in electricity demand was only 4.5%, significantly lower than the MEMR estimate of 6.3%. Furthermore, approximately a third of the total installed fossil fuel capacity (58 GW) exceeded the necessary capacity in 2021 (CREA, 2023).

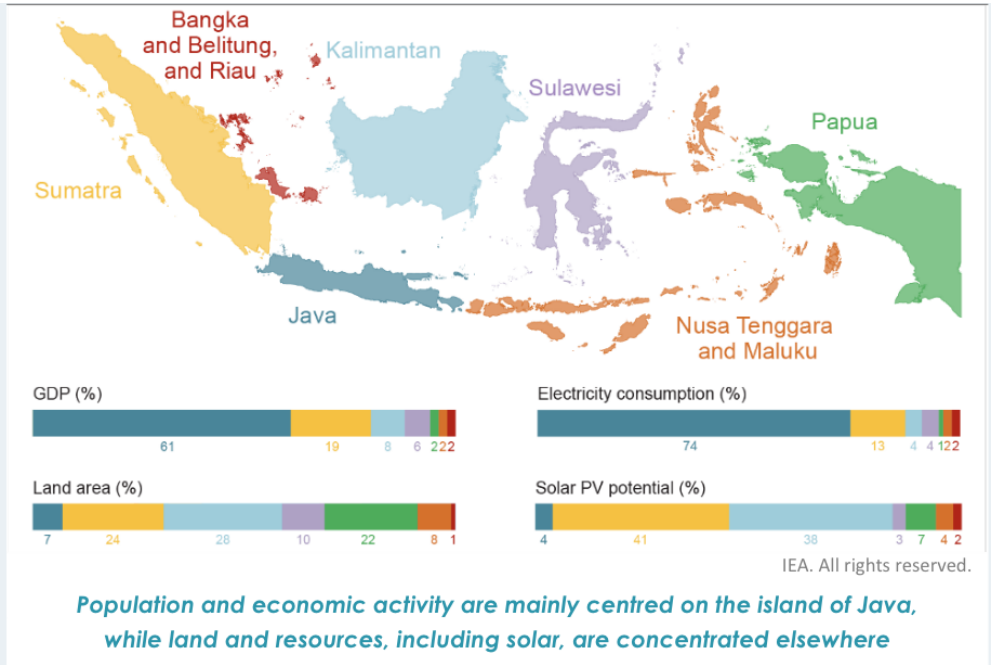
This overcapacity serves as a significant barrier to the transition from coal to renewables, as contractual obligations of PLN make additional renewable power capacity more costly. Not

because renewables are more expensive than fossil fuels - **the levelized cost of electricity (LCOE) for PV in 2022 is comparable to new coal-fired power plants** (IESR, 2019b) - but due to the 'Take or Pay' (ToP) system, which necessitates PLN to pay both for the already contracted coal capacity and again for electricity from additional renewables. This inflexibility contributes to higher system costs, hindering the development of renewable energy (IEA, 2022c).

To address this, the government proposed a Just Energy Transition Partnership (JETP) for early retirement of coal-fired power plants, aiming to retire 1.7 GW of IPP and PLN capacity by 2040. Meanwhile, PLN will need to renegotiate contracts with Independent Power Producers (IPPs) to adjust to changes in fuel consumption patterns or high renewable energy output.

As a country with about thousands of islands, Indonesia has around 38 individual electricity systems. Energy consumption is dominated by the isle of Java, which accounts for more than three-quarters of the national electricity demand. Reasons for Java's high electricity demand are that 60% of the Indonesian population lives here (and on Bali) and 60% of the national GDP is generated on the island (IEA, 2022a, p. 28) with reference to (BPS-Statistics Indonesia, 2017, 2021; IEA, 2022a) . Consequently, 15.8 GW of Indonesia's coal-fired power plant capacity is located on Java (as of April 2021) (Bisnis Indonesia, 2023; PT PLN, 2021a). **Indonesia's PV potential however, is mainly centered on the islands of Sumatra and Kalimantan** (as are its coal resources). Although Java accounts for about 14% of Indonesia's wind power potential and also has important hydropower and geothermal resources, its renewable capacities will probably not be sufficient to meet its electricity demand. The resulting challenges arising of this unbalanced distribution of renewable potential and energy demand among Indonesia's islands/electricity systems as well as possible solutions for the energy transition are further discussed in chapter 6.1.2 (IEA, 2022a, p. 28) with reference to (BPS-Statistics Indonesia, 2017, 2021).

Figure 19. Regional distribution of GDP, land, electricity consumption and PV potential in Indonesia

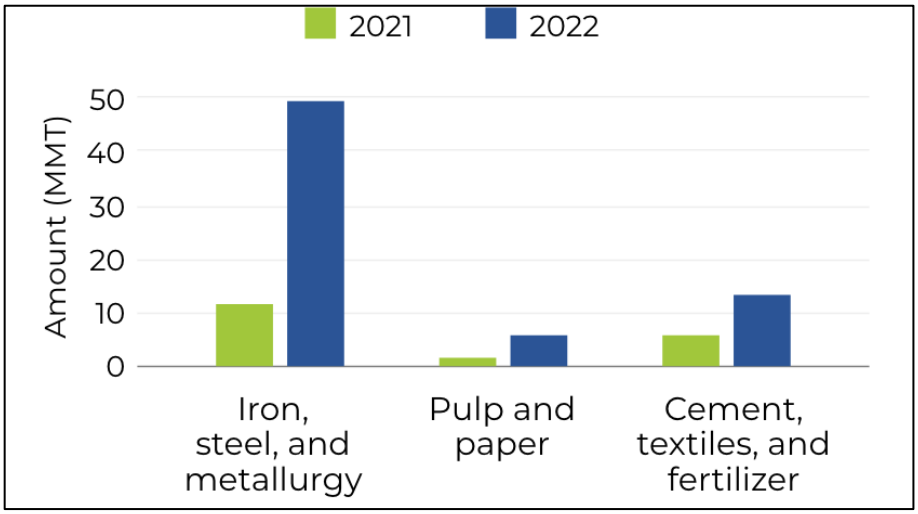


Source: (IEA, 2022a, p. 28) with reference to (BPS-Statistics Indonesia, 2017, 2021)

4.4. The role of captive coal fired power plants

Nearly 25% of operating coal-fired power plants in Indonesia are operated and utilized off-grid by industrial actors - so called captive coal fired power plants (CCFPP). The operating captive power capacity has been consistently increasing in the last ten years, nearly eightfold from 1.4 gigawatts (GW) to 10.8 GW and over half of the total proposed coal capacity additions are for captive use. Captive power plants are commonly part of “national strategic” projects and around 76% (8,214 MW) of the operational capacity is dedicated to the metal industry (CREA & GEM, 2023). It is important to note that Indonesia is the largest producer of nickel, which requires high temperatures in production and has been another driver for increasing coal demand over the last years (CREA & GEM, 2023).

Figure 20. Coal demand increase in industry sectors in Indonesia from 2021 to 2022



Source: (IESR, 2023b)

As nickel is an important metal for renewable energy, the sectoral dependency on coal is another challenge for the transition in Indonesia. The current issue involves conflicting policies, aiming both to decrease carbon emissions and to escalate the production of materials essential for renewables. The same applies to tin, for which Indonesia is the second-largest producer worldwide(PwC, 2023c).

The dedication of operational capacity to the metal industry stems from the government's effort to turn Indonesia into a manufacturing hub for electric vehicles and batteries. As a concrete step, the Government has banned the export of nickel ore with a grade below 1.7% (MEMR Indonesia, 2019). Therefore, most of the plants will feed the nickel, copper and aluminum smelters that the government is promoting. The Indonesian government committed to restrict the deployment of new coal-fired power plants, but there are several exceptions for captive plants(CREA, 2023). Captive power plants are usually independently owned and operated - the information on detailed future development plans is limited, but the demand for metals to power electric vehicles and batteries is rapidly increasing.

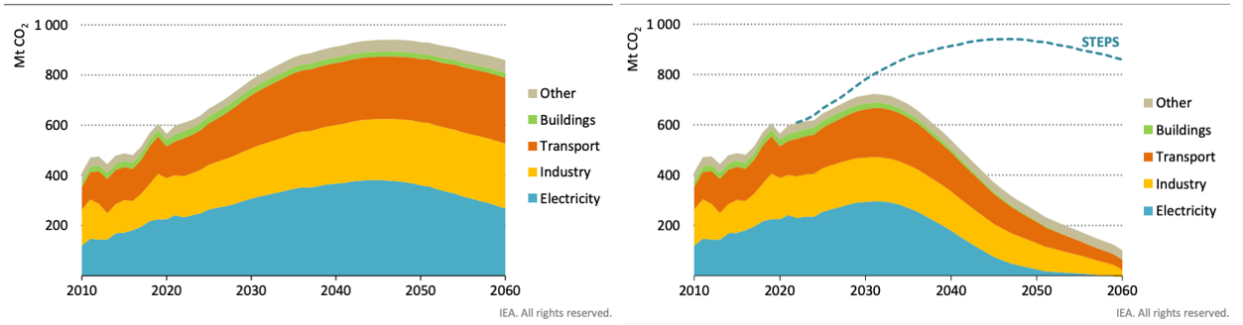
4.5. Key future energy trends and pathways to net zero emissions

Indonesia's objective to reach net zero by 2060 has shifted the paradigm of its energy sector. While in the past it has focused on security of supply and a driver for economic development in the country - the new, additional requirement is to reduce CO_2 emissions to (almost) zero by 2060.

The IEA and MEMR have published a possible scenario towards a net zero emission system (IEA, 2022a). In this scenario, energy related CO_2 emissions peak in 2030 (see figure 21, right

graph). If one compares this to projections of CO_2 emissions based on policies which are already in place (figure 21, left side) it becomes very clear that **Indonesia has to introduce much stricter and more holistic policies to actually reach its climate objectives**.

Figure 21. Total energy CO_2 emissions by sector in Indonesia in the IEA's 2010-2060



Stated Policies Scenario (left) and the Announced Pledged Scenario (right).
Source: (IEA, 2022a)

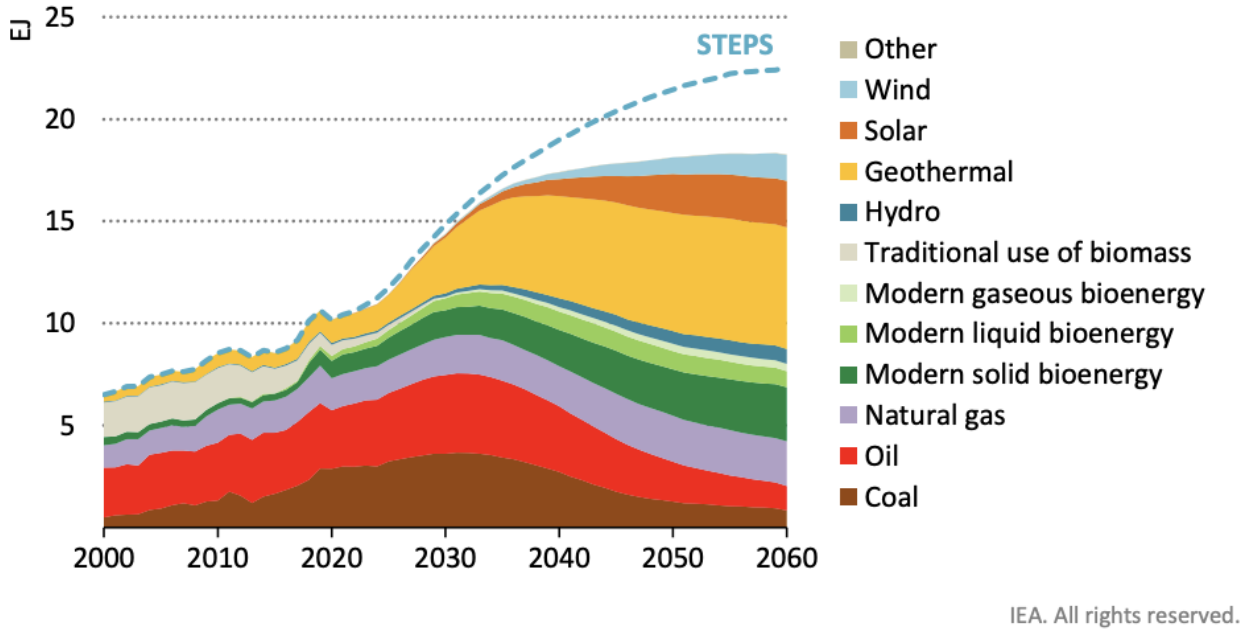
To estimate possible pathways, we take a closer look at this IEA/MEMR study and the two scenarios it explores: The Stated Pledged Scenario (STEPS) are projections based on the implementation of existing policies and measures that the government has officially announced or enacted. The Announced Pledged Scenario (APS) are projections based on the climate commitments or pledges made by Indonesia as part of internal agreements or domestic policies. Thus, APS describes one possible pathway towards Indonesia net-zero by 2060 climate policy commitment.

Projections of future energy supply

Under the Net-Zero/APS scenario, the total primary energy supply in Indonesia is expected to increase from 10765 Petajoules in 2022 to 14400 PJ by 2030 and 19000 PJ by 2060 (see figure 22). The scenario prioritizes rapid strides in energy efficiency and electrification, resulting in a smaller increase in demand compared to what current policies would imply (STEPS scenario).

In the net–zero pathway the fossil fuel's share in the energy supply mix is projected to slightly decline from 72% in 2021 to 65% by 2030 but then drop sharply to 22% by 2060. Coal use is expected to still increase in coming years, but then to plateau and decline after 2030.

Figure 22. Total energy supply in Indonesia in the Announced Pledges and Stated Policies scenarios, 2000 – 2060

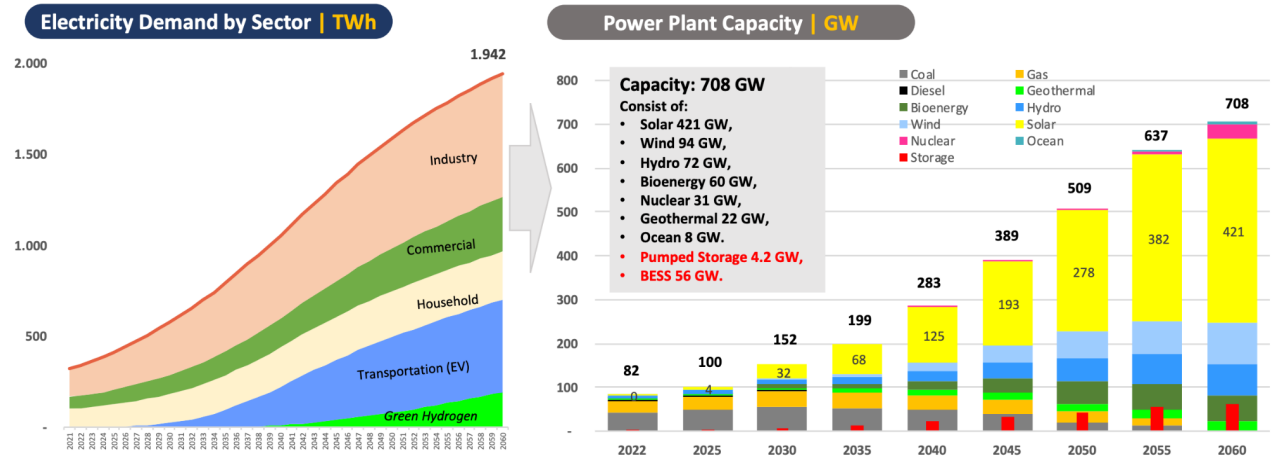


Source: (IEA, 2022a)

Scenarios for electricity generation

The existing, young fleet of coal-fired power plants will result in a high share of coal in the electricity mix in coming years. However, in the APS net-zero scenario, the relative share of coal in the electricity mix already decreases by 2030. New capacity would mainly come from geothermal and solar as well as wind in later years. By 2040 the absolute amount of electricity generated from coal would need to decrease. Solar and wind energy is expected to dominate Indonesia's electricity with solar PV capacity expected to surpass 20 GW by 2030 and reach an impressive 300 GW by 2050 (IEA, 2022a) . Meanwhile, wind power capacity is also expected to grow from less than 1 GW in 2023 to a projected 90 GW by 2050, predominantly from wind offshore off the coast of Kalimantan. By 2060 wind and solar would be contributing more than 70% of Indonesia’s electricity mix (see Figure 23).

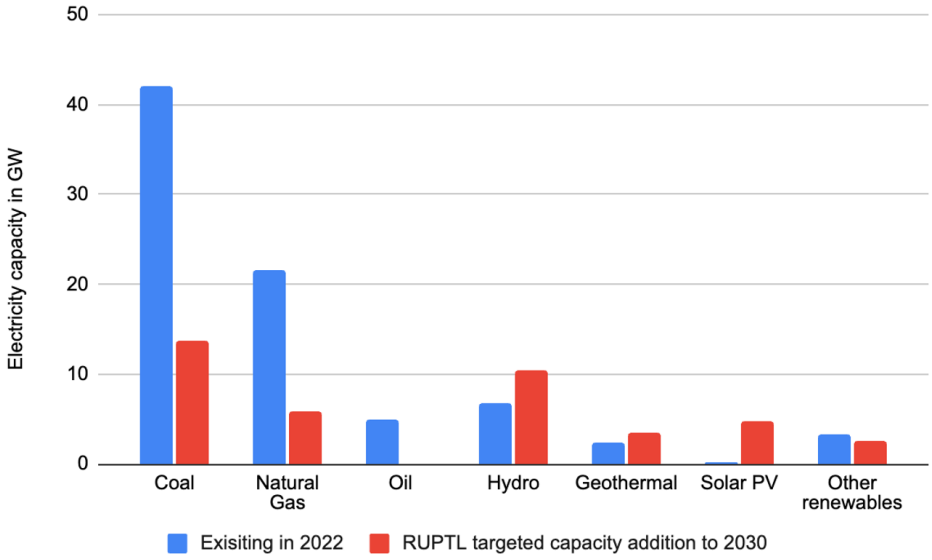
Figure 23. Total electricity generation in the Announced Pledged Scenario



Source:(MEMR Indonesia, 2022)

When comparing the net-zero scenarios with the current energy planning, as stipulated in the RUPTL it becomes obvious that the current energy planning is not yet aligned with the climate policy ambitions. **While the MEMR calls for 32 GW of PV in 2030, current RUPTL planning aims at only 5 GW** (see figure 24). At the same time, RUPTL plans for an additional 14 GW of coal by 2030, which would entrench the country on a high carbon path if not early retirements are to be introduced at a later stage.

Figure 24. Capacities for electricity generation in 2022 and targeted capacity additions by 2030

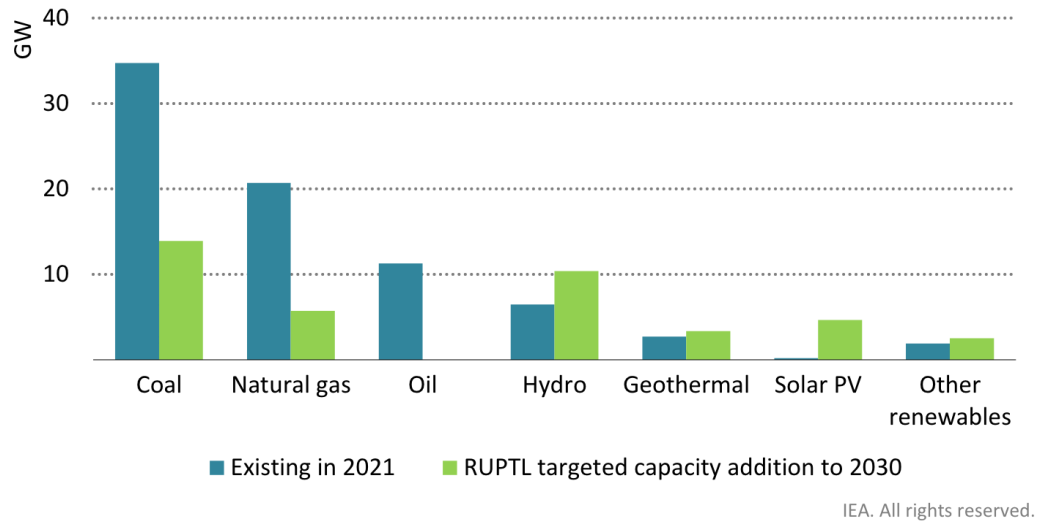


Source: own figure with data taken from (MEMR Indonesia, 2023)

According to the RUPTL 2021-2030, the objective is to add 40.6 GW of capacity by 2030 in Indonesia, with an annual increment of 4 GW. The plan shows a targeted addition of 13.8 GW in coal capacity by 2030. However, the current coal capacity stands at 46 GW, nearly 9 GW more than in 2020, exceeding the target set for 2030.

Similarly, the hydropower capacity has reached 6.7 GW in 2022, marking a 0.45 GW increase from 2020, falling short of PLN's target increase of 0.75 GW. Moreover, the solar power capacity stood at 0.28 GW in 2022, with an increase of only 0.14 GW from 2020, significantly lower than the targeted additional capacity of 0.35 GW by the end of 2022.

Figure 25. Targeted capacities additions in electricity supply plan



Source: (IEA, 2022a)

Overall, there are discrepancies between the targets set in the RUPTL 2021-2030 and the actual capacity increases observed. The rate of increase in coal capacity exceeds the targeted rate, suggesting a need for reassessment of coal capacity expansion plans in alignment with environmental goals. The efforts to expand hydropower capacity may need to be intensified to meet the set targets. Plus, the slow deployment of solar power in Indonesia needs to be accelerated to meet the target of an additional 20.9 GW of renewable energy by 2030.

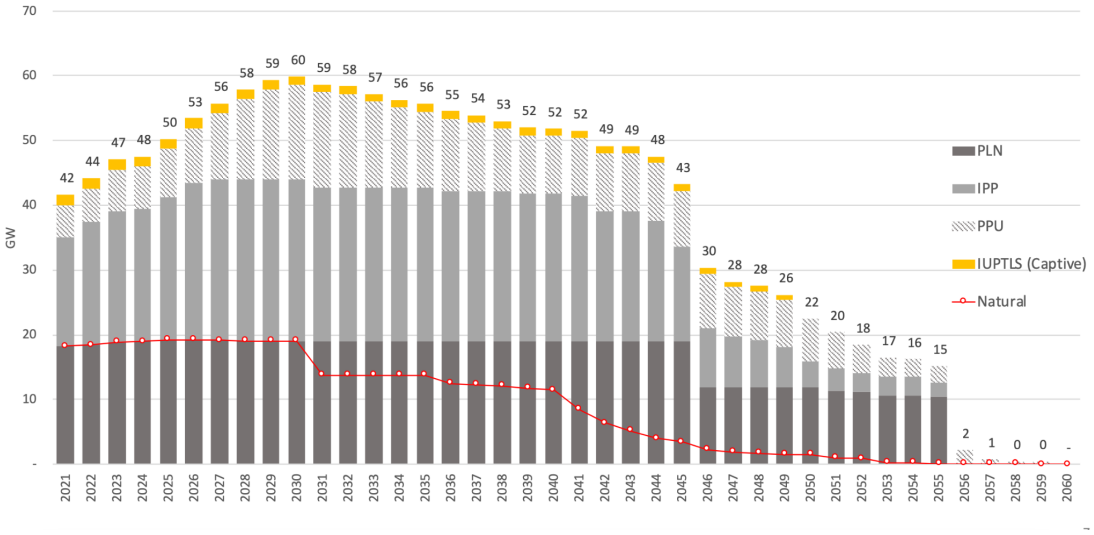
These discrepancies indicate the need for a re-assessment of energy policies and strategies to ensure alignment with targets and goals.

Retirement plans for coal-fired power plants

In order to reach net-zero emissions by 2060, PLN announced that it would phase down all of its coal-fired power units by 2056. The company plans to retire all coal-fired power units by 2030 and begin lowering their capacity in 2031. By 2040, they want to build nuclear power

plants, and by 2056, they want to phase out all coal-fired power plants. An alternate scenario, in which coal-fired power facilities continued to operate while incorporating improved carbon capture technologies, was also discussed (PT PLN, 2022a).

Figure 26. Projected retirement of coal-fired power plants in alignment with net-zero emissions by 2060



Source: (MEMR Indonesia, 2022)

PLN's strategy to shut down its outdated coal-fired power stations may be found in the new Rencana Usaha Penyediaan Tenaga Listrik (RUPTL) for 2024-2033. It does not, however, include nuclear power development by 2040 or establish a timetable for the retirement of all coal-fired power facilities by 2056. The plan also specifies that, beginning in 2030, the retirement of aging coal-fired power plants will be carried out gradually. But a number of things will need to happen first, like how long the Power Purchase Agreement (PPA) lasts and how long the individual power plants are profitable.

In order to accelerate the transition to net-zero emissions by 2040, early CFPP retirement might start prior to 2030 and aim to retire 5.5 GW of coal-fired power capacity. Recently published studies show how this could be possible through canceling captive plants at pre-construction stages, lowering plant utilization and co-firing with biomass (Center for Global Sustainability & IESR, 2024). to However, the JETP funds only cover 1.7 GW of early coal retirement (Climate Policy Initiative, 2023). This significant shortfall necessitates thorough analysis, strategic prioritization, and stakeholder cooperation to overcome challenges and expedite the shift towards a greener future.

Challenges to increase renewable energy in the short term

In the short term, the above-mentioned scenarios are in line with the current plan to increase the share of renewables. Based on RUPTL 2021-2030, new and renewable energy power plants will dominate the additional capacity of power plants with 24.8% total energy mix in 2030. In order to achieve a share of 23% renewable in its total energy supply by 2025, additional RE capacity of 5 GW is needed (PT PLN, 2021b).

Despite having a legal framework for the development of renewables, **Indonesia's actual implementation of RES development falls short of the intended goal, as they face significant hurdles for implementation** (see also economy chapter). Main challenges are the price cap imposed on potential revenue, resulting in reluctance from the State Electricity Corporation (PLN) to agree on renewable prices that might later be perceived as causing 'state losses' for projects not subject to BPP price caps, as well as high upfront investment costs of solar modules and equipment. The introduction of a new pricing scheme for renewable energy under Presidential Regulation No. 112/2022 aimed to reduce some barriers. However, its effectiveness in attracting investors and reducing the negotiation period remains uncertain due to its recent implementation in 2023.

Mid to long-term challenge: dispatchable energy

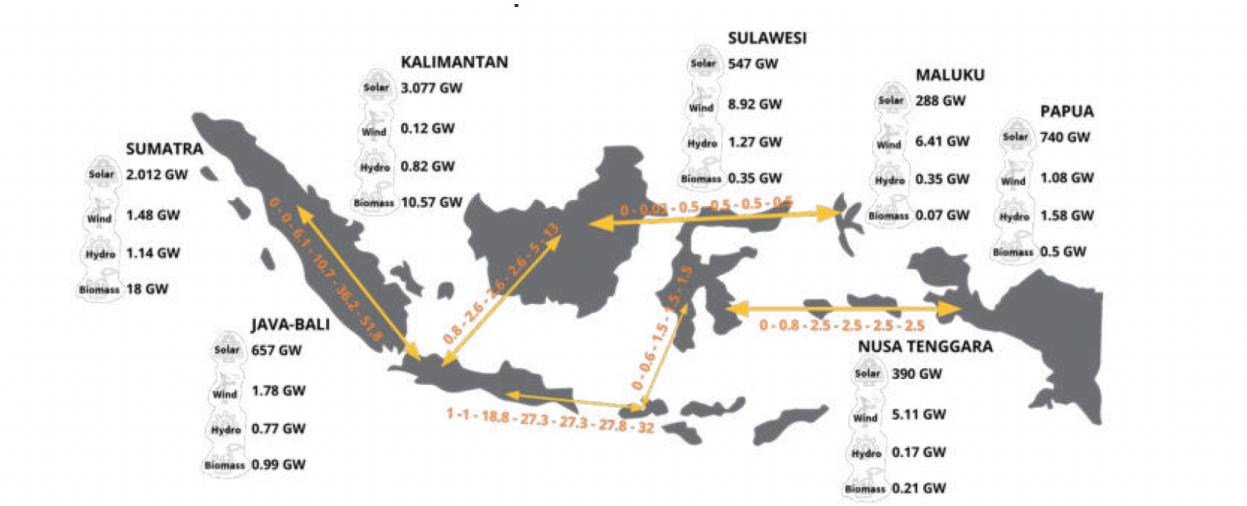
In the near future, additional renewable energy can easily be integrated into the electricity mix, as a large amount of dispatchable fossil fuel power plants can balance demand and supply. As the share of intermittent renewables such as wind and solar increases, dispatchable (coal fired) power plants close, the need for demand response measures and energy storage solutions becomes increasingly apparent. These measures are essential for effectively managing the intermittency of renewable energy sources, ensuring grid stability and optimizing energy usage. Hence, the use of dispatchable renewable energy sources like hydropower, geothermal and bioenergy become essential. For instance, pumped hydro storage, a proven reliable energy storage technology, can store energy for later use during peak demand periods and holds significant potential particularly on Java. As the share of renewables increases further, other energy storage types like battery storage will also become important. Hydropower remains the cornerstone of dispatchable renewables, projected to account for over 70 GW of capacity by 2060, while geothermal energy and bioenergy are expected to contribute around 22GW and 25 GW of capacity by 2060, respectively.

Necessary transformation in the grid

Currently, Indonesia does not have electricity grid connections between its islands. The country is considering a "super-grid", which would also change the preconditions and possibilities for an energy transition. Currently, Java leads the nation in electricity consumption, which is expected

to rise by 2030 (IESR et al., 2021). However, the islands of Sumatra and Kalimantan hold the largest technical potential for renewable energy.

Figure 27. Illustration of inter-island interconnection capacity and renewables potential



Source: IESR analysis.
Note: The number of renewables capacity are technical potential according to IESR study, not the installed capacity.

Source:(IESR, 2022b)

This disparity could be resolved by importing electricity from these renewable-energy-rich islands, which will enhance the reliability of the system and convert coal regions into hubs for renewable energy (IESR, 2022b). Indonesia's Minister of Energy and Mineral Resources, Arifin Tasrif, has announced plans to build a super grid by 2025 (MEMR Indonesia, 2021). The project involves the creation of the Nusantara Supergrid Electrical Network, an underwater power cable connecting five major electricity areas, aiming to optimize the use of renewable energy.

Before linking the islands, existing transmission lines, particularly in Sumatra and Kalimantan, need reinforcement. By 2025, Java's increasing supply-demand deficit is to be managed by establishing Java-Kalimantan and Java-Nusa Tenggara lines, necessitating high-capacity interconnections with Sumatra, Kalimantan, and Nusa Tenggara (IESR et al., 2021).

In parallel or alternatively, Indonesia could try to diversify its economic and population growth more evenly across its islands. The establishment of the new capital in East Kalimantan is a key step in this direction. Setting up energy intensive industry hubs not in Java, but on the other islands, could be an option to balance electricity demand with renewable energy potential (IEA, 2022c, p. 18).

Box 5: Solar energy from Australia?

Indonesia has a large potential for solar energy. However, conditions in Australia are even better. In consequence Sun Cable, an Australian company, is planning the Australia-Asia PowerLink, a A$30 billion project to channel solar energy from Australia to the Asia-Pacific region, specifically Singapore. The cable is projected to carry 3.2GW of electricity, supplying up to 15% of Singapore's total electricity needs (SunCable Energy, 2023). The first stage of the project involves a massive solar farm in Australia's Northern Territory, which would provide an initial 900 megawatts of electricity supply to local industry around Darwin, export 1.7 gigawatts to Singapore, and later add a further 3 gigawatts for Australian customers.

A central element of the plan is the construction of a 4,200km undersea cable via Indonesia towards Singapore which is planned to become operational by 2029.

The project carries two important messages for Indonesia: For one: once this cable between Australia and Singapore exists, importing solar generated electricity may also be an option for Indonesia. But more generally: renewable energy supply with long distance power lines is technically feasible and can be economically competitive. So, an Indonesian super grid to connect the countries' islands is feasible and could ensure a high share of renewable use (e.g., Kalimantan and Sumatra providing Solar and Wind energy for Java).

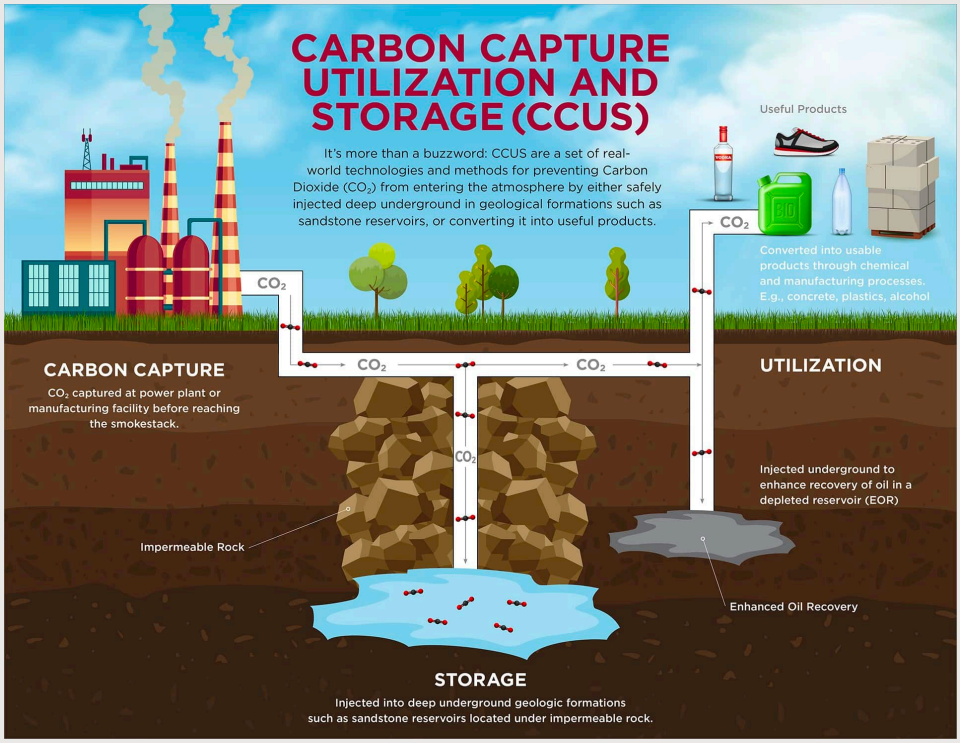
Carbon Capture Utilization and Storage (CCUS)

In many long-term net-zero scenarios, carbon capture utilization and storage (CCUS) plays a somewhat important role. However, **it should be noted that while this technology is established e.g., in oil production, there are hardly any successful projects to use CCUS with coal-fired power plants yet** (see box on CCUS below). Consequently, actors like the state owned PT Pertamina (Persero) position themselves as potential future actors for CCUS - but so far with clear reference to the oil and gas industry (Pertamina Indonesia, 2023). So far, the IEA/MEMR net-zero scenario for Indonesia do expect a substantial share of coal with CCUS in the mid to long-term. In contrast, the national climate policy roadmap by MEMR assumes no coal in 2060 (MEMR Indonesia, 2022). In other scenarios developed by third-party organizations CCUS is mostly seen critically, for instance due to costs and unresolved technical questions (IESR, 2023b). Irrespective of the question of what the role of CCUS could be in the future, it is clear and consistent across all scenarios that the share of renewable energy will increase and the role of coal for domestic electricity production will need to decrease strongly by 2030 in order to be in line with the national and international climate targets.

Box 6: CCUS - technology status quo

Carbon Capture Storage is a technology that aims to capture carbon dioxide emissions from large scale industrial sources such as power plants before they are released into the atmosphere. The captured carbon dioxide is then transported and stored underground in geological formations such as depleted oil and gas reservoirs or deep saline aquifers where they can be stored for a long period of time. Alternatively, the CO_2 could be utilized to e.g., to produce products, which contain carbon, like plastic.

Figure 28. Overview of the Carbon Capture Utilization and Storage (CCS) technology



Source: (IndustryARC, 2024)

CCS is a controversial issue, perceived differently by diverse experts, institutions and countries. During the 1990s and early 2000s, there were high expectations of Carbon Capture and Storage (CCS) for climate mitigation and reducing the CO_2 emissions of coal-fired power plants. However, the pipeline of CCS projects under development has more than halved between 2010 and 2017. In 2020, only 26 commercial CCS facilities were in operation globally and only the 115 MW Boundary Dam in Canada is connected to a coal-fired power plant. CCS is used successfully in enhanced oil recovery – where the CO_2 is used to press more oil out of oil fields. But the core benefit here is a higher oil recovery, not the CO_2 storage.

In the debate on CCUS it is important to clearly distinguish the four options for which CCUS could play a role:

- low-carbon power generation using fossil fuels;
- production of low-carbon hydrogen at scale;
- deep decarbonization in hard-to-abate industry;
- delivering negative emissions.

1) CCUS can potentially reduce a substantial amount of emissions from coal and gas-fired power plants, but not down to zero. Generally speaking, CCUS in power plants reduces efficiency, which leads to higher energy demand and costs. According to the IISD, carbon capture storage is projected to range from IDR 320-565 thousand/tCO_2 (USD 20-35/tCO_2) for processes with concentrated CO_2 streams to IDR 590 thousand -1,8 million/tCO_2 (USD 36-110/tCO_2) for diluted gas streams (IISD, 2023). Against this background countries in the EU have put aside their CCS plans for coal-fired power plants as this option would neither be available early enough to reach existing climate targets nor be economically competitive against renewables.

2) CCS may be an option for the production of 'blue hydrogen' (from natural gas with CCUS). Expert assessments of the potential are controversial. Producing hydrogen at the source of natural gas wells can potentially use existing infrastructure (e.g., pipelines) as well as storage facilities (e.g., gas wells) and can help reduce emissions with a mid-term perspective. The production of blue hydrogen does imply CO_2 emissions and can thus not be seen as a permanent option towards a climate-neutral energy system.

3) Many climate scenarios give CCUS a clear role in reducing emissions in sectors where alternative zero-carbon technologies are not available. Cement is one prominent example where CO_2 is emitted by deacidifying the limestone used as a raw material in cement production. Here CCS is likely to be an important technology to complement other emission reduction solutions in the construction sector (e.g., new construction materials and circular economy approach).

4) From a long-term perspective, CCS can play an important role in achieving negative emissions. Many climate scenarios rely on negative emissions after 2050 – either to compensate for emissions that are extremely difficult to avoid (e.g., in agriculture) or to compensate for overshooting the greenhouse gas emission budget before 2050. Negative emissions could be achieved by extracting CO_2 from the air with subsequent storage (direct air capture – DACCS) or from biomass burning with subsequent CO_2 capture and storage (BECCS).

Overall, Carbon Capture, Utilization, and Storage (CCUS) has the potential to play a significant role in the transition to a climate-neutral economy, especially in industries like cement that produce emissions that cannot be avoided. However, the extent of CCUS's application and its

geographic distribution remain uncertain. The current plans for CCUS deployment are inadequate to significantly reduce global emissions. For instance, since January 2022, there have been announcements for around 50 new capture facilities expected to be operational by 2030, with a combined capture capacity of approximately 125 Mt CO_2 per year. This falls significantly short of the estimated 1.2 Gt CO_2 per year required to reach net-zero emissions by 2050 in certain scenarios (IEA, 2023a).

In conclusion, CCUS will likely play a role on the path towards a climate-neutral economy in specific fields. The magnitude of CCUS use and its distribution among countries is still unclear, but for sectors with unavoidable emissions like the cement industry, CCUS is likely to play a role in the future. According to the IEA, project developers have stated since January 2022 that they hope to have about 50 new capture plants up and running by 2030, with an annual capacity to capture about 125 million tons of CO_2. However, even if those plans were fully implemented it is obvious that to reach global climate targets, the largest share of necessary CO_2 emission reduction will come from enhanced energy efficiency, increasing use of renewable energy and a subsequent reduction of use of coal.

Co-firing coal power plants with biomass: Plans and risks

Biomass cofiring has emerged as a go-to near-term climate policy fix in some of Asia's coal dependent countries, where forest biomass burning is booming. As Indonesia has a large biomass potential, the State Electricity Company (PLN) plans to scale up biomass co-firing and implement the co-firing in 52 coal-fired power plants by substituting 10% of coal with biomass by 2025 (PT PLN, 2023). Biomass co-firing is planned to produce 10.6 GW of electricity capacity with 9 million tons of biomass per year (PwC, 2021).

Even though biomass co-firing may be a fairly cheap short-term fix to reduce some CO_2-emissions, it is clearly not scalable to substitute the current coal fleet - neither in scale nor in a longer time horizon. Feedstock availability would need to be assessed in more detail and considered in a national strategy (IEFFA, 2021). In general, woody biomass use is only climate neutral if sustainable re-forestation can be guaranteed - initially, biomass burning leads to higher emission, which would only be re-captured in the long term, when forests grow back. Furthermore, in a net zero transition, there will be a high need for biomass in other sectors like biofuels for transport or biogas for cooking, so the amount of biomass for co-firing in coal plants will be very limited with a mid- to long-term perspective.

Box 7: Knowledge gaps in the field of energy

The development of the coal mining industry for the transition of the coal regions in Indonesia. We see the following uncertainties and knowledge gaps:

- In general, knowing the certainties and uncertainties of future domestic coal demand and use are an important basis for decision makers on all levels to define timelines for transition measures that are currently lacking reliable data.
- This is especially the case regarding the development of captive coal-fired power plants. Those industrial coal plants currently show higher growth rates than what is mirrored in many plans and scenarios. A better projection would be important to forecast domestic coal demand more accurately.
- How realistic is the establishment of a strong inter-island power grid? What are the time frames for such a development, and what would be the expected effects on regional economies?
- Analysis about sustainable feedstock availability for biomass co-firing in the mid-term as a way to reduce the use of coal for domestic power plants.

5. The role of coal for the economy

5.1. Production volumes and use

The three major coal-producing provinces in Indonesia are East Kalimantan, South Sumatra and South Kalimantan. Their combined output is around 80% of the national production. East Kalimantan holds more than 40% of the total coal resources. South Sumatra currently accounts for approximately 25% of the total coal resources and South Kalimantan for 15% (MEMR Indonesia, 2023).

Table 3. Coal Production, resource and reserves by region in 2022

	Total Indonesia	East Kalimantan	South Sumatra	South Kalimantan
Coal production	687 million metric tons	294 million metric tons*	57 million metric tons **	147 million metric tons*
Coal resources	92 billion metric tons	38 billion metric tons	23 billion metric tons	14 billion metric tons
Coal reserves	33 billion metric tons	14 billion metric tons	9 billion metric tons	9 billion metric tons
Coal export	465 million metric tons	272 million metric tons	83 million metric tons	108 million metric tons

* Numbers are from 2021 as no data available for 2022 (ESDM Kalsel, 2020; ESDM Kaltim, 2021)

** Numbers are taken as an estimate (Mongabay, 2023)

Source: (MEMR Indonesia, 2023)

Figure 29. Distribution of the coal basins in Indonesia

Source: (Rosyid & Adachi, 2016)

Approximately **80% of produced coal in Indonesia is exported**, primarily to countries such as China, India, South Korea and the Philippines. In 2019, Indonesia had a market share of 43% of India's total coal imports, and 46% of China's coal imports. Indonesia held an even more substantial market share in the case of thermal coal, representing approximately 54% of India's imports and 62% of China's imports in 2019. On the other hand, domestically, the remaining 20% of produced coal in Indonesia have been used primarily for electricity generation. Power plants consumed about 80% of coal use in 2020, followed by metallurgy (10%) and cement (5%). As shown in the previous chapter, nowadays around 60% of Indonesia's energy production comes from burning coal, an amount that has increased over the last years due to both efforts to decrease the need for importing oil and to meet increasing energy demands in the country (BPS-Statistics Indonesia, 2022; MEMR Indonesia, 2023).

Indonesia's energy sector is **dominated by state-owned enterprises**, with PT Perusahaan Listrik Negara (PLN) as the monopolist owner of the electricity distribution network and the biggest player in the industry. About 60% of national coal production comes from a group of 10 companies, all of which are listed on the Jakarta Stock Exchange (see table 4).

Table 4. The 10 biggest coal producing companies in Indonesia

Name	Yearly coal production (2022) in t	Revenue (2022)
Adaro Energy Tbk (ADRO)	63 million	IDR 111 trillion (USD 8.1 billion)
Kaltim Prima Coal (KPC)*	53 million	IDR 25.1 trillion (USD 1.6 billion)
Bayan Resources Tbk (BYAN)	39 million	IDR 51.7 trillion (USD 3.3 billion)
Bukit Asam (PTBA)	37 million	IDR 42.6 trillion (USD 2.7 billion)
Kideco Jaya Agung	36 million	IDR 34.4 trillion (USD 2.2 billion)
Dian Swastatika Sentosa (DSSA)	34 million	IDR 38.5 trillion (USD 2.46 billion)
Golden Energy Mines (GEMS)	28 million	IDR 45.3 trillion (USD 2.9 billion)
Arutmin*	22 million	IDR 3.4 trillion) (USD 218 million)
Berau Coal	6 million	IDR 234 billion (USD 15 million)

Source: Company annual business reports of 2022 *as part of Bumi Resources Tbk.

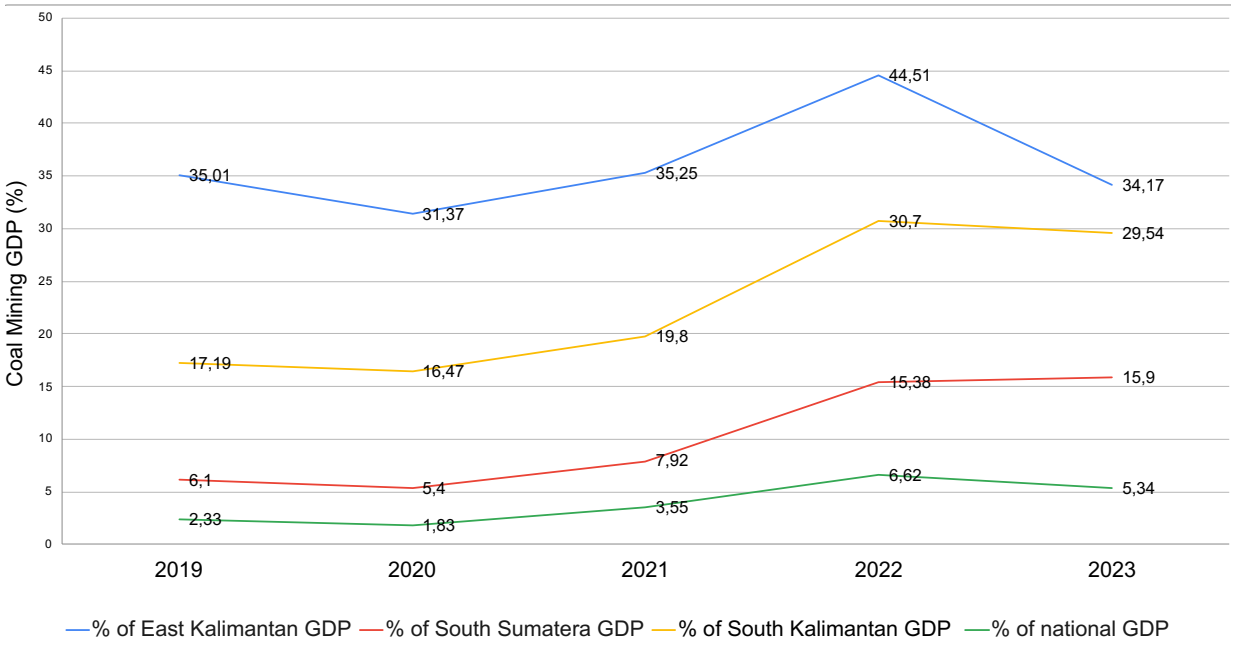
While the power sector is largely owned by Indonesian entities, there has been an **influx of foreign finance into Indonesia's power sector** mainly from East Asia. While foreign capital involvement is in principle not a concern, ownership structures may become a challenge for potential early retirements of CFPP as announced in the Presidential Regulation 112/2022.

In addition to the dominant large-scale mines, there are many small-scale and unauthorized mining operations that persist in Indonesia, including “semi-illegal” mining operations, where a mining company holds a permit for an area which is actually not authorized by the government, for example the forest reserve area. Additionally, the transportation of coal is an area affected by illegal activities, for example supplying coal via unauthorized water routes (Atteridge et al., 2018). While in Kalimantan, illegal mining seems to take place mainly in times of higher coal prices above USD 100 per ton of coal indicating its purpose is export, in Sumatra and other regions illegal mining is an ongoing activity more closely connected to local value chains.

5.2. Economic benefits

For decades, the mining sector has played a pivotal role in fueling Indonesia’s economic growth, emerging as a key driver of the nation's GDP. As a domestic natural resource available in large quantities, Indonesia’s economy has been profiting heavily financially by the exploitation of that resource, though the side effects of mining practices and use of coal for energy production also has its costs (see 5.2.2) (IEA, 2022a). In terms of economic relevance, the mining and quarrying industry’s contribution (oil, gas and coal extraction) to Indonesia’s GDP has been increasing from about 6% in 2021 to 9% in 2022 and 2023 (IEA, 2022a)**. Coal plays an important role in the national economy, in 2023, it contributed approximately 5,3% to the national GDP, generated 1.8% of the national state revenue and accounted for 11.4% of the total export value.**

Figure 30. Share of coal mining in national and regional GDP



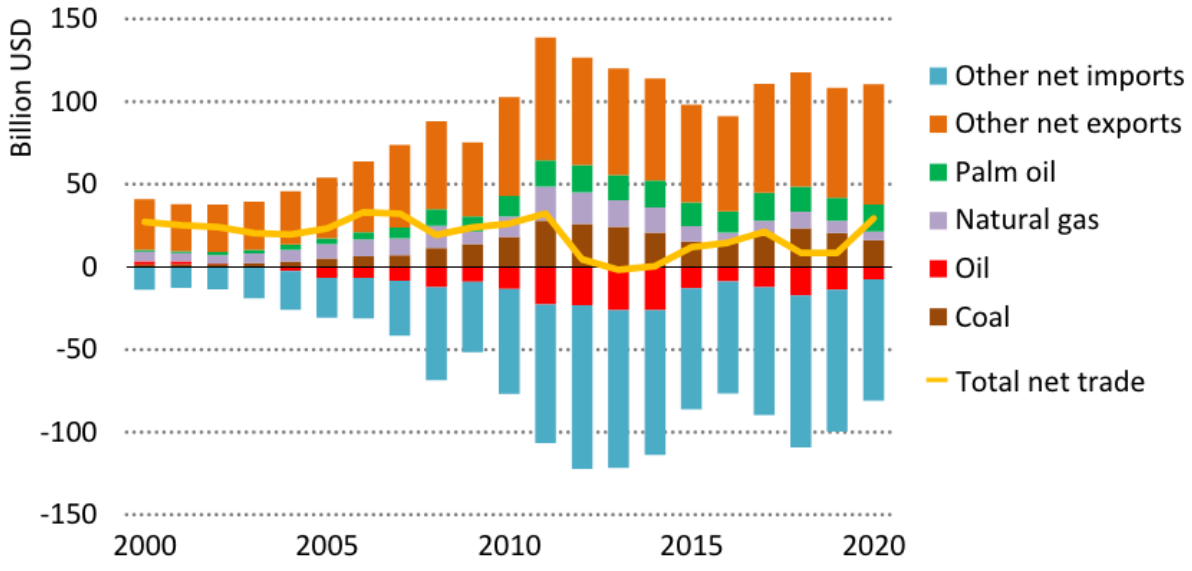
Source: Own depiction based on (BPS-Statistics Indonesia, 2024)

While coal plays a very important role for the national export value the sector's overall economic impact on the country is comparatively modest. However, in the specific regions dedicated to coal mining, its significance is notably pronounced (see also figure 30 and deep dives): In East Kalimantan, coal mining accounts for 30-35% of the Gross Regional Domestic Product (GRDP). Other coal-mining provinces of Kalimantan follow, with coal contributing to 8 to 18% of their GRDP. On a regency level, coal mining can even contribute up to 80% to the GRDP (Agora Energiewende, 2023).

As indicated before, the high levels of coal production plus strong coal exports have been an asset for the Indonesian economy, especially in times of high prices as it had been the case in 2022 and parts of 2023.

For example, in 2022 total value of coal exports was at a record high of IDR 736 trillion (USD 47 billion), more than double than the usual approximately IDR 313 trillion (USD 20 billion) from 2017 to 2021. **Total revenue of coal through exports marks about 11.4% of Indonesia's total export value** (see figure 31). Due to the surplus in exports from coal and other natural resources, mainly palm oil, and natural gas, the country was able to keep the overall imports and exports closer to a balance which can be considered a macroeconomic benefit of coal exports, especially as imports of higher value goods increased over the last years and are yet hard to abate. However, this will most likely change in the coming years, when coal demand will decrease as projected by several energy scenarios (see following subchapter).

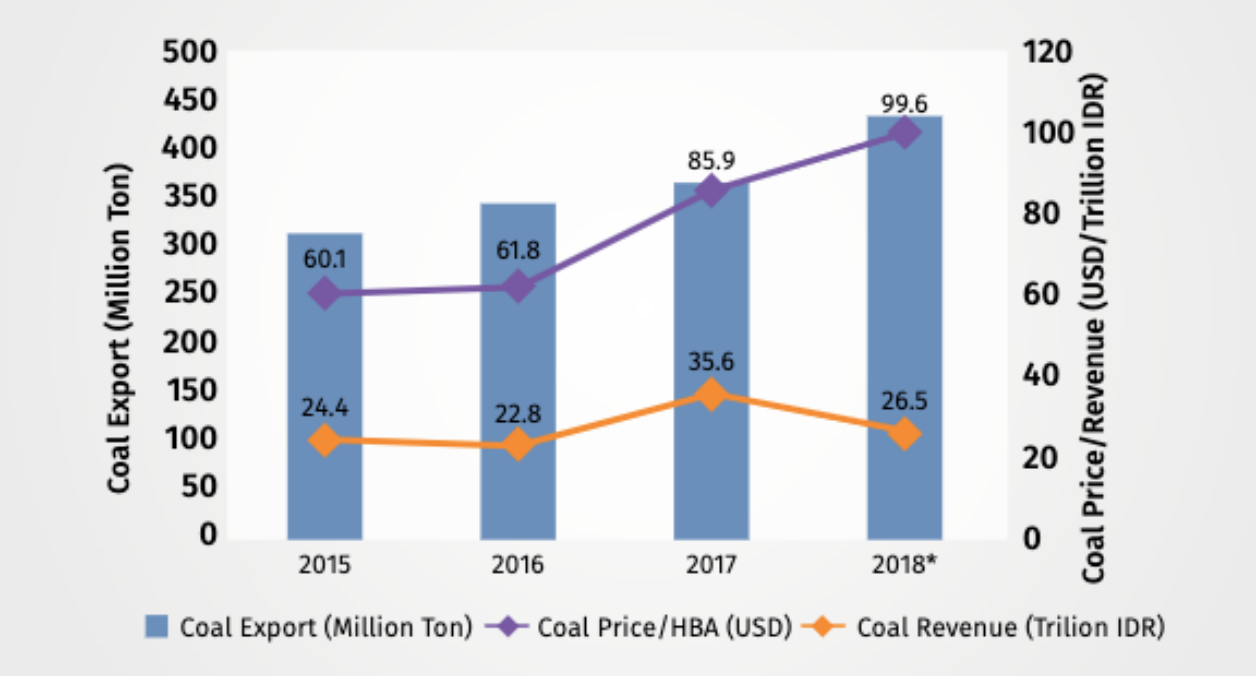
Figure 31. A third of Indonesia's total net exports comes from coal, fossil gas and palm oil



Source: (IEA, 2022a)

The Indonesian government's regulation no. 9/2012 states that there are three ways for the coal sector to contribute to state revenue: land rent, royalty/tax, and sales of mining products. Over the past four years, coal revenue has averaged over IDR 31 trillion (2.17 billion USD), or nearly 80% of total revenue from sources other than oil and gas. Over the last years, revenues saw a substantial increase, reaching IDR 109 trillion (USD 67 billion) in 2023 due to higher coal market prices (BPS-Statistics Indonesia, 2024). The revenues are derived mainly from taxes, royalties as well as land and building rights acquisition fees (see box 8). There are currently no excise or export taxes on coal. More detailed disaggregated data on state revenue from the coal sector is not available in Indonesia (GSI & IISD, 2021).

Figure 32. Revenue from the coal sector



Source: (IESR, 2019a)

Despite macroeconomic benefits, the exports of coal also **contribute strongly to state revenues**. Coal revenues play a pivotal role at the regional level, since nearly 80% of coal royalties are allocated to various districts, often referred to as regencies, and provincial governments. This distribution is guided by regulations stipulating a 16% share for the provincial government, a 32% share for the producing regency, and an additional 32% for neighboring regencies within the same province (IESR, 2019a).

Provincial government representatives have stated that around 46% of the revenue generated comes from mining operations, including quarrying. An estimated 80% of the land-rent and

royalties paid to PNBP are transferred to the Revenue Sharing Funds (DBH) to coal production regions (IESR, 2022c). Furthermore, coal royalties account for 5% of the non-taxed total state revenue and at the provincial level, the contribution ranges from 11% to 33% of the revenue (Agora Energiewende, 2023).

Box 8: Types of taxes and royalties in Indonesia

Carbon tax

The carbon tax in Indonesia is regulated by Law no. 7/2021 under the Harmonization of Tax Regulations (UU HPP) of Article 12 paragraph (1). It was set up with the aim that carbon tax will be limited to PLTU coal with a cap along the tax regime. The minimum rate is IDR 30 000 per tonne of CO_2 equivalents. The carbon tax rate is assessed periodically and is set higher or equivalent to the market price of carbon (Ekawati Rini Lestari, 2023).

Tariffs

In 2015, the government of Indonesia imposed an export tax of 1.5% on the exports of coal. This was implemented under the MoF Regulation No. 107/2015. The companies exempted from this income tax are Contracts of Work (CoW) and Coal Contracts of Work (CCoW) companies (GIZ, 2021).

Royalties

The government has changed its royalty rate for coal mining operations, shifting from a single tariff of 13.5% to a variable range of 4% to 28%, depending on the government-set coal benchmark prices. However, the Job Creation Law allows also a 0% royalty rate as an exception for businesses that promote energy independence.

Land acquisition and building taxes

Under the HKPD Law, the land and building tax (PBB rate) is a part of regional taxes, and is a maximum of 0.5%. The tax due is calculated by applying tax rate on the sale value of the tax object also known as NJOP (ranging from 20% to 100%) deducted by non-taxable NJOP. The non-taxable NJOP is set at a minimum of IDR 10 million.

Import taxes and import duty

Imported goods are subjected to a rate of 11% VAT, starting from 1st April 2022. The import duty levied by the Indonesian government includes other tax facilities such as VAT and income tax. It is payable at rates from 0% to 150%, on the custom value of imported goods. Currently,

custom duty on import of coal is 1% Basic Customs Duty (BCD) and 1.5% of Agriculture Infrastructure Development Cess (AIDC) totalling to 2.5% (PwC, 2023a).

Through these revenues, regions benefited to some extent with improved quality of life and increased accessibility to services, especially in those communities in which mining companies implemented Corporate Social Responsibility (CSR) programs which aimed to improve economic, educational, and socio-cultural conditions, as well as healthcare of people living in proximity to the coal mines (Prasetio et al., 2021) For instance, PT MME, a coal company holding its mining business license (IUP- Ijin Usaha Pertambangan Operasi Produksi) in Muara Enim provided free medicine and health consultations to Darmo village. In another sub district of Muara Enim- Tanjung Enim, PT BA's CSR team built a mosque, repaired the damaged roads and delivered livestock during the duration of *Eid* (IESR, 2023d).

Also, the infrastructure development has helped in making the regions more connected, fostering regional integration and creating job opportunities outside the coal sector. Furthermore, there are a number of planned road development projects that are partly or fully financed by coal companies, which includes Trans-Sumatra Highway, Jantho road, and a mining road which runs through Harapan Forest. For example, the coal company PT Marga Bara has taken the approval of the Indonesian government to construct a 88 km road to transport coal (Jayden E. Engert et al., 2021).

However, at the same time some studies related to the coal regions of Indonesia stated that in South and East Kalimantan, the coal mining generated little value-added per output as compared to other economic sectors (see also deep dive section). Instead, it is evident that the mining activities tend to worsen inequality by disproportionately benefiting high economic groups, including company's shareholders since a large amount of value-added share goes to the capital owners (Hilmawan et al., 2016). **While this is also the case in other countries around the world, it is important to note that the narrative of "coal mining brings prosperity to the regions" can at least be questioned.** To gain a more comprehensive understanding, it is therefore essential to delve into the various economic costs associated with coal as well.

5.3. (Socio-)Economic Costs

Economic costs related to the coal economy in Indonesia include various forms of subsidies as well as secondary costs, such as negative environmental and health effects associated with coal production and combustion.

For several decades, Indonesia has had energy subsidies in place, initially introduced to support lower-income households. However, with the ever-growing energy consumption in the country, today the energy subsidies take up a high share of the state budget and have reached up to 2% of

Indonesia's GDP. The subsidy instruments have long been criticized not only from an economic and environmental perspective, but also for not really fulfilling its purpose as a mechanism for reducing inequality, as for example the gasoline subsidy disproportionately supports middle to upper class households with higher consumption rates (IISD, 2019). Due to recent oil and coal price increases, **in 2023, the government of Indonesia more than doubled its budget for total energy subsidies from 207 trillion IDR to 502.4 trillion IDR.**

While the majority of these subsidies account to gasoline consumption, electricity consumption is also subsidized with IDR 70 trillion (USD 4.5 billion) in 2023. The state revenue allocation to consumers does not mean, however, a targeted subsidy for the coal industry, but leading to market inefficiencies due to incentivized (over)consumption of energy. Coal is directly subsidized in another way: With the aim to keep electricity prices stable as well as protect the finances of government-owned electricity company Perusahaan Listrik Negara (PLN) from sudden hikes in coal prices, the government introduced a domestic market obligation that mandates coal producers to sell 25% of their coal production to PLN. Additionally, the regulation includes a coal price cap at USD 70 per ton, which means power producers need to sell their coal domestically at maximum that price to the market. This has been the case almost all times since the introduction of the price cap, resulting in a factual subsidy of users of coal (paid by the mining companies), which is mainly PLN as a major electricity producer, but also other smaller energy companies and industries such as the nickel industry. PLN and other companies do not disclose data on how much financial impact the mechanism has, but several research institutions have estimated the total value of coal cap policy to PLN after its introduction in 2018, ranging between USD 1.2 and 4 billion for that year (IISD & GSI, 2019).

While consumers profit from lower energy end prices in the short term, the price cap is a strong market intervention that significantly influences investment decisions at companies about which energy technology to choose, making coal more cost-competitive and prices more predictable than it actually is. In effect, **both energy efficiency and renewable energy are less competitive to coal-generated electricity due to the effects of the coal price cap.** Without reforms, this policy will significantly act as a barrier for renewables development and leads to an overall inefficient energy market (IISD & GSI, 2019).

Additionally to the price cap system, there are some smaller direct support mechanisms for the coal industry, such as the Indonesia Infrastructure Guarantee Fund (IIGF) for the construction of coal-fired power plants (IISD & GSI, 2017)), as well as funds amounting to IDR 96.3 billion (USD 6.7 million) per year for the purpose of developing research, development, technology and training in coal exploration, mining and processing (IISD, 2019). Otherwise, quantifying the total amount of all coal subsidies remains difficult to show. There are a few subsidies for coal production, which cannot be added to the subsidies category directly since they serve specific government objectives. For example, the 1.5% export tax on coal for IUP-licence holders serves as a way of reducing the royalty rate for IUP in comparison to CCoW companies. This makes

calculating subsidies linearly difficult. Additionally, there are many unidentified subsidies which are connected with the PPA or contracts which are not open for public access. In the past, the total amount of identified and **quantified yearly subsidies for the coal sector ranges from 24-74 trillion between 2010-2019**, but this is considered to be an underestimation due to lack of concrete data (GIZ, 2021).

Table 5. Estimates of Subsidies to Coal from 2014 to 2017

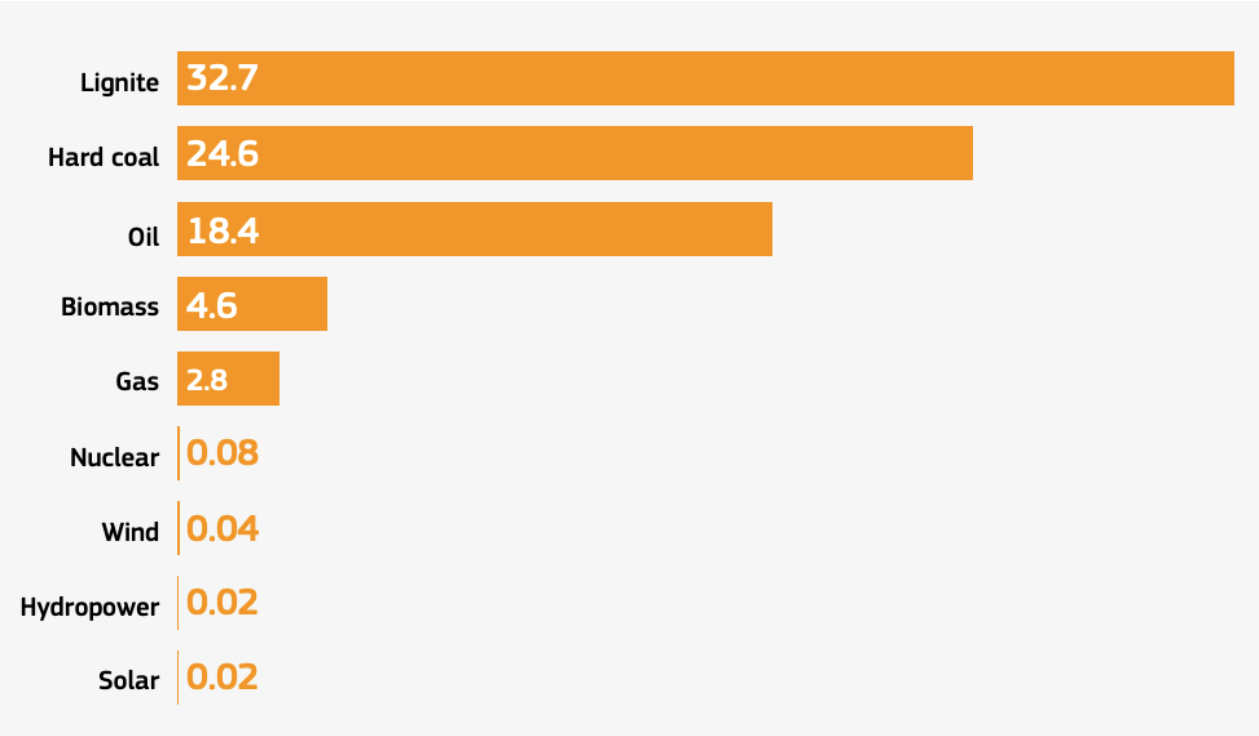
	Subsidy	2014	2015	2016	2017
Direct and Indirect Transfer of Funds and Liabilities	Government credit support through loan guarantees	70.2	60.9	36	29
	Indonesia Infrastructure Guarantee Fund (IIGF)— Coal-related Projects				
Government revenue foregone	Export tax exemption on coal				
	Waiving import tariff for certain advanced equipment in budget year of 2011	201.7	91.1		
	Preferential VAT rate for goods and services purchased by coal mining companies				
	Domestic Market Obligation				
	Failure to collect land and building tax for coal mines		14.7	32.4	39.9
	Preferential corporate tax rate for businesses in specified fields including coal mining				
	Reduction in corporate tax for coal mining companies registered after August 15, 2011				
	Failure to collect taxes and royalties from unregulated or illegal coal mines				
	Tax Allowance 30% for coal liquefaction and coal gasification	95.2			
	Preferential royalty rates and corporate tax rates for small coal mining license holders				
	Value added tax exemption to coal	565	471	479.6	336.5
Provision of Goods or Services Below Market Value	Coal price cap of US$ 70 per ton				803.8
	Support for research, development, technology and training				
Income or Price Support	Subsidy for mine owners prior to the amendment of the existing regulation on mine mouth coal pricing	14	7	14.6	
	Total	**946.1**	**644.7**	**562.59**	**1209.2**

Source: (BAPPENAS, 2019)

Another large source of costs related to the mining and use of coal are health costs due to air pollution: The combustion of coal produces sulfur dioxide (SO_2) and nitrogen oxides (NO_x), contributes to the creation of particulate matter ($PM_{2.5}$) and surface ozone in the air (GIZ, 2021). Non-communicable diseases emerging from coal mining induced air pollution pose a significant impact on citizens and the health system in all countries that have coal mining and operate power plants. For example, in the EU several studies point out that air pollution is the

largest environmental health risk, also resulting in estimated yearly costs of up to 2-3% of the EU's yearly GDP (European Commission, 2021). **In Indonesia, outpatient costs due to air pollution are estimated at IDR 755,100 (USD 54) per month, almost equivalent to half of the average monthly income per capita for a lower-middle class household in Indonesia.**

Figure 33. Death rates from energy production per TWh



Source: (European Commission, 2021)

Furthermore, it was identified that approximately 7,500 premature deaths in Indonesia in 2011 were linked to coal consumption, with a projected increase to 25,000 by 2030 in the absence of significant interventions (Koplitz et al., 2017). **In 2020, a study estimated that the emissions from coal-fired power plants have increased by 110% over the past decade and were responsible for 10,500 deaths and the health costs up to IDR 109.9 trillion (USD 7.4 billion).** It is estimated that under current policies, the cumulative health impacts from 2024 until the end of the life of all coal-fired power plants would result in 303,000 air pollution-related deaths and $210 billion in health costs (CREA & IESR, 2023).

Another aspect to take into consideration is that **land which is used for coal mining cannot be used for food production**. For instance, coal mining covers 19% of Indonesia's former rice land and 23% of land identified as suitable for rice cultivation (JATAM, 2017). Given that food security and affordability is an important topic in Indonesia, it is a serious concern

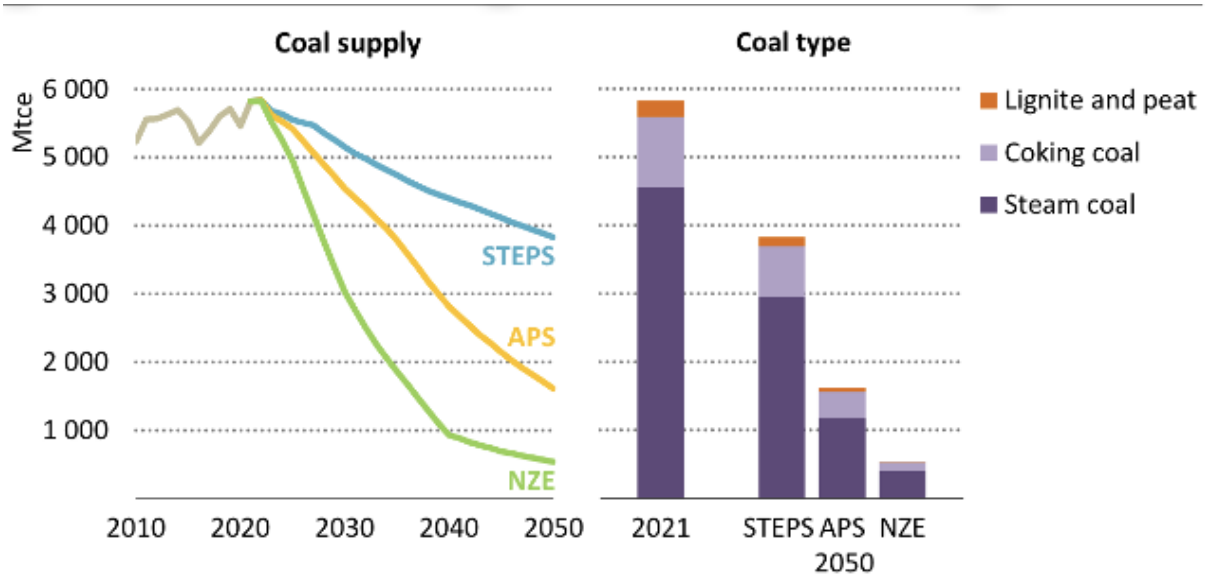
(Waterkeeper Alliance, 2017). This is exacerbated when coal mines are not properly rehabilitated, or when land and water are contaminated, making the land unusable for future agricultural food production (JATAM, 2017) (see also ecology chapter).

5.4. Economic trends and development scenarios

When thinking about the future of the coal industry sector, it first and foremost needs to be taken into account that the **industry is to a large share dependent on the worldwide demand for coal.** As described in the previous chapter, the global coal demand will most likely peak in 2030, and exporting countries like Indonesia will be affected by this first. This peak in consumption is caused mainly due to growing competition from cheaper renewables, which makes energy production from coal uncompetitive. However, international political agreements on emission reductions and pledges from countries to lower their emissions (see below), as well as cheap renewable alternatives will surely be an additional driver of shrinking demand for coal and other fossil fuels.

Irrespective of how fast this development will unfold, the result will be that Indonesian coal producers will be able to sell less coal, therefore have to adjust their production by phasing down mining activities, will generate less revenues and potentially will lay off many of their workers. Therefore, the **main strategy for coal-dependent regions will be to diversify its economy and find other sectors for economic activities that are ideally also less driven by foreign demand**.

Figure 34. Coal supply by scenario and coal type



Source: (IEA, 2022d)

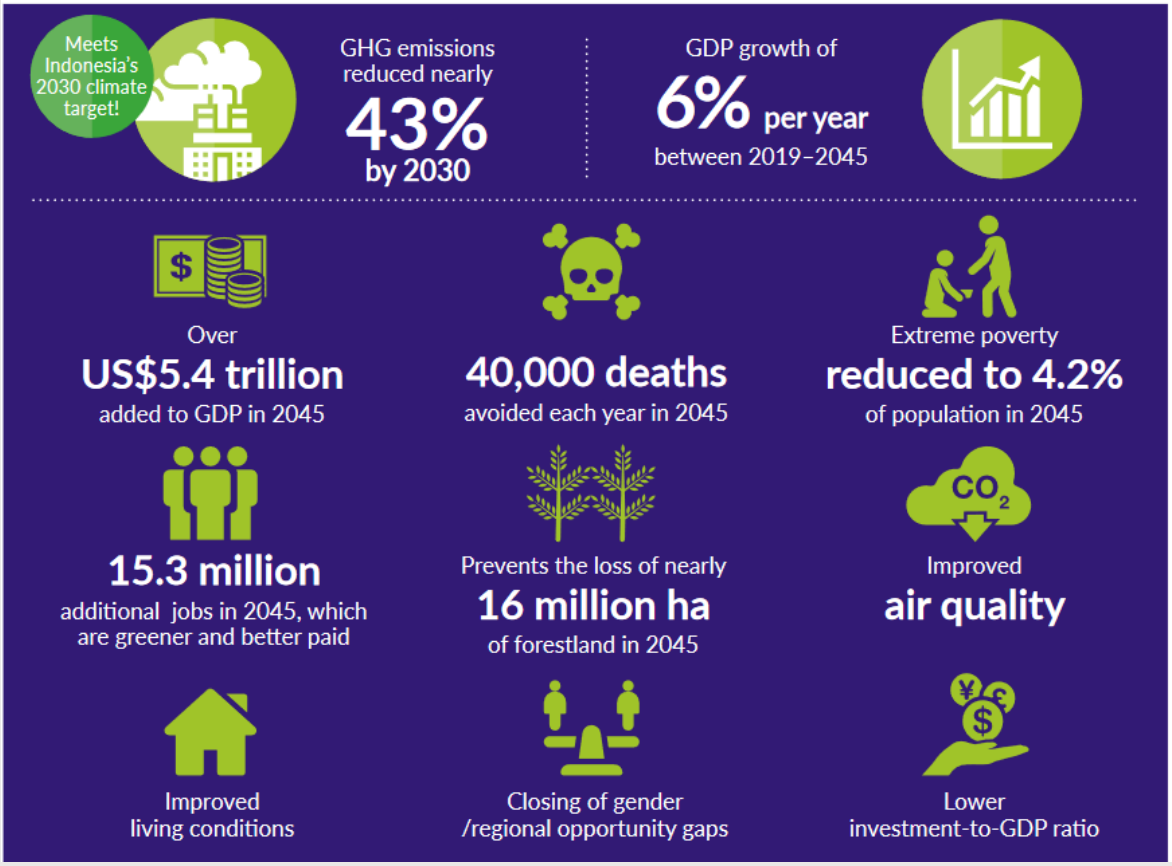
Despite this decline in the coal industry, leading financial and development institutions project **continuous economic growth in Indonesia**, notably despite uncertainties of global economic development. Until 2030, it is expected that Indonesia will have growth rates around 5% each year (yet lower than the overestimated growth projections by the national government of Indonesia), giving national and regional authorities more leeway for compensating losses in the coal sector by growth of other sectors and developing more diversified regional economies (IEA, 2022a). **Most likely, going green means a further push for economic development**: The Low Carbon Development Initiative launched at Indonesia's Ministry of National Development and Planning (BAPPENAS) projects in their LCDI High Scenario (see box 9) a low-carbon development pathway can deliver an annual GDP growth rate of 6%, resulting in a net benefit of USD 5.3 trillion in 2045 (BAPPENAS, 2019). Researchers from other organizations are coming to similar conclusions: In a scenario analysis, it was estimated that a shift to a greener economy will create additional economic output of IDR 2 900 trillion over the next 10 years, equivalent to 14% of Indonesia's GDP in 2024. Meanwhile, under the business-as-usual scenario the surplus of GDP in 10 years is projected at IDR 1 800 trillion, 60% lower than the green economy scenario (Greenpeace & CELIOS, 2024). The projection will be achieved with help of the government and other business actors in shaping the workforce in energy transition through adequate education and training. A Bappenas and NDP study in 2022 also projected that 4.4 million jobs will be created by 2030, out of which 75% will be for women in five primary sectors: food and beverage, textile, construction, wholesale and retail trade and equipment (BritCham Indonesia, 2022).

Phasing out of coal is projected to reduce health costs due to improved air quality: For example, **phasing out coal by 2040 could prevent a cumulative total of 182,000 air pollution-related deaths and save USD 130 billion in health care costs.** Rauner et al. also use a modeling approach to compare the relative political costs of phasing out coal with the indirect social costs saved through reduced impacts on human health and the environment. Their model shows that the local environmental and health benefits would outweigh the direct political costs of phasing out coal, even without taking into account the additional global benefits of not emitting CO_2 (Rauner et al., 2020).

This **scenario direction is further underlined by studies that estimate the economic costs that may arise if climate change is not limited to 1.5°C warming**, but rather reaches temperature increases of above 2°C: For instance, projected climate change effects could cost Indonesia up to 2.5-7% of the country's GDP yearly, which would correspond to a total amount of IDR 132 trillion (USD 8.4 billion) until 2050, mainly due to a decreased agricultural output (USAID, 2016).

Box 9: Projected benefits of the Low Carbon Development Initiative's scenario growth path for Indonesia

Figure 35. Key economic indicators for Indonesia's main coal-producing provinces Kalimantan in 2020



Source: (BAPPENAS, 2019)

The LCDI High Scenario is an effort made by the Indonesian government and research partners to achieve the unconditional national climate targets set out in the Nationally Determined Contributions (NDCs). The LCDI High Scenario pins down policies and a set of scalable, actionable interventions in different economic sectors, which will help in maintaining economic growth, alleviating poverty and help in achieving targets. The figure above demonstrates the benefits of Indonesia's New Low Carbon Growth Path (LCDI High Scenario compared with Base Case), policy initiated during COP23, under which the GHG emissions are reduced by 43% by 2030, and GDP growth rate is 6% per year between 2019-2045. Under the LCDI High Scenario, it is estimated that over USD 5.4 trillion will be added to the GDP and more than 15.3 million additional green jobs will be generated. In addition, there would be a reduction in poverty from 9.8% of total population to 4.2% (BAPPENAS, 2019).

Overall, international institutions and research see good economic development potentials in the sectors of chemicals, pharmaceuticals, transport, construction, food and beverage, and renewable power generation in Indonesia (Agora Energiewende, 2023). East Kalimantan will have further opportunities due to the development of the new capital of Indonesia in proximity to the cities of Balikpapan and Samarinda (see deep dive chapter).

Box 10: Knowledge gaps in the field of economy

- There is both no publicly available **disaggregated data on state revenues from coal mining**, as well as accurate total sums of subsidies in the coal sector or exact numbers on the costs of the coal price cap mechanism, which would help to quantify how much the usage of coal actually benefits the Indonesian economy.
- **Quantified data on the impact of the informal sector** and its contribution to local, regional and national economy is not available.
- There is a lack of quantified data about the **projected economic costs of continuous coal mining** and use due to climate change on the regional level.
- There is currently little data on **how the negative impacts of coal mining and the degradation of ecosystems and natural resources affect ethnic minorities, indigenous and rural communities, or women** (see also chapter 4 on intersectional gender aspects).

6. The role of coal for employment

6.1. Jobs in the coal sector

According to MEMR data, the coal mining industry employed about 167,000 workers in 2020 (IESR, 2022c). However, these data only include those working under a permit issued by the government, and only take into account mining activities (excluding transport, reclamation and other types of activities related to mining). **Total (formal) employment[5], in the coal industry, is estimated between 250,000** (IESR, 2022c) **and 400,000 workers** (IEA, 2024). Employment in the coal sector is thereby higher in specific regions, namely 11% of total employment in East Kalimantan, 3% in South Sumatra, and 4% in North Kalimantan in 2020 (IESR, 2022c).

[5] According to the Directorate of Coal Business Development, it is estimated that this number only covers two third of the total workforce. Enterprises having central government-issued permits are required to submit quarterly reports to the Ministry detailing the number of workers on their sites, including contractors. In the meantime, those who possess permissions from the regional government (IUP Daerah) submit reports to the relevant regional government.

Figure 36. Key economic indicators for Indonesia's main coal-producing provinces Kalimantan in 2020

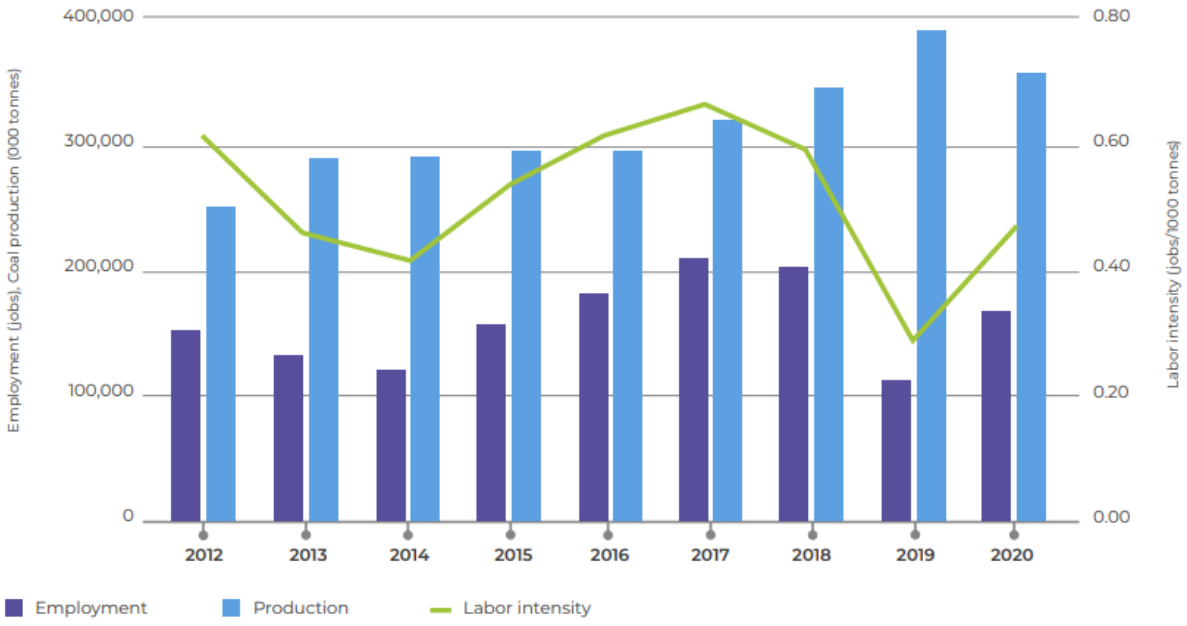


Figure 4. The employment in the coal industry, coal production, and labor intensity over the 2012-2020 period. The coal production number excludes production by local IUP to match the MEMR employment data.

Source: (IESR, 2022c)

There is no nationally aggregated data for coal workers' characteristics (IESR, 2022c). However, some coal companies do report on the age structure of employment in the coal sector. **In most companies, less than 10% of the workforce is over 50, while 50% of the workforce is aged between 31 and 50**. The percentage of young workers under 30 ranges from 15% to 37% (IESR, 2022c). Furthermore, coal workers tend to have low-skilled qualifications: 72% have secondary level education and only 14% have post-secondary education levels (Ruppert Bulmer et al., 2021).

Table 6. Workforce distribution among provinces

Province	Annual coal output (2022)	Workforce in mining[6]
East Kalimantan	288 Mt	62 000

[6] Formal jobs, directly employed in the mining industry, excluding transport and use.

Province	Annual coal output (2022)	Workforce in mining[6]
South Kalimantan	210 Mt	48 000
South Sumatra	57 Mt	15 000
North Kalimantan	22 Mt	7 000
Central Kalimantan	18.5 Mt	13 500
Jambi	10 Mt	6 000
Aceh	9 Mt	1 500
Bengkulu	2.5 Mt	2 500
West Sumatra	2.5 Mt	1 500
Riau	1.5 Mt	1 000

Source: (Global Energy Monitor, 2023a)

The Indonesia Central Bureau of Statistics estimated that the **female employment in the sector was below 10%** in 2022 (Fiscal Policy Agency of the Ministry of Finance of Indonesia, 2022). Moreover, it seems that female education is concentrated in non-STEM faculties (12% of the graduates in 2018 in STEM were women), which are those more vulnerable to shift to automation (Fiscal Policy Agency of the Ministry of Finance of Indonesia, 2022). Regardless of educational proficiency, fewer women than males who leave school find employment, and it takes longer to find employment (Choi et al., 2023).

The government has made an effort to support and grow upper secondary vocational education since 2006, with a focus on girls. In 2006, only around a quarter (24%) of students pursued vocational programs. The government initially aimed for ambitious targets: 50% enrollment by 2010 and 70% by 2015. While these goals were not reached, vocational education has still expanded: Currently, nearly half (44%) of all upper secondary students are enrolled in vocational programs, representing an increase of almost 80% since 2006. Females are now twice as likely as males to be enrolled in vocational upper secondary education (Choi et al., 2023). Research findings suggest that increasing the share of vocational education lowers unemployment generally, however, finding a job is still considered to be tough for new

graduates in Indonesia. This highlights the need for the Indonesian government to prioritize not just increasing access to vocational education, but also enhancing the quality and curriculum of these programs (Choi et al., 2023; Yoana et al., 2024).

According to official statistics, 95% of coal mining jobs are formal, which ranks among the highest similar to the government sector (Ruppert Bulmer et al., 2021). However, there is no public disaggregated data on informal employment in the coal sector. According to news articles, the Indonesian government also reports that **as many as 3.7 million people engaged in illegal mining in Indonesia**, including in places that are not within the official Mining Business Permit Area (WIUP) (Bhwana, 2021) and without specifications on what that "involvement" means, but in any case estimating the number of informal jobs in coal mining way higher. Generally, illegal mining activities in Indonesian territory are caused by a lack of enforcement of mining laws, corruption, and poverty of local communities, who otherwise see few options for other employment opportunities. Illegal mining sites, however, pose numerous health risks and cause many accidental deaths due to the lack of safety. However, data on people working in illegal mines is generally limited.

According to the legal framework in place for the coal sector, local employment should be prioritized by the mining service companies. MEMR estimates that 66% of total workers are local in 2020. However, different estimates state that the total number of local workers in East Kalimantan is about 40% (Aprilia et al., 2019; IESR, 2022c). The main reason seems to be the lack of qualified and experienced local candidates. Moreover, many workers tend to migrate to the region where they found a job, changing their ID in the respective municipality.

6.2. Level of income in the sector

The general notion is that **formal jobs in the coal sector are well paid and attractive** - compared to alternatives in the coal regions. In Indonesia, the **average monthly net salary of formal workers** in the mining and quarrying sector is around IDR 6.234.204 (BPS-Statistics Indonesia, 2023). For instance, the average monthly net salary of formal workers in the coal industry in East Kalimantan workers is approximately IDR. 6.5 million (USD 410) whereas in South Sumatra around IDR. 4.3 million (USD 270) (BPS-Statistics Indonesia, 2023).

According to the IEA, wage premiums for formally employed miners are up to 100% higher compared to workers paid in other industries (IEA, 2024). Similarly, the think tank IESR states that salaries in the coal sector are relatively high compared to the level of education required, discouraging workers from moving to other industries or green jobs that require higher levels of education and skills (IESR, 2022c). At the same time, if informal jobs are included in calculations, the level of income in the coal sector seems to be lower than in other sectors: While

mining and quarrying provide 8.6% of jobs (formal and informal) in East Kalimantan, those jobs contribute to only 7.5% of the provincial labor income[7] (see table 7) (IESR, 2022b).

Table 7. Key economic indicators for Indonesia's main coal-producing provinces

	South Kalimantan	Central Kalimantan	East Kalimantan	North Kalimantan	South Sumatra
Coal mining share in provincial GDP	17.2%	7.3%	35.1%	17.8%	6.1%
Coal share in provincial goods exports	78.1%	58.0%	75.6%	74.2%	18.9%
Mining and quarrying share in provincial employment	3.9%	6.0%	8.6%	3.6%	1.6%
Credit to mining and quarrying as share total non-financial bank credit	5.0%	0.1%	3.4%	n.a.	0.4%
Estimated mining and quarrying share in total provincial labour income	3.5%	7.0%	7.5%	3.8%	1.5%

Notes: Labour income share is calculated as average wages in each sector weighted by its share in total employment. It includes informal employment and in-kind incomes.

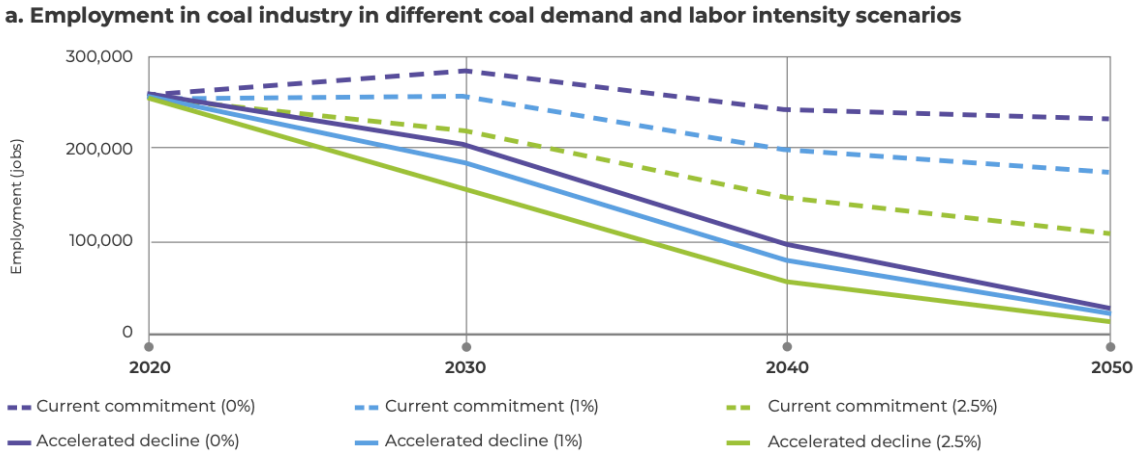
Source: (IEA, 2022a)

6.3. Expected effects of sector development on employment

A potential energy transition has direct and indirect negative, but also positive impacts on the labor market. Overall, a **coal phase-out or phase-down process will come hand in hand with a decline of employment** in the sector along the full coal supply chain, namely in mining and quarrying, logistics, and other supported services (PAGE, 2023). It is projected that there will be a decline in employment in the coal sector, which can have a large negative spillover effect especially on the local economies.

[7] This could be explained if coal jobs were relatively low skilled jobs. Then the more high-skilled jobs of other sectors would provide a larger share to the provincial income - while at the same time it would be possible that jobs with similar skill levels would receive higher income compared to similar jobs in other sectors (fictional example: a truck driver of a coal mining company may earn more than a truck driver delivering food to the market, but both obviously less than an IT specialist).

Figure 37. Estimated future employment in the coal industry under different scenarios



Source: (IESR, 2022c)

IESR estimated the number of jobs in the sector under two different scenarios: the current commitment and an accelerated decline. Under both scenarios, the employment levels of the coal mining industry will decrease significantly. In the current commitment scenario, there would be 14 000 to 110 000 job losses by 2040 and 25 000 to 148 000 by 2050, depending on the labor intensity, whereas in the accelerated phase-out scenario, the employment losses would reach 55 000 to 136 000 by 2030 and 227 000 to 252 000 by 2050 (IESR, 2022c). Furthermore, some regions such as East Kalimantan and South Sumatra will be strongly affected due to the massive coal business present in those two regions (PAGE, 2023). In East Kalimantan, (Tate et al., 2023) estimates a loss of 16 900 workers due to the closure of mines by 2050[8].

Furthermore, the coal phase-out will cause a significant income loss[9] for coal-fired power plants (CFPPs) and the supply chain. The estimates are summarized in table 8.

[8] According to the Global Energy Monitor, the methodology aims to collect information on workers employed in the extraction.

[9] The estimate of the number of jobs lost annually multiplied by the average yearly wage for workers was used to compute the CFPP revenue losses.

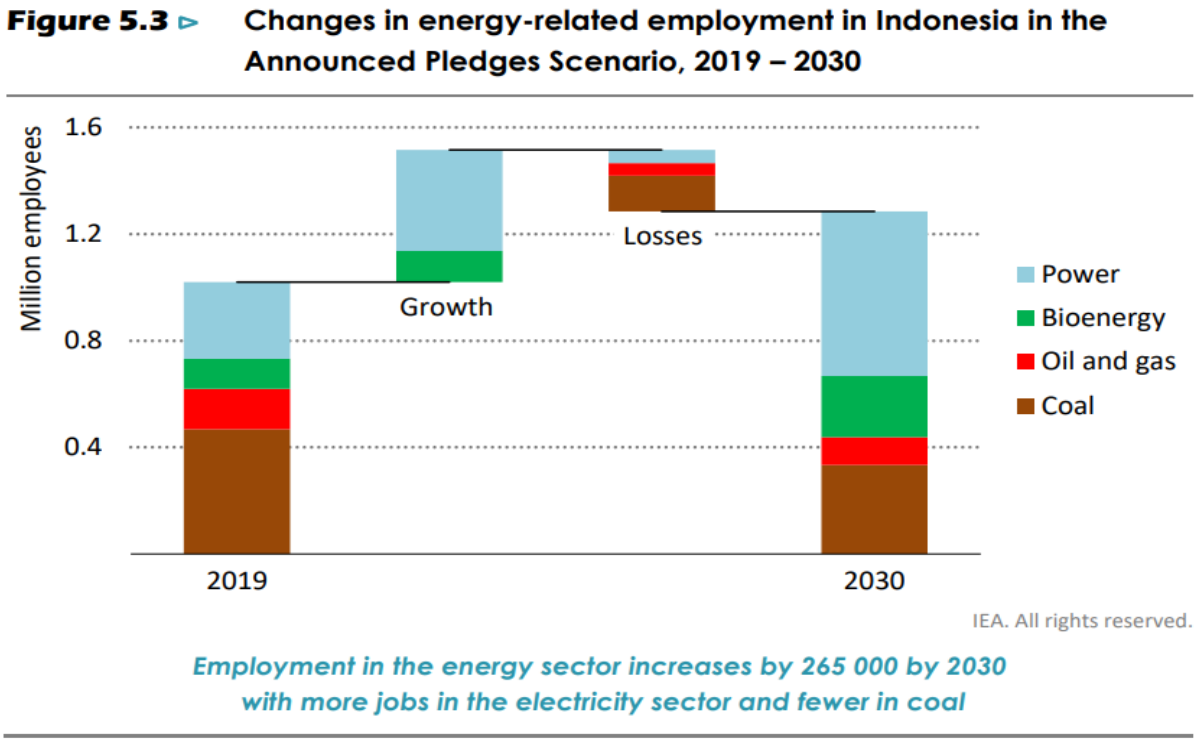
Table 8. Number of workers and yearly income loss per MW by capacity class

Capacity Class	Workers/MW[23]	Total Yearly Income Loss/MW
>600 MW	0.15	$484.89
300-600 MW	0.44	$1,380.05
100-300 MW	0.60	$1,882.96
<100 MW	1.51	$4,737.77

Source: (IESR, 2022a)

However, **according to scenarios from several international and research institutions, there will be a net gain in employment**, as more jobs are expected to be created through shifting towards a green economy than lost by phasing out coal as the primary energy source (ASEAN Secretariat & ILO, 2021). Net gain in employment in Indonesia could gain up to 19.4 million over the next ten years in a green economy development scenario, with the service sector, processing industry as well as agriculture and fishery having the highest job growth potential (Greenpeace & CELIOS, 2024). More specifically on energy, the IEA estimates that the net increase in employment in the energy sector would be 265,000 by 2030, after considering the job losses mainly in the coal sector.

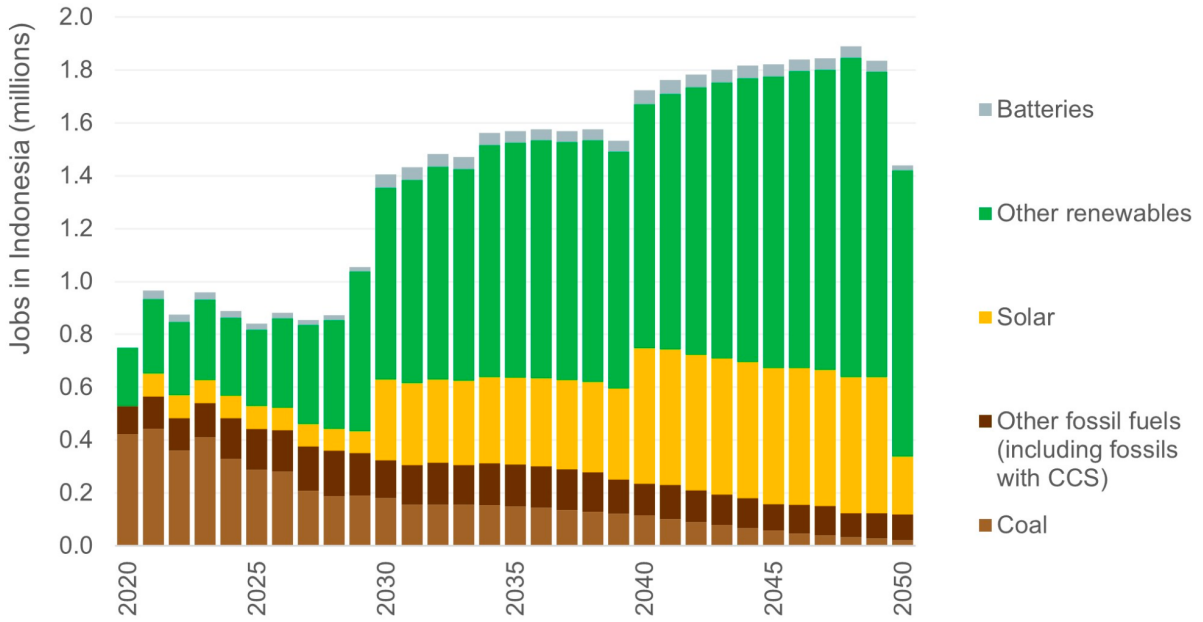
Figure 38. Changes in energy-related employment in Indonesia in the Announced Pledges Scenario, 2019-2030



Source: (IEA, 2022a)

The NewClimate Institute and IESR furthermore developed a scenario that estimates the job gains if JETP targets are reached: Through investments into renewables, a total of one million jobs in Indonesia could be created (New Climate Institute, 2023).

Figure 39. Number of jobs in the power sector for a JETP-aligned scenario



Source: (New Climate Institute, 2023).

These scenarios suggest to expect a growth in green economy activities in the areas of renewable energy, transportation, emissions control, energy efficiency in industry, together with cleaner manufacturing, will have a positive effect on the labor market, namely an increase in the number of green jobs[10] in the country's economy. According to PAGE, a green transition can affect around 54 % of total employment, both directly and indirectly. **Agriculture, forestry, and fishing, and manufacturing sectors are projected to expect a net growth in employment** (PAGE, 2023). Some analyzes predict a boost in green jobs, namely with, on average, 1600 new jobs per replacement solar installation, and 2300 jobs per replacement onshore wind installation (GGGI, 2020; Jong, 2022). The Global Green Growth Institute (GGGI) estimated the job-years per unit of electricity generation (GWh) from new capacity and per unit of investment (USD million) under the RUKN[11] scenario. According to the study, large hydro generates 3.8 times more job-years per electricity output than coal, followed by small hydro, geothermal and solar PV. Per USD million invested in new capacity, small hydro is expected to create the highest number of jobs, whereas coal generates the least number of jobs.

[10] The ILO defines green jobs as “decent jobs that contribute to the preservation and restoration of the environment, be they in traditional sectors such as agriculture and manufacturing, or in new, emerging green sectors such as renewable energy and energy efficiency” (ILO, 2016).
[11] The National Electricity Plan 2019-2038, Rencana Umum Ketenagalistrikan Nasional (RUKN).

Figure 40. Job creation per unit of capacity added in terms of capacity and USD investment.

Figure 3.7. shows the job creation per unit of capacity added in terms of capacity and USD investment.

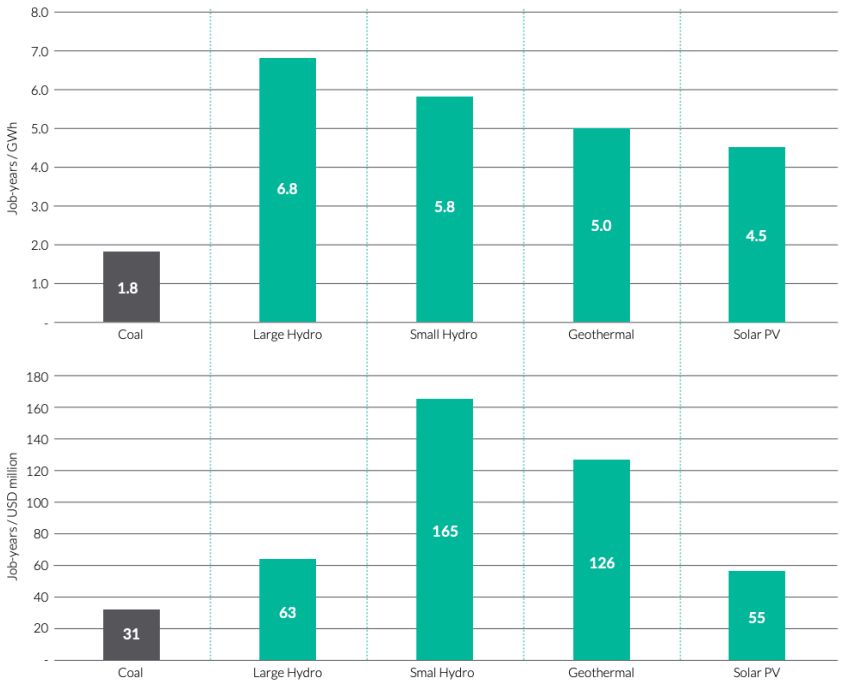


Figure 3.7. Direct job creation per unit of electricity generation (GWh) from new capacity and per unit of investment (USD million) under the RUKN scenario in Indonesia

Source: GGGI Analysis

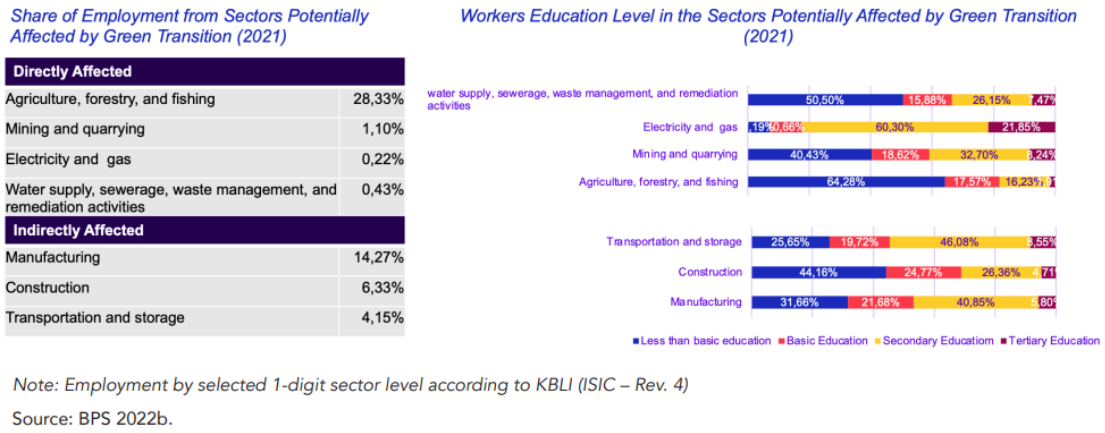
Source: (GGGI, 2020)

Despite these promising studies, there is, however, a **need for better data in order to assess the impact of climate change and climate-related policies on social inclusion** (ILO, 2022a). Currently, it remains difficult to determine what policy changes are needed to assure a just transition to environmental sustainability and to monitor progress going forward. Early planning, mobilizing financial and institutional capacities result to be relevant elements to ensure a smooth transition process without leaving anyone behind (New Climate Institute, 2023).

A key lever for policy action mentioned in several studies is **the role of education and the importance of retraining schemes and efforts to strategically fill skills gaps**. Most workers are aged under 50, thus they need to switch to new jobs when workers will be laid off after a predicted decline in coal mining after 2030 (IESR, 2022c). The most important sectors present a high percentage of employment with less than basic education, namely 64.28% for agriculture, forestry, and fishing, and 31.66% for manufacturing sectors. According to the New Climate Institute, in order to facilitate a seamless transition for coal workers—particularly those who are now engaged in the design and construction of coal plants—at least USD 1-2 billion

(IDR 16 trillion) in investments would be required this decade. However, the resulting gains in job growth that can be expected depend on the timeline of the transition plan, the region, and on the technology choices.

Figure 41. Employment in sectors potentially affected by a green transition.



Share of Employment from Sectors Potentially Affected by Green Transition (2021)

Directly Affected	
Agriculture, forestry, and fishing	28,33%
Mining and quarrying	1,10%
Electricity and gas	0,22%
Water supply, sewerage, waste management, and remediation activities	0,43%
Indirectly Affected	
Manufacturing	14,27%
Construction	6,33%
Transportation and storage	4,15%

Note: Employment by selected 1-digit sector level according to KBLI (ISIC – Rev. 4)

Source: BPS 2022b.

Source: (PAGE, 2023)

Finally, the shift towards renewable sources is projected to lead to a **migration flow of the labor force towards the regions where solar PV (and other alternative sources of energy) will be based** (New Climate Institute, 2023).

6.4. Role of unions

Since the 2000s[12], the number of trade unions in Indonesia has increased significantly. In 2018, the trade union federations were counting 137 members, compared to 24 in 2000 (Danish Trade Union Development Agency (DTDA) & Mondiaal FNV, 2020). There are five central confederations at national level, stating to represent 76% of organized workers. The three largest are KSPSI (Pimpinan Presiden), KSPSI (Pimpinan Ketua Umum) and KSPI. However, union membership has declined over time, by 4.6% from 2014 to 2019. Organized workers are mainly from the formal sector, but there are some unions that include people from the informal sector as well. There is no data on women's participation in trade unions, as the trade union database does not provide disaggregated statistics (Danish Trade Union Development Agency (DTDA) & Mondiaal FNV, 2020).

[12] This date refers to the years in which Indonesia created a legal framework which allowed the development of trade unions and the implementation of trade union rights, namely the Trade Union Act (2000), the Manpower Act (2003) and the Settlement of Industrial Disputes Act (2004) (Palmer & Noriel, 2009).

By times of writing, **a tripartite social dialogue**[13] **between relevant stakeholders about just transition has not yet been formalized in Indonesia**. A call to create this discussion structure on climate change was addressed by Indonesian trade Unions in July 2021 (Christensen & Suharsono, 2022). The main concern expressed by the organizations is the lack of transparency to address negative impacts on employment in the Indonesia phase out plan (ITUC, 2022).

Box 11: Knowledge gaps in the field of employment

- *Workers in the coal sector*: Although some companies report disaggregated data of workers´age and education level, there is a need for more comprehensive sets of data on age, skills, education and origin of workers.
- *Employment data*: about national and regional labor market estimates by sector, there is a lack of separate data for mining and quarrying categories. Also, there is no aggregated data for total employment in the coal transportation industry and employment in coal power plants.
- *Informal employment*: there is a need for more information about informal employment to more accurately estimate the size and characteristics of this part of the economy.
- *Green and decent jobs*: To better estimate future prospects for the labor market, more accurate data is needed to better understand the impacts of climate change and the policies needed to mitigate its effects. The aim is to identify the green sectors that could be the future sectors, not only for those already in the market in brown sectors, but also for future generations entering the labour market in the next decade. This would not only allow for the creation of transition policies for today's workers, but also help to develop and redirect secondary/university education.
- *Social protection and public employment services (PES)*: There is a need for a broader understanding of whether the social security programs already in place could account for employment losses brought on by the economic transition. Moreover, the PES is fundamental in the re-skilling/up-skilling process, highlighting the need for more investments in terms of human capital.
- *Women participation*: There is a lack of data describing the involvement of women in the coal sector on sub-national levels, in the educational/vocational schools, as well as share of participation in trade union organizations.

[13] Tripartite social dialogue usually involves governments, workers' organizations, and employers' organizations (Hohenberger, 2022). However, Indonesia does not display a uniform structure of tripartite organization among districts and provinces, but it depends on the needs of the local contexts (Labor Institute Indonesia, 2016).

7. The role of coal for ecology

Indonesia is the largest archipelagic state in the world, consisting of more than 13 000 islands (Andréfouët et al., 2022), has seven major biogeographical regions that exhibit a wide range of biotic variation (Republic of Indonesia & Minister of Environment and Forestry, 2021) and ecosystems range from glaciers to tropical forests, grasslands and mangroves (Republic of Indonesia & Minister of Environment and Forestry, 2021; World Atlas, 2023). Approximately 20 million Indonesians live in and around forest areas, of which about six million depend on forest resources (Sunderlin et al., 2008; Widianingsih et al., 2016). It is apparent that functioning ecosystems are a precondition for human life, but even more so in Indonesia, where a high share of the population relying on the ability to perform subsistence farming, which makes them **highly vulnerable to the negative effects of climate change** (Gann et al., 2019; IPBES, 2018).

Figure 42. Vegetation types of Indonesia

Source: (University of Texas Libraries, 2006)

7.1. Impacts of Coal Mining on Ecosystems in Indonesia

In Indonesia coal production has led to several environmental problems, including deforestation and degradation of soil, water and biodiversity (Bian et al., 2010; Pratiwi et al., 2021). Covering almost 17.5 million hectares, coal mining and exploration is the largest net industrial land use in the country (JATAM, 2017).

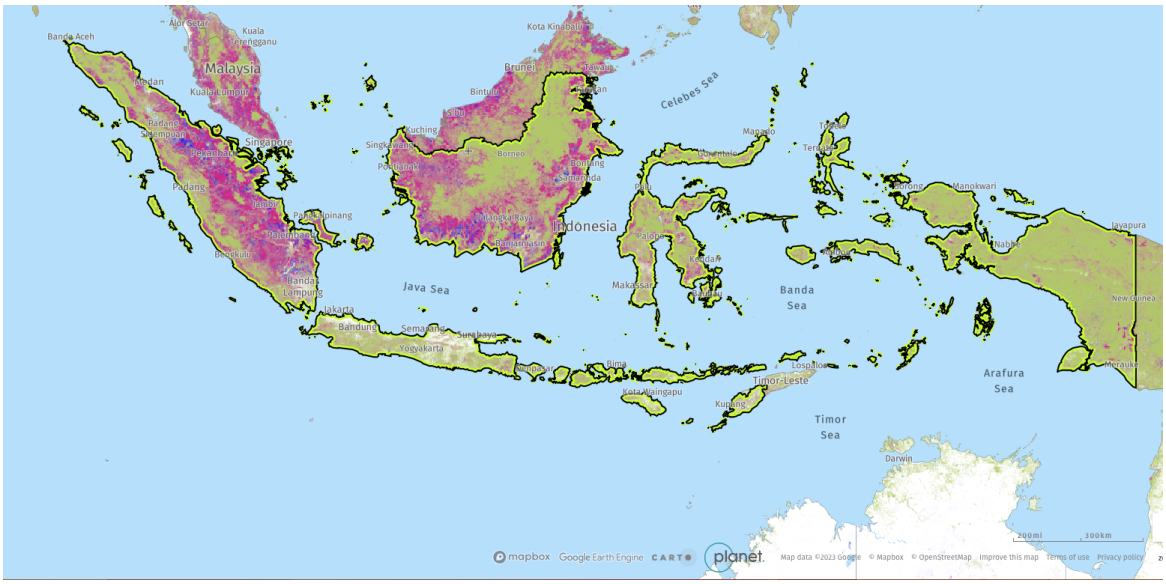
Deforestation

Most of the mines in Indonesia are open-pit mines, which require the clearing of vegetation and the removal of soil for the creation of the mines. This leads to changes of the landscape and the physical, chemical and biological properties of the soil (Lestari et al., 2019).

According to the Forestry Law No. 41/1999, forest areas managed by the state can be used for non-forestry activities, such as mining. This **allows mining in production forests** and even in protected forests**,** the latter only in form of underground mining and under certain additional conditions (Government Regulation No. 24 on the Use of Forest Areas, 2010; Law No. 41 of 199 on Forestry Act, 1999; Pratiwi et al., 2021)

Mining in forest areas can be carried out by obtaining a permit(Pratiwi et al., 2021) (Leasehold Licence of Forest Area; LLFA; Pratiwi et al. 2021). Deforestation therefore results in additional net emissions from land-use change, adding to the total CO_2 emissions from coal combustion (IPCC, 2022). Figure 45 shows Indonesia's primary forest in green in 2001 and the loss of tree cover from 2001 to 2022 in red.

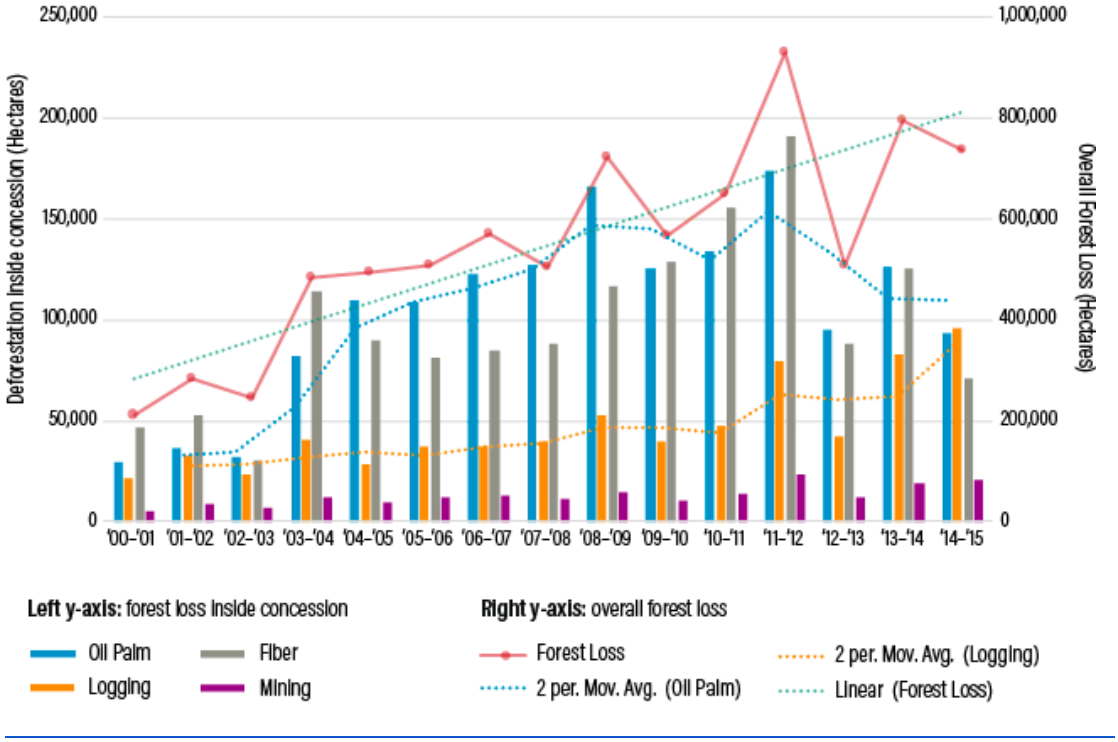
Figure 43. Indonesia’s primary forest loss 2001 to 2022



Source: (Global Forest Watch, 2023)

Although the main drivers of deforestation in Indonesia are logging and the conversion of natural forests to commercial crops or wood fiber, a **significant proportion of additional deforestation occurs as a result of mining** (IPBES, 2018; Wijaya et al., 2017). It is reported that these four major industries - logging, wood fiber plantations, palm oil and coal mining- contributed to the loss of nearly 45% of Indonesia's total forest cover between 2000 and 2010 (Abood et al., 2015). Deforestation outside legal boundaries adds to this loss. Much of the **illegal deforestation** can be attributed to concession holders exceeding the area of their permits. Fig. 46 gives an overview of the deforestation and forest loss by concession type (Wijaya et al., 2017).

Figure 44. Forest Change in Indonesia by Concessions Type



Source: (Wijaya et al., 2017)

Loss of Soil Quality and Functions

The process of clearing land for coal mines involves not only the removal of vegetation, but also the removal of soil and other material to create the open pit mines. The removal and storage of soil can have a negative impact on the soil quality, function and productivity, leading to a loss of **microorganisms and a reduction in soil organic carbon, nitrogen and phosphorus** (Pambudi et al., 2023; Pratiwi et al., 2021). In Indonesia, companies are required to conserve and store soil and return this 'topsoil' to the site after excavation or during the reclamation process (Liu & Lal, 2014; Pratiwi et al., 2021), however, there is a lack of data on whether these laws are implemented accordingly.

Biodiversity loss

Habitat degradation and fragmentation, landscape change and pollution are some of the **main drivers for biodiversity loss and species extinction** in Indonesia. Wildlife is threatened by mining activities through contamination of soil and water sources, landscape alteration and habitat loss (Martins-Oliveira et al., 2021). Highly biodiverse lowland forests in Indonesia are especially threatened by land-use conversion and mining. Currently, research and guidelines

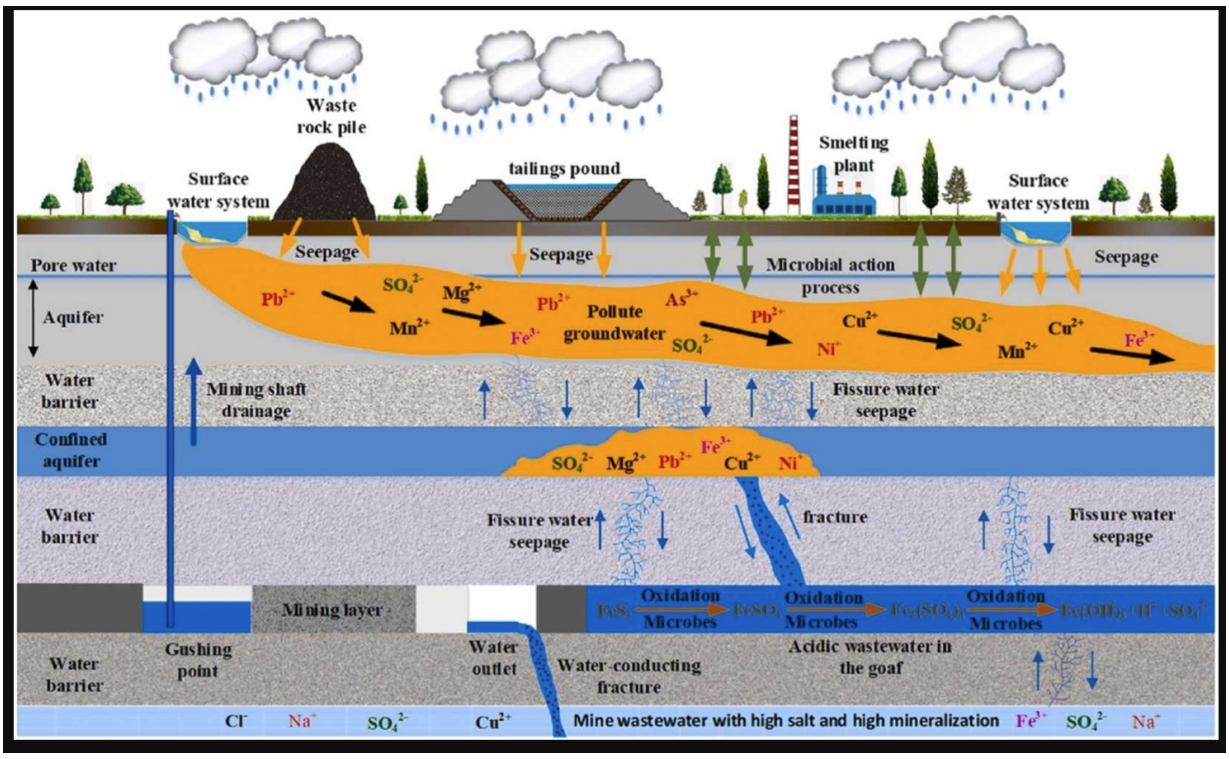
from international organizations such as the International Union for Conservation of Nature (IUCN) are seen to undervalue mining as a threat to mammals (Martins-Oliveira et al., 2021).

Acid Mine Drainage

In operation or in inadequately closed open-cast coal mines, **acid mine drainage (AMD) can pose a threat to the environment and human health** (Koc et al., 2023). This is one of the main e risk in Indonesian (coal) mines[14] (Amy et al., 2023), even though AMD management is implemented at least on paper in most mining sites in Indonesia. AMD can occur when run-off water comes into contact with exposed rock containing sulfur-bearing minerals, and reacts with water and air to form sulfuric acid and dissolved iron (Michalski, 2011). This polluted water then contains high concentrations of heavy metals and highly acidic sulfates which, once released into the environment, contaminate surface and groundwater and degrade aquatic habitats(Iskandar et al., 2011; Jiao et al., 2023; Rambabu et al., 2020). AMD poses an immediate threat to humans, plants and the surrounding ecosystems (Rambabu et al., 2020). The acidity of the water and the soil can reduce the growth of plants and thus alter the functioning of the local ecosystem (Lestari et al., 2019). Figure 47 shows an illustration of AMD. It was emphasized that the **prevention of AMD should be a key focus in mining** (Kefeni et al., 2017).

[14] The risks of AMD are not limited to coal mines, but are also relevant to other mineral mines in Indonesia, such as tin, nickel, copper and gold mines (Iskandar et al., 2011).

Figure 45. Illustration of Acid Mine Drainage



Source: (Jiao et al., 2023)

Box 12: Impacts of coal mining and use on human well-being

In addition to the degradation of ecosystems, coal mines pose a direct or indirect risk to human wellbeing, with harmful demographic, economic, social, cultural and political consequences, affecting health and safety (Blesia et al., 2023; JATAM, 2017; Murhaini & Achmadi, 2021; Wahyudi et al., 2022). This creates external costs that are not reflected in the price of coal (see also economy chapter).

7.2. Rehabilitation of Coal Mines

To counteract the negative impacts of mining, restoration efforts are crucial. These efforts include all measures taken to restore the ecosystem, taking particular account of the usefulness for and needs of local communities. It is important to note that restoration is never as good as not degrading the ecosystem in the first place, but it is an opportunity to restore ecosystems and functions that benefit the environment and communities. **To achieve successful mine rehabilitation, it is essential to keep the mine environment as safe, stable and**

unpolluted as possible from start to finish. The process and planning requires complex engineering skills and financial investment (Young et al., 2022).

As most mining sites in Indonesia are located in forested areas, **reforestation is generally considered to be the best ecological and economic option** (Pratiwi et al., 2021), however, all sites should carry out individual assessments to find the best viable solution. Other types of rehabilitation include plantation and production forests, aquaculture, cattle farms, ecotourism and others (Pambudi et al., 2023). Even though land reclamation is costly, studies suggest that the economic value of the **ecosystem services provided by reclamation are higher than the cost of establishing the reclamation works**[15] (I. E. Setiawan et al., 2021).

In Indonesia, the Ministry of Energy and Mineral Resources (for mining permit holders) and the Ministry of Forestry and Plantation (for LLFA holders) regulate the obligation for reclamation on mining sites (Lestari et al., 2019). The legal framework for mine reclamation is set out in Law No. 3 of 2020 on Mineral and Coal Mining (UU Minerba) and its associated (Law No. 3 of 2020 on Mineral and Coal Mining, 2020).

Under the law, **reclamation of mines is a mandatory activity to be carried out at all stages of mining activities**. However, there is an indication that **former mining sites are being left abandoned, posing a severe threat to the environment and safety.** In the past, some mining companies have not fulfilled their mining reclamation obligations such as paying into reclamation funds (Leonard, 2018; Listiyani et al., 2023; PWYP Indonesia, 2018). According to the Mining Advocacy Network (JATAM), more than 3,000 unrehabilitated mines were recorded in 2020 (Umah, 2021)[16]. As a result, the social and environmental problems associated with post-mining reclamation remain a challenge, leading to ongoing conflicts between mining companies and local communities (Listiyani et al., 2023).

Despite an amendment of the mining law in 2020, increasing penalties and sanctions for law violations, the mining law in Indonesia remains in urgent need of further strengthening and closing blind spots in the regulatory framework, as environment aspects have been rather weakened than strengthened (Kartikasari, 2024). Same as important, violations of the law need to be better prosecuted against companies that fail to rehabilitate (Listiyani et al., 2023). For instance, East Kalimantan has 44 mining inspectors responsible for 1,443 coal mines (Wicaksono & Rahmawati, 2024).

[15] The ecosystem services considered were expansion of forest cover, CO_2 absorption and oxygen production (I. E. Setiawan et al., 2021).
[16] These numbers may include also illegal mines, which are always left abandoned without any reclamation activities.

Box 13: Knowledge gaps in the field of ecology

Overall, there are many data gaps in the field of ecology and the impact of mining on the environment, climate and its effect on society at large and local communities in Indonesia. Strengthening knowledge about the following topics will be particularly relevant:

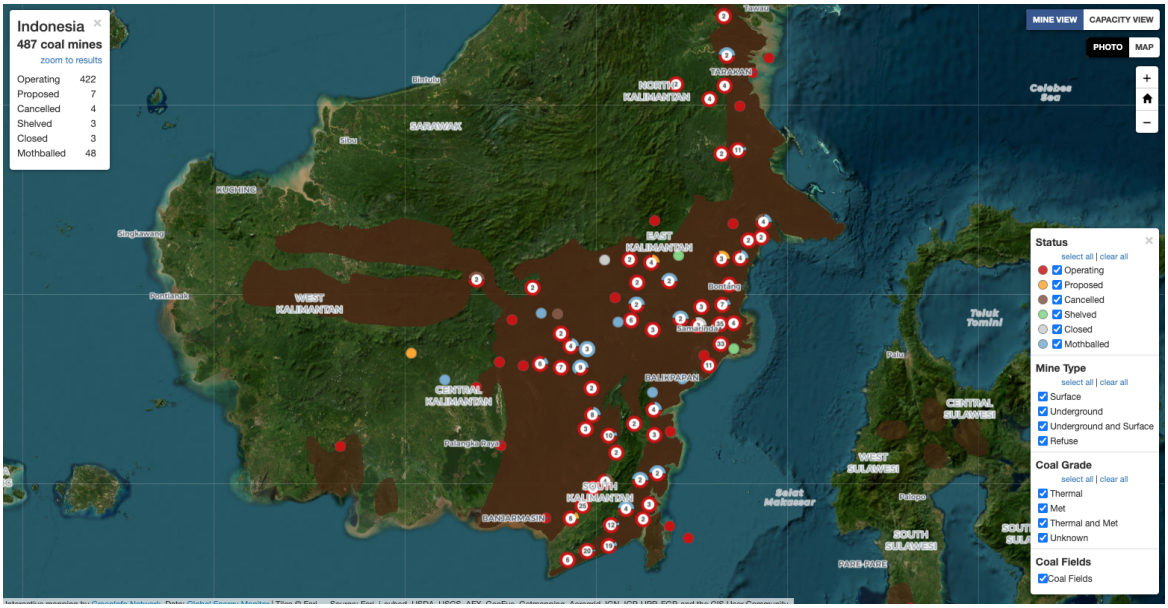
- Figures on the total number of mines that have been rehabilitated, are in the process of being rehabilitated or have been abandoned could be identified as well as how these numbers have changed over time to be able to assess the effectiveness of land reclamation policies.
- Impact of coal mining in Indonesia on biodiversity, the consequential effects on local ecosystems, or the feedback links to the well-being of the population.
- Meta-analyses that assess how 'good' the reclamation or rehabilitation of coal mines in Indonesia are, as most existing analyses are case studies.
- Data about top-soil storage process, compliance with soil storage obligations, or the potential impact of soil quality loss on land reclamation programs in the country.
- The number of untreated cases of AMD and the consequences is missing.
- Potential analyses about renewable energy installations in rehabilitated coal mines in Indonesia.
- (Economic) assessments comparing the value of Indonesia's primary forests and ecosystems allocated to these mines with the costs of coal mining, including all negative externalities.

8. Deep Dive: Coal Region East Kalimantan

East Kalimantan (Kalimantan Timur - Kaltim) is the third Indonesian largest province, with seven regencies and three municipalities. In 2022, the population was 3.86 million people (BPS-Statistics of Kalimantan Timur Province, 2023).

East Kalimantan Province in Indonesia has been a significant player in the country's economic landscape, primarily due to its robust mining sector, particularly coal. East Kalimantan boasts substantial coal reserves and resources, contributing significantly to national coal resources (40.10%) and reserves (42.40%). In 2021, the province accounted for 47.35% of national coal production (288 million tons) and a remarkable 74.37% of national coal exports (236 million tons) (Syarawie, 2022). Furthermore, coal is used as a key energy source to produce the building materials for the new capital, Nusantara, increasing significantly its demand (Goh, 2022). In East Kalimantan, there are the first two largest coal-producing mines, namely Sangatta Mine, owned by **PT Bumi Resources Tbk**, which registered 49.2 million tonnes estimated of coal produced and Pasir Mine, owned by **PT Indika Energy Tbk**, with 35.7 million tonnes estimated in 2021 (GlobalData, 2022). The **PT Kaltim Prima Coal Kalimantan Timur**, which manages the biggest open-pit mine in the world, recorded 70 million tonnes of coal in a year, setting a world record (Rahmawati, 2023).

Figure 46. Location of the coal mines in East Kalimantan

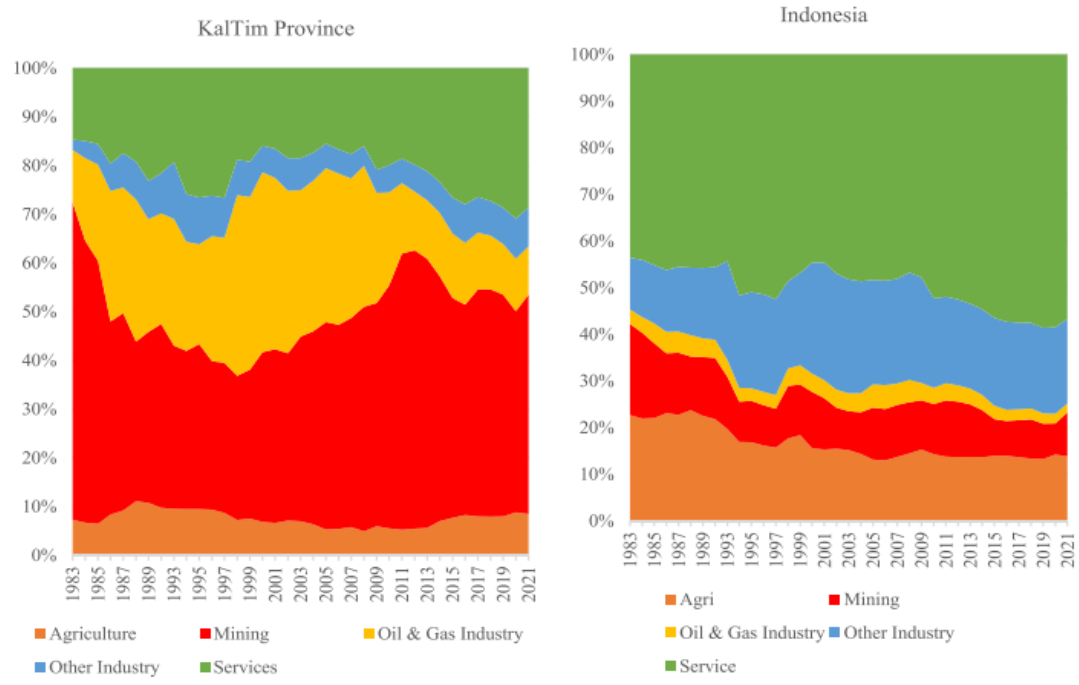


Source: (Global Energy Monitor, 2023b)

8.1. Economics of the region

East Kalimantan province was the second-richest province in Indonesia in 2021, becoming vital for the national economy: Kaltim makes up 27% of Indonesia's total mining value added and 4% of the country's GDP. Agriculture and plantation have been contributing significantly to the local economy, especially with the palm oil development. Forestry, rubber production, agriculture and fishery are other main sectors in the region. Despite the growth in mining activities, regional economic growth has not necessarily translated yet into a corresponding increase of the welfare of its citizens as the financial capital that circulates in the region due to the recently highly profitable extractive sector do not necessarily stay in the region. Despite East Kalimantan's economic strength due to its large-scale mining sector, the region's level of public services infrastructure is considered as below average (Yusuf et al., 2023).

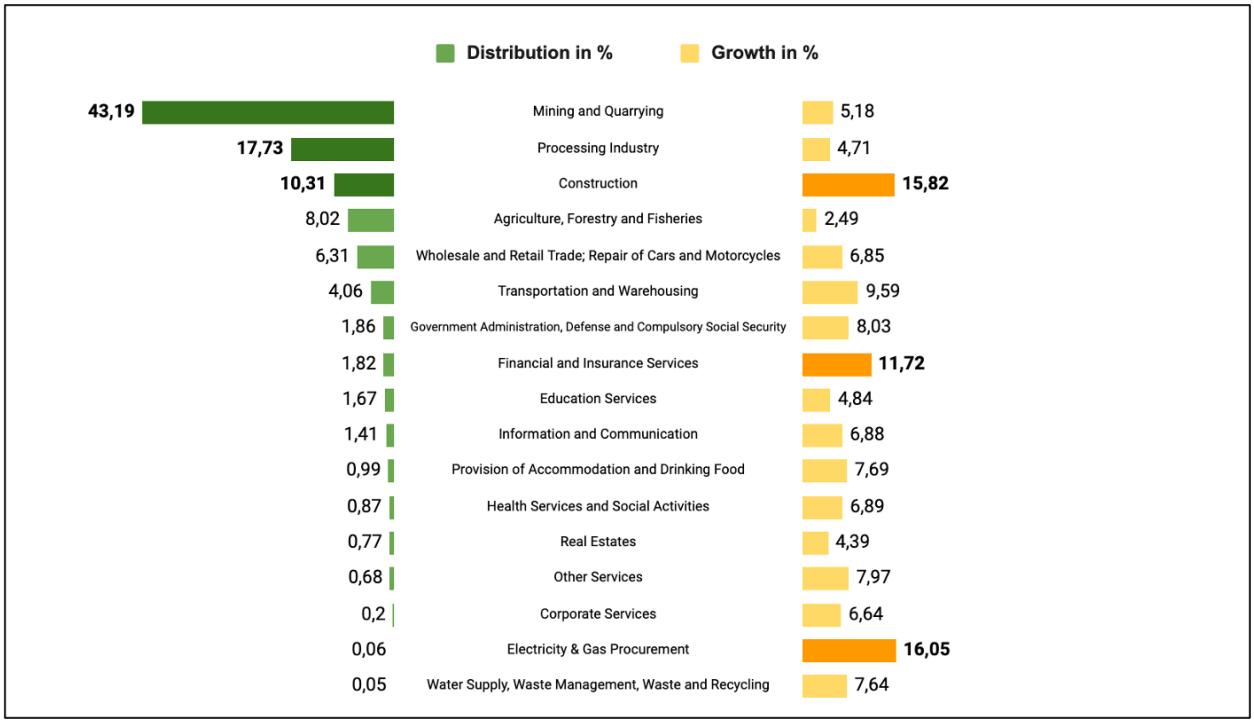
Figure 47. The sectoral share of Indonesia's and East Kalimantan Province 1980-2021



Source: (Yusuf et al., 2023)

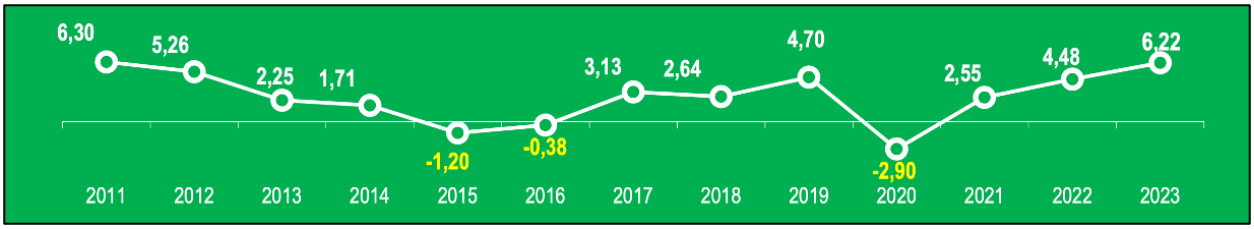
The mining sector has spread across 5 million hectares of East Kalimantan and it accounts for **30-35% of the GRDP** in 2022 (Jati, 2023a; Tate et al., 2023). Economic growth of East Kalimantan is linked to coal prices, as there is 86% correlation between the Reference Coal Prices and East Kalimantan's GRDP, implying an high sensitivity to the fluctuation of commodity price weakening its economy, as Figure 49 shows (Syarawie, 2022; Yusuf et al., 2023).

Figure 48. Sectoral GRDP Distribution and Growth in East Kalimantan in 2023 (in %)



Source: Own figure with data taken from (BPS East Kalimantan, 2024)

Figure 49. Annual GRDP Growth Rate in East Kalimantan from 2011- 2023 (in %)



Source:(BPS East Kalimantan, 2024)

Quite substantial importance has been the construction sector with a growth rate of around 16% contributing to 10% of the province's GRDP[17]. Important other, above average sectors are the Financial and Insurance services sector (11.7%, Transport and Warehousing (9,6%) and Administration. The Mining and Quarrying sector only saw a below average increase of 5.2% attributed to global coal price declines and reduced coal exports. Overall, East Kalimantan's economic growth remains closely tied to commodity prices and business cycles. One single action which may strongly change this in the future is the establishment of the new capital city, Nusantara. Moving the Indonesian government from Jakarta to an area in East Kalimantan,

[17] The Electricity and Gas Procurement sector showed the largest relative growth rate (16%), but is marginal for the overall economy.

which a few years ago was mainly forest can obviously provide a strong economic boost - but is in its complexity a very challenging process (see box below).

Box 14: High potential for regional development - but challenging complexity: Building the new capital city Nusantara

The recent plan to move the capital from Jakarta to a new planned city called Nusantara, due to Jakarta's overpopulation, unsustainable pollution levels, and the excessive groundwater consumption, represents a new challenge and potential opportunities for the region. The initial construction phase of Nusantara is between 2022-2024, and then, until 2035 the city are to be strengthened as a resilient core area[18].

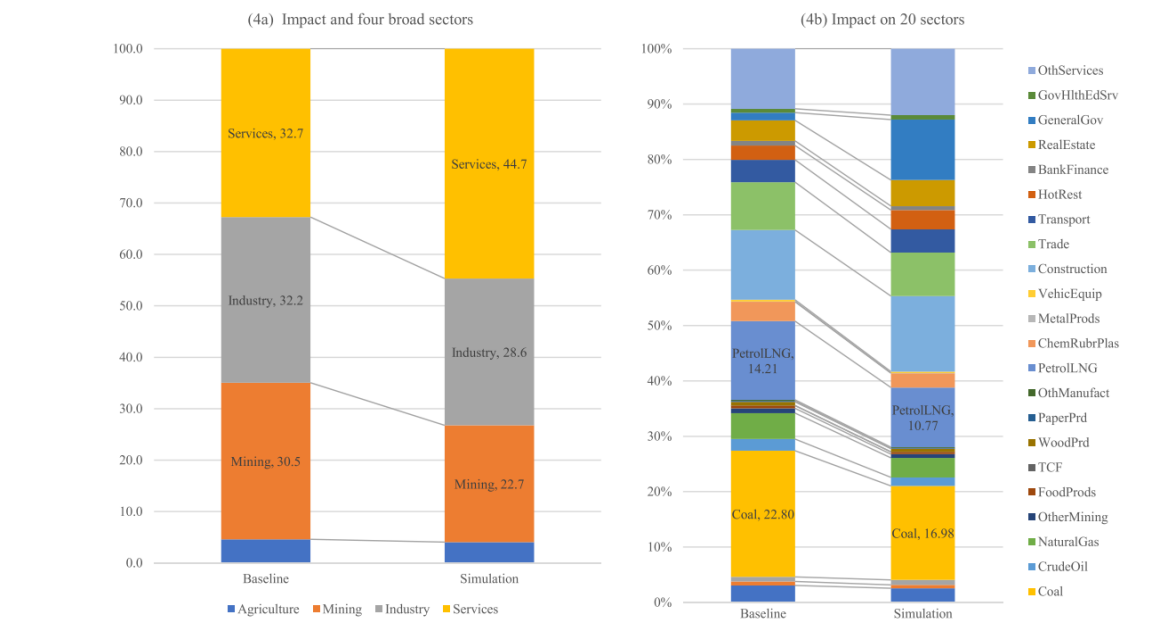
The plans and prospects of the new capital are perceived differently among Indonesian society. On one hand, some believe in the vision, highlighting the economic opportunity for the region (Syaban & Appiah-Opoku, 2023) as it is expected that a shift from fossil fuels towards a less carbon-intensive production diversifies the economy and supports growth in the tertiary sector (Yusuf et al., 2023). Moreover, some believe that it will encourage the idea that there will be a greater focus on environmental damage caused by coal mining, which will encourage government, businesses, and the community to take a more proactive approach to resolving these issues (Asfianur et al., 2023). On the other hand, others are worried about the impacts and debate about the prioritization in the budget spending, considering that other policy areas needed those resources more urgently, such as health, education and poverty (Syaban & Appiah-Opoku, 2023) and general skepticism towards whether this megaproject can fulfill its promises, given the experiences in other planned cities around the world (Beech, 2023). Another factor for opposition was the absence of community participation in the policy-making process (Asfianur et al., 2023).

Future economic output

The development of the new capital is expected to provide a significant boost to the country's economic growth, contributing to Indonesia's GDP of IDR 180 billion and creating 3 million jobs, raising the general level of public welfare, the skills of the local workforce and increasing regional and national income. The capital relocation has a potential to encourage the region to diversify its economic activity, becoming less dependent on coal mining. There is expected to be a major shift towards a service-oriented economy, largely driven by the governmental services. Therefore, the relocation would cut carbon emissions since traditional sectors in East Kalimantan are more carbon-intensive than emerging service sectors. However, the expansion impact may boost carbon emissions, creating an ambiguous net effect (Yusuf et al., 2023).

[18] For more information on the development of the new capital, refer to the new capital website.

Figure 50. Simulated impact of capital city relocation on Kaltim output by sectors



Source: (Yusuf et al., 2023)

It is expected that a strong migration into the region from other parts of Indonesia will happen, Plans exist to transfer a large number of state civil servants (ASN). Different scenarios estimate between 120,000 and 180,000 state officials. This movement will also involve their families and will certainly trigger other economic activities. Thus it is estimated that a **total of 1.5 million people** would move to the region (Asfianur et al., 2023). With respect to a just energy transition, one of the key questions is how many people from the coal mining regions can find new jobs in Nusantara (no only former miners, but also their children or their neighbors who do not work in the mines, but who still may face economic challenges once the mines close) and what would they need in order to do so (education, training, other support)?

The upcoming capital city aims to ensure a sustainable and eco-friendly urban development environment, initially accommodating 1.9 million people and projecting the creation of 4.8 million jobs in technology, petrochemicals, and renewable energy by 2045. With approximately 80% of the funding anticipated from private investments, this initiative offers investment prospects for businesses aiming to broaden their presence in Eastern Indonesia or those interested in investing in infrastructure, technology, education, and housing across Indonesia (Edelman Global Advisory, 2023). Furthermore, additional major road constructions are planned within the new capital and throughout Kalimantan to facilitate access to Nusantara from the rest

of the island (Gokkon, 2023). Indonesia 2045 Vision states that the New National Capital City (IKN) will assist the country in reaching its goal of being **a developed nation by 2045**.

Negative impacts on the region

However, these estimates have also been **criticized** due to the project's severe impact on the region, particularly its **environmental impact and the displacement of indigenous communities** living in intact parts of the forest (BBC News, 2022; Gokkon, 2023). Significant land use changes, such as the removal of forests and other natural habitats could affect the region's biodiversity, especially for species that are already endangered or vulnerable and the ecological processes, such as soil formation and nutrient cycling, that sustain biodiversity may also be hampered by the loss of natural habitats (Syaban & Appiah-Opoku, 2023). It has also been argued that argued that the construction of the new city will lead to the expansion of palm oil plantations and logging in an area rich in wildlife and rainforests. Widespread road construction in Kalimantan has increased hostilities between indigenous tribes, making less accessible food, and those moving into newly developed areas, as well as fragmentation of prime forest. In rural Indonesia, road construction is often associated with corruption (Gokkon, 2023; Syaban & Appiah-Opoku, 2023).

... high potentials but many challenges remain

Living up to its potentials and promises will be a challenge: Establishing Nusantara as a truely environmental city is a challenging and complex process which call for strict environmental impact control and good collaboration of the government with other actors, specifically involving local actors and civil society in participatory processes (Nurkaidah et al., 2024). Moving the capital has the potential of a strong economic increase, but will initially come with high costs of development associated with the move (Asfianur et al., 2023). It will therefore be important to have the other future challenges, which the region is facing in mind and spend public money wisely so that the new capital can truly contribute to a Just Transition in East Kalimantan.

In 2022, 1.85 million people were economically active, of which 64.73% participated in the labor force and 5.71% were unemployed (BPS-Statistics of Kalimantan Timur Province, 2023). The **coal industry accounts for 11% of total employment in East Kalimantan** (IESR, 2022c)**, with 159,900 coal miners, almost 40% of the Indonesian workforce**, and now comprises 35% of local GDP (Tate et al., 2023).

The average net wage of formal workers in the mining sector in East Kalimantan is IDR 5.1 million per month, higher compared to other sectors (BPS-Statistics

Indonesia, 2023)[19]. East Kutai is the region with the highest average income according to the National Labor Force Survey in August 2022 by the Central Bureau of Statistics. The average net wage of mining and quarrying sector workers in East Kutai is IDR 6.8 million. The wage amount reached 226% or more than twice the provincial minimum wage (UMP). Furthermore, according to the legal framework in place for the coal sector, local employment should be prioritized by the mining service companies. MEMR estimates that 66% of total workers are local in 2020. However, different estimates state that the total number of local workers in East Kalimantan is about 40% (Aprilia et al., 2019). The main reason seems to be the lack of qualified and experienced local candidates. Moreover, many workers tend to migrate to the region where they found a job, changing their ID in the respective municipality.

8.2. Negative impacts of the coal industry

The main negative effects of coal mining and processing in East Kalimantan are ecological and socio-economic. Concerning the ecological consequences, one of the main ones is deforestation which causes several environmental problems (see also ecology chapter).

The lack of company's compliance in carrying out reclamation and post-mining obligations represents an increasing problem in the region (Indrayanti, 2023). Over 1 700 coal mine voids in East Kalimantan have been abandoned without proper rehabilitation measures that are required by law (Toumbourou et al., 2020). More than 87,000 hectares (215,000 acres) of abandoned mine pits have been left behind by mining corporations in the province, according to activists (Woodbury & Arbainsyah, 2020). The abandoned coal pits represent an important threat for those who live in proximity to these sites, as the increasing number of deaths demonstrate (especially among children and teenagers) (Jong, 2020). In 2021, the 40th victim was registered in East Kalimantan (JATAM, 2021). Furthermore, by 2022, there appear to be more than **200 illegal mines** in the East Kalimantan region (Deras, 2022).

The main causes of systematic non-compliance appear to be the corruption of the coal companies, the integrity and capacity of the regional bureaucratic apparatus, the (lack of) transparency in the licensing system, and the weak effectiveness of the law enforcement system, multiple interpretations of "reclamation" and "post-mining activities", and finally low level of awareness of the communities (Indrayanti, 2023).

In terms of socio-economic impacts, there appears to be a gap between economic growth and social development. **Local communities suffer losses that are not commensurate with the gains made by coal-producing regions** (Hasjanah, 2023). For example, the Dayak people in Kalimantan claim to have lost community forests and other land to mining (Yehle, 2018). This indigenous community originally lives in the deep forests of Kalimantan and agriculture is their main activity. The expansion of coal mining areas is forcing the Dayak to

[19] The Provincial Minimum Wage (UPM) in East Kalimantan is Rp.3.404.177

relocate and adapt to this new reality (Ángel et al., 2023). On the other hand, many communities survive on coal because of the jobs it provides. However, a lack of higher education means that management positions go to outsiders with university degrees (Askar, 2023). Furthermore, local communities do not have the knowledge and awareness to participate in the decision making process which involves coal phase-out (Jati, 2023a).

8.3. Regional governance strategies and plans for the region

Regional authorities developed a policy framework, based on the national plans and agreements. The East Kalimantan Green Development Programs are based on the Kaltim Green initiative, firstly established in 2010, and then in 2013 formulated as long-term "economic transformation". In 2011, Kaltim Green was officially formalized as Gubernatorial Regulation[20] as a comprehensive and multisectoral green economic transition programme. Furthermore, in 2013, the then governor of East Kalimantan, Ishak, and other government officials, released a report describing **"Kaltim Vision 2030"**, which outlined the basic steps of a long-term strategy to transform the region's economy. However, this vision has never been incorporated into official documents or proposed legislation. Under this framework, the 2013–2018 Provincial Medium-Term Regional Development Plan (RPJMD) was carried out. It did not include provisions to restrict the exploitation of fossil fuels, but it did anticipate a new economic route centered on agriculture and agroindustry.

In addition, the regional authority has followed the national energy planning path by promoting the **Regional Energy Plan (Rencana Umum Energi Daerah/RUED)**, which refers to the National Energy Plan (Rencana Umum Energi Nasional/ RUEN). RUED is a regional long-term development plan that aims to accelerate sub-national energy transitions by 2050 and to ensure the availability of renewable energy sources (Riyandi, 2023). However, completing the Regional Energy General Plan (RUED) and implementing it to meet renewable energy targets is a challenge for Indonesian local governments. According to the new Perpres No. 11/2023, local governments now have more authority to develop renewable energy, however, the foreseen budget is limited, leaving a need to balance the policy with other objectives (Simanjuntak & Hasjanah, 2023). Furthermore, more programs are implemented in East Kalimantan, namely the **East Kalimantan Jurisdictional Emissions Reduction Program (EK-JERP)** to provide financial incentives for confirmed emission reductions and the **Green Growth Compact (GGC)** to support sustainable economic growth and protect forests.

When trying to analyze the future of the region, the new capital is the defining element of any future socio-economic projection (see box 14). East Kalimantan's economic development plan focuses mostly on diversification and the development of new economic sectors, and the new capital is considered the main driver of this process. Furthermore, the green transition can be an

[20] Pergub No. 22/2011

opportunity, as renewable energy sectors can lead to new employment and economic growth. Starting from September 2023, the IESR has conducted an investigation to explore the readiness of the region to face the transition and its renewable potentials. Global Energy Monitor estimates a loss of 30,000 workers in Indonesia, where around 50% (16,900 workers) will be in East Kalimantan due to the closure of mines by 2050 (Tate et al., 2023).

As one of the emerging sectors, the government is boosting tourism to play a stronger role in the regional economy (IEA, 2024; Office of Assistant to Deputy Cabinet Secretary for State Documents & Translation, 2024). However, the region does not have enough infrastructure to promote tourism, thus it will require future investment plans (IESR, 2022c). For instance, the Tourism and Creative Economy Ministry announced plans that use the sustainable tourism idea in an effort to draw additional investment into IKN's tourist and creative economy sector (Cahyoputra & Febrianna, 2024).

Box 15: Key knowledge gaps in East Kalimantan

Details on the status quo of the mining industry: A lot of information relates to national level or mining in general (not only coal). Data which is lacking is specifically:

- Statistics of economic indicators disaggregated along the whole value chain of coal mining: including upstream (e.g., manufacturing of mining equipment) and downstream (beyond coal mining: transport and use). What is the economic importance of the various steps for the region? What is value creation along the value chain?
- Number of jobs along the value chain, including details like: age, gender, origin (see below) and importantly skills. In order to estimate if coal workers (not only miners) could also take up other jobs, it is vital to have knowledge on typical skill sets along the coal value chain.

If data availability can be improved, the following research questions could be further addressed:

- **Trends in coal mining jobs in coal regions (e.g., Kaltim)**: While it can be assumed that the number of jobs will decrease, due to mechanization of mining (tons per worker ratio increases), the expected magnitude of this development (e.g., assuming that the amount of coal would be constant for next (e.g.) 10 years?) is currently understudied.
- **Projections and scenarios on the future of the coal industry** (amount of coal to be mined) are a fundamental basis for any Just Energy Transition planning. What is needed is a good estimate of likely pathways for the development of coal demand (both domestic and export) which will define the timelines in which coal mining activities are expected to decrease.

- **Role of migrant workers in the transition**: As it is estimated that the share of migrant workers (coming from other regions in Indonesia) is 35 - 60% of the coal mining workforce, it would be important to know more about those migrant workers: What are their skills? What are their views on moving to other areas if mines were to be closed (either within Kaltim, e.g., to bigger cities or even other regions in Indonesia) It is thinkable that some would actually prefer to move (e.g., back to their home region, or into more urban areas) while others would prefer to stay? What measures could be helpful to support those willing to re-migrate (this could be early information campaigns, skilling programs, financial support - are there international good practice examples)?

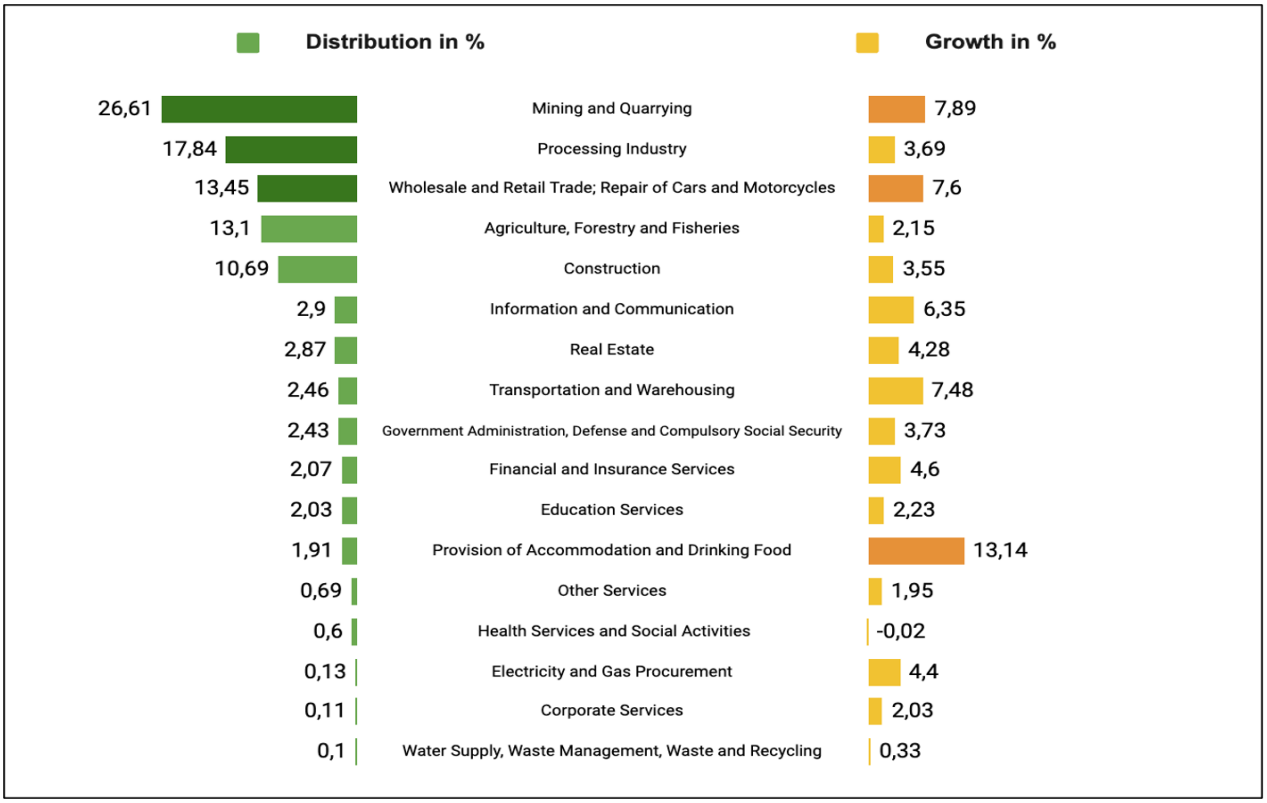
9. Deep Dive: Coal Region South Sumatra

9.1. Economics in the region

South Sumatra's five provinces consist of Jambi Province, South Sumatra Province, Bangka Belitung Province, and Lampung Provinces. Southern Sumatra ranks as the fourth wealthiest province concerning natural resources, with high contribution from land-based industries such as rubber and coffee and has a high number of agricultural, plantation and forestry households. It is also the fourth largest province regarding oil palm plantages in Indonesia (Asmani & Ekadinata, 2019).

The province's economic landscape is shaped by a few key sectors, mining and quarrying leading at 26%, followed by the processing industry at 18%, and agriculture and forestry at 13% (see figure 53). According to data from the Central Bureau of Investigation, Indonesia, South Sumatra has maintained an average growth rate of 2.6% over the span of the last 14 years, surpassing the national average growth rate of regional GDP (Asmani & Ekadinata, 2019).

Figure 51. Sectoral GRDP Distribution and Growth in South Sumatra in 2023 (in%)



Source: (BPS South Sumatera, 2024a)

In 2023, South Sumatra Province's economy grew by 5%. From a production perspective, the accommodation and food services sector saw the highest growth at 13%, followed by the mining and quarrying sector at 7.89%. The three sectors contributing most to the GRDP are Mining and Quarrying at 26.6%, the Processing Industry at 17.8%, and the Wholesale and Retail Trade sector at 13.4% (BPS South Sumatera, 2024a). At 43%, agriculture, forestry, and fisheries employ the largest portion of the population. The wholesale trade employs 15% and processing industry sector employs 7% of the workforce in South Sumatra (BPS South Sumatera, 2024b).

Table 9. Leading sectors in South Sumatra

Sector	Location
Coffee	OKU, South Oku, Lahat, Musi Rawas Utara, Pagar Alam
Rubber	Palembang
Sugar Cane	OKI, OKU Timur
Palm Oil	OKI, Musi Banyuasin
Oil and Natural Gas	Musi Banyuasin dan Banyuasin
Coal	Muara Enim
Pepper, Pala and Cloves	OKU Selatan, OKU Timur, Lahat, Empat Lawang
Fishery	Entire South Sumatra

Source: Own table with data acquired from (BAPPEDA Sumsel, 2023)

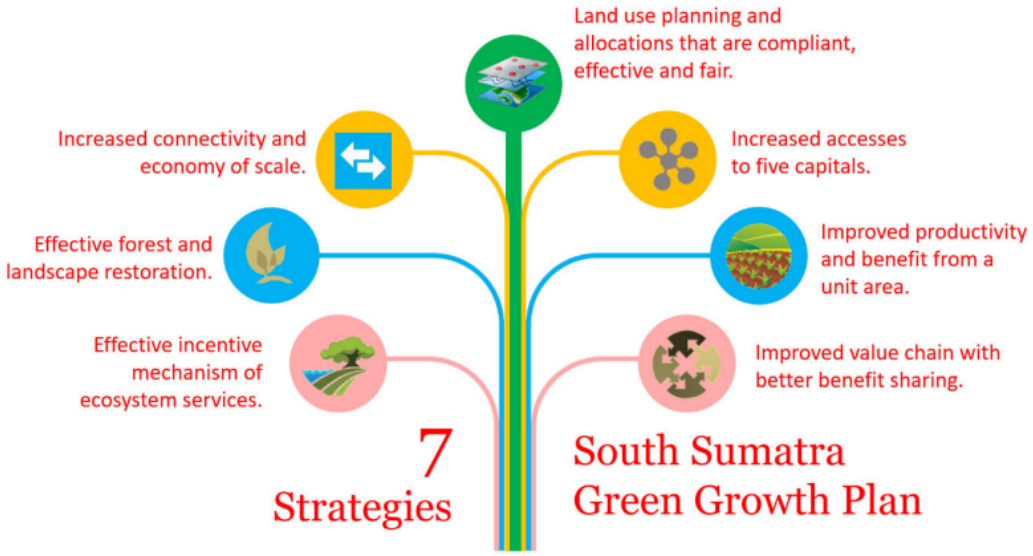
9.2. Development plans for the region

The Long-Term Regional Development Plan (RPJPD) for South Sumatera, covering 2025 to 2045, is currently being formulated. This comes as the existing plan, which spans from 2005 to 2025, approaches its end. Drawing from directives in the National Medium-Term Development Plan (RPJPN), the RPJPD focuses on three main areas: economic development, social mobilization, and governance transparency (DESDM SUMSEL, 2024). In that regard, the

current draft particularly mentioned the aim to build up industrial value chains in resource-based and renewable sectors.

In the recent past, private and philanthropic initiatives have in parallel developed roadmaps and strategies for South Sumatra, partly individually and partly in collaboration with the provincial government. For instance, the Sustainable Trade Initiative (IDH) has devised a Green Growth Masterplan specifically focusing on forestry and ecosystem development (see figure 54) (Asmani & Ekadinata, 2019). How much these initiatives influence the official planning, has not been published.

Figure 52. Development plans for South Sumatra



Source: (Asmani & Ekadinata, 2019)

On energy planning specifically, the Ministry of Energy and Mineral Resources (ESDM) considers a Java-Sumatra electricity transmission line, which is currently considered again in PLN's long-term planning after the project were shelved in 2017. Given the rising demand of electricity on Java and considered higher potential for energy generation on Sumatra Island (both including fossil based and renewables electricity generation), PLN is in discussion with other energy solution companies about how to build this transmission line. The project would also include a 500-kW high voltage connection connecting the electricity network from South Sumatra to North Sumatra. It is estimated by ESDM that when the interconnection of electricity transmission is completed across Sumatra Island, it could potentially result in major savings in electricity generation costs (VOI, 2023).

Generally speaking, South Sumatra holds substantial technical potential for solar and geothermal energy. The Ministry of Energy and Mineral Resources estimates the region's renewable energy potential at around 21 000 MW, including 17 000 MWp of solar energy, 448

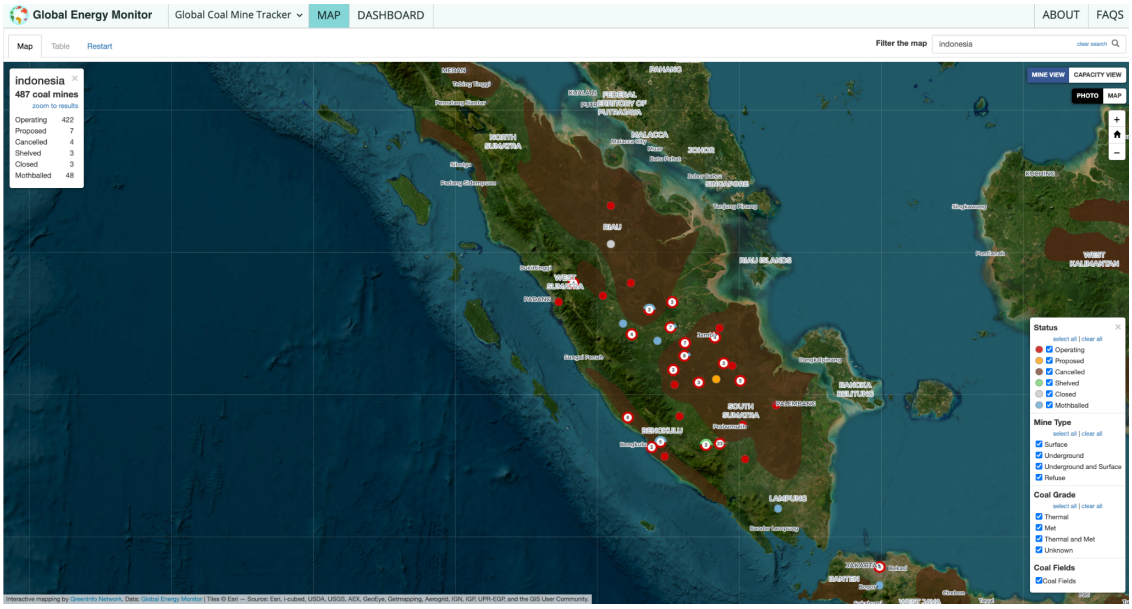
MW of hydro power, 301 MW of wind power, 2 132 MW of bioenergy, and approximately 918 MW of geothermal energy. However, only 4.7% of this potential has been utilized so far, with a current installed renewable capacity of about 989 MW(Kurniawati Hasjanah, 2024). The mining company Bukit Asam plans to repurpose former mine sites for solar panel installation and has allocated land in South Sumatra for solar plants with a potential capacity of up to 200 MV, expected to be completed by 2027 (Soumya Duggal, 2021). Regarding geothermal energy, notable projects include the Ulubelu II geothermal power plant, with a total gross power output of 116 MW (Power Technology, 2017). Other projects, are conducted by PLTP Lumut Balai and Danau Ranau (Power Technology, 2024).

Despite the potential of investing into renewables, the region also has some silicon natural resources that are currently considered to exploit. Overall and similar as for East Kalimantan, there is a lack of more in-depth knowledge about the future sectors that could become a replacement for the coal sector in terms of economic relevance.

9.3. The coal industry in South Sumatra

South Sumatra has the second largest coal reserves in Indonesia with approximately 22.47 billion tons of coal resources (IESR, 2023d). The coal mining sites located in South Sumatra, account for 17% of the total mining sites in Indonesia (Ángel et al., 2023) and also holds a significant portion of Indonesia's coal resources. Out of the total national coal resources amounting to 149 billion tons, approximately 43 billion tons are located in South Sumatra. The main coal mining areas are located in Muara Enim, Lahat and Ogan Komering (Antara, 2023). In South Sumatra, the transportation of coal is mostly carried by trucks and trains. As this causes continuous traffic, the South Sumatra Coal Mining Association is attempting to establish a dedicated transportation system (Antara, 2023). Similarlarly, PT Titan Infra Energy, a coal company operation in South Sumatra has already established 113 kilometers hauling lines across three regencies- Lahat, Muara Enim, and Pali (Petromindo, 2020).

Figure 53. Location of the coal mines in South Sumatra



Source:(Global Energy Monitor, 2023b)

The major coal mining companies operating in South Sumatra is the state-owned company PT Bukit Asam Tbk which operates from Tanjung Enim and PT Thriveni. In 2022, Bukit Asam produced 37 million tonnes of coal, of which 12.5 millions tonnes were exported (Reuters, 2023). Due to locational factors on the island, conditions for export are less good as in other coal regions. For instance, there is also no port close by that could be used for shipping overseas.

Figure 54. Sumsel-8 steam power plant

Source: (Bukit Asam, 2023)

Worth mentioning is also the current coal-fired power plant project Sumbagsel 1 in South Sumatra, which is built as a mine-mouth coal fired power plant to be installed with a capacity of 1.3GW. Once completed, it is expected to be the largest coal-fired facility on Sumatra Island and the largest mine-mouth thermal power station in Indonesia. The power project aims to generate up to 8.6 billion kWh of electricity per year over a projected lifespan of 25 years (Bukit Asam, 2023).

Table 10. Production and distribution of coal in South Sumatera between 2016-20222

No	Kabupaten/Kota	Produksi (Ton)					
		2017	2018	2019	2020	2021	2022
1	Muara Enim	23.884.363,56	27.053.415,69	27.854.410,07	23.419.813,07	22.957.423,25	-
2	Lahat	17.183.804,46	20.645.407,83	20.435.975,67	21.923.675,81	25.698.264,78	-
3	Musi Banyuasin	3.230.979,88	5.311.373,63	4.860.992,43	2.906.122,54	4.650.663,35	-
4	Musi Rawas Utara	605.205,70	1.039.845,49	1.272.176,42	1.058.796,92	799.108,13	-
5	Ogan Komering Ulu	526.448,39	481.647,61	343.349,16	264.684,65	264.515,30	-
Total		45.443.290,58	54.572.354,44	54.827.794,89	49.573.092,98	54.369.974,81	90.141.580

Source: (BAPPEDA Sumsel, 2023)

9.4. Socioeconomic implications of coal mining

Despite the significant contribution of the sector to the region's economy, similarly as in East Kalimantan, how much citizens in the region actually profit seems to be at least questionable. For instance, the mining and quarrying sector only employs 2.2% of the population (BPS South Sumatera, 2024b). While tax revenues from coal are a significant part of the region's state budget, a recent analysis by IESR also concluded that actually 78% of the total profit remains with the mining companies and its shareholders. Employees would benefit less than in other sectors from companies earnings as the impact on income and employment is relatively lower in comparison to other sectors such as services, trade and agriculture (IESR, 2023d).

Another criticism raised in regards to mining in South Sumatra is that insufficient mining land rehabilitation and unsustainable forest exploitation practices have led to various adverse effects such as forest fires, floors, reduced river discharge, compromised water quality and habitat depletion (Asmani & Ekadinata, 2019). For instance, in Jambi residents are exposed to dust and thick diesel fumes from coal trucks. These impact of coal mining has led many residents to abandon their homes, yet many still remain due to financial costs of moving (Muhammad Beni Saputra, 2023).

Muara Enim region in South Sumatra experienced negative environmental effects due to coal mine waste getting discharged in the Kiahan River. Additionally, there have been events of coal mining-related landslides, particularly along the river Enim. Furthermore, many individuals in

the Muara Enim region claiming respiratory health issues or ISPA. (Nanda Julian Utama et al., 2019).

In terms of the society, the coal industry's existence in South Sumatra has caused economic activities to change from forestry and agriculture to coal mining. In Muara Enim Regency, both the government and private companies aren't the sole participants in the mining industry. Local communities, especially in 'Tambang Rakyat' or also known as people's coal mines are involved. These operations, conducted individually or in small groups, are called **community mining**. Community mining income is a significant element of the coal-related activities, but due to it's informality there is little knowledge about the extend and details of community mining practices (Nanda Julian Utama et al., 2019). Mobility between community mining and formal jobs in the industry is considered as relatively low, due to a lack of formal education of the local workforce, which is usually required for a job in a coal company. This has led to recruitment from other regions and an influx of migrant workers (IESR, 2023d).

Box 16: Knowledge gaps for South Sumatra

- Health impact of existing coal-fired plants on the population of South Sumatra.
- Region-specific quantified data about the employment in the coal sector and its impact on the economy is not available.
- Long-term economic alternatives and employment opportunities for the region as a whole and for the coal communities especially.
- The impact of climate change on the local level and predictions for the local economy and effects for the society.

6. Gender and coal

In Indonesia, the transition away from coal will affect men and women differently. To foster a Just Energy Transition, Indonesia's policies will need to recognize gender differentiated impacts, otherwise they risk reproducing inherent existing injustices.

Worldwide, women comprise a small proportion of the formal mining workforce, but are present in large numbers in informal sectors. In the Asia-Pacific region, higher participation rates of women are seen in informal artisanal and small-scale mining, which tends to occur more commonly in poor and remote areas (UN Women Indonesia, 2020). Women in informal coal jobs are typically contracted as poorly paid outworkers or are self-employed (Lahiri-Dutt et al., 2022). While there is scarce literature on gendered impacts in the context of Indonesia's coal industry, research from other transitions across the world (reviewed by (Lahiri-Dutt et al., 2022) provides valuable insights to approach the issue. These can be summed up into three main themes:

- Coal mine closure causes different types of impacts on men and women:
    - As coal-dependent regions undergo economic and industrial transformations, women's job losses occur especially in the informal sector, and are accompanied by reduced access to basic services, increased caregiving responsibilities, and increases in domestic and other forms of violence against women, and food insecurity, among others.
    - The absence of women in formal spaces in coal communities means that their views are less likely to be represented in mine closure support programs and policies.
    - Coal communities are generally male dominated and the spouses and partners of male coal workers are more likely to have less financial independence and be more adversely affected by closure.
- Changes in energy systems do not automatically address gender inequalities:
    - The level and quality of women's labor participation in emerging technologies improves when compared to jobs in fossil fuel industries. However, women still face more barriers to entry into the renewable's workforce in comparison to men. If not addressed early on, the same structural inequalities will be replicated and transferred over to new energy systems
    - Data and evidence-based analysis on the gender and social equity impacts of energy transition for countries of the Global South is still largely missing

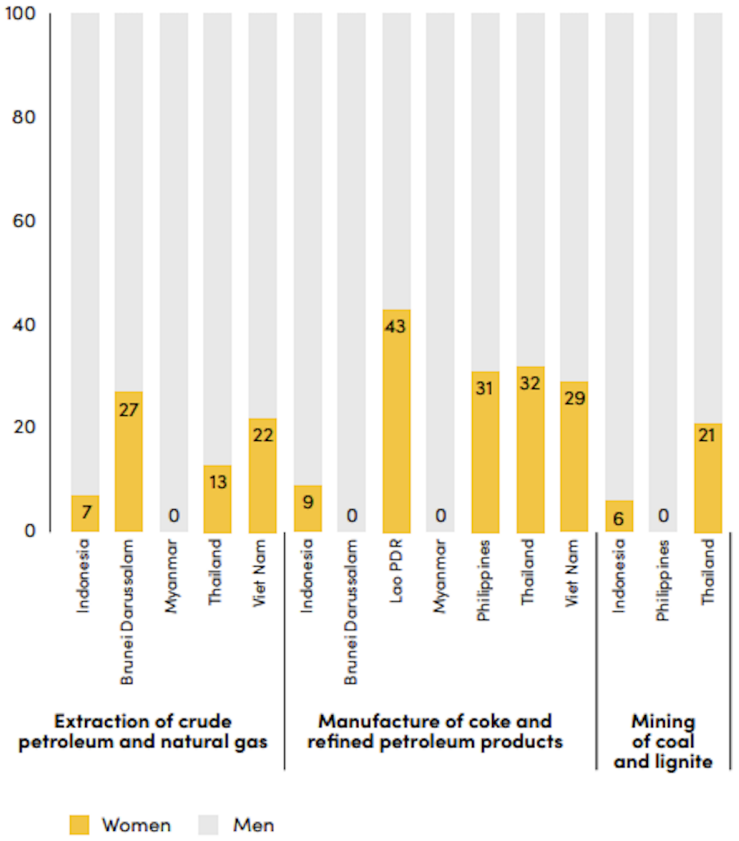
- One way to address the differentiated impacts are gender-responsive policies:
    - This means recognizing the specific needs, challenges, and opportunities for women and marginalized groups. One important step towards gender-responsive policies is equal participation in decision-making processes at all levels.
    - A focus on gender entails not only focusing on women's vulnerability, but also on amplifying their agency and recognizing the specific contributions they bring to the just energy transition. For example, supporting women entrepreneurs and leaders in the clean energy sector can contribute to more equitable economic development.

The following sections review evidence around the gendered impacts of both the coal sector and the energy transition in Indonesia, to then reflect on relevant policies that should be considered in the context of gender-responsive policies for Just Transition.

6.1. Gendered Impacts of the Coal Sector in Indonesia

Only 6% of the roughly 400,000 formal workers in coal mining in Indonesia are women (see Figure 58). This is lower than the shares in other countries (with the caveat that Indonesia's coal sector is much larger than in other Asian economies). There are no estimates available for the number of informal coal workers who are women, because there is no public disaggregated data on informal employment in the coal sector in general (see employment section). Place-based studies do reveal a high level of informality, with women's jobs in coal mining being low-skilled and marginalized, mainly as coal collectors (Sagung Dyah A.N.A. & Dewi, 2020).

Figure 55. Proportion of people involved in the fossil fuel energy sector by sex



Source:(ILO, 2023)

There are practically no studies existing on the gendered impacts of the coal sector in Indonesia, and none that look at the impact of mine closure. Evidence from the district of East Kutai in the province of East Kalimantan indicates that coal mining has resulted in significant changes to livelihoods (Dr Kuntala Lahiri-Dutt & Ms Petra Mahy, 2007). While dated, this research lays out some of the gendered impacts one may encounter in coal regions. It finds that mining has caused 'shifting power equations' within communities and families which affect women, including '*increased cost of living, lack of direct employment opportunities in the mine for women and their resulting dependency on male relatives, environmental impacts (dust and water), loss of agricultural land and resources, the failure of compensation to ensure sustainable alternative livelihoods, and women's lack of decision-making power at the community level*'.

They also find that the impact of mining on women also varies between settlements and depending on distance from the mine. For example, in one location, the main impacts are related to '*poor education and training of women compared to men, the increase of migratory laborers, leading to a sharp increase in alcohol and drug use, domestic violence, sexual*

assault, the spread of prostitution and family disruption: poor water and sanitation facilities, poor health and the spread of sexually transmitted infections'. In another, women's '*lack of voice or presence in formal public decision-making spheres is reflected in their inability to benefit from or retain land compensation monies, and increased domestic burdens of providing for the family, which keeps them away from market opportunities'*.

6.2. Gender considerations in the energy transition

There is a small body of literature regarding the gender-differentiated impacts of the energy transition in Indonesia. For example, a study into renewables and clean cooking fuel interventions in West Sumatra found poor design could potentially exacerbate inequalities (Aung et al., 2020).

With respect to participation in the energy sector in Indonesia, the number of women serving in political positions related to the energy sector continues to be low at all levels (USAID, 2021). Women only made up 12% of all graduates of STEM-related fields in 2018 (Fiscal Policy Agency of the Ministry of Finance of Indonesia, 2022). Surveys reveal that female students are not as confident as male students to pursue STEM studies, caused partly by the lack of role models for career prospects in the energy sector. The expansion of renewable energy will require a skilled workforce, providing an opportunity to increase the number of women in the energy sector.

A workshop on gender issues related to energy just transition in East Kalimantan conducted in August 2023 in the frame of the IKI JET project identified key barriers, drivers and actions for the integration of intersectional gender aspects in the local transition from coal to renewable energies. Around 20 participants from government, academia and civil society identified barriers related to politics, gender roles and religion. Aspects discussed included: the lack of a national policy and provincial level plans and strategies to enable JET; the need for a clear definition of what a just energy transition is and that all people can be informed; the lack of women-led policy making or even the involvement of women.

One participant also highlighted the impacts of the projects on natural resources and how this can affect women differently and be a barrier: "Women will get the most impact when the natural resources get disturbed and destroyed because of their significant role at the domestic level. Even though the domestic part is small, it is vital for the next generation and family resilience, particularly in the water resources, because they use water most of the time, and it is their responsibility to provide clean water for the family every day. So, if the water is polluted, the women will deal with many challenges to survive".

The drivers are associated with the need to create a downstream industry in East Kalimantan to provide more economic development to start more employment after the coal mining closure, supporting gender equality in the economy, that is, increasing employment opportunities for women. There is a need for more media (social media and open-sourced news media) to

promote gender and JET awareness in society, especially in the education system at school and university levels. Discussions during the workshop also referred to educational material such as, e.g., school books which convey gendered contributions of men and women, e.g., with the visuality of the father always going to work while the mother goes to the market. Participants pointed out that this needs to be changed because the mother is also able to work. A strategy to strengthen processes and movements that promote gender equality and a just energy transition is essential to get more people involved, and communication can play a key role in making this possible for a better future.

With respect to the measures, greater employability of women is considered imperative in any project to be developed. With regard to mine closures, it is important to evaluate how many women received economic incentives and from the empowerment program developed by the agency, there needs to measure from the training or workshop on skill improvement, how many women already developed a business after the activities. There is a policy preparing the strategy in the JET process and already put the gender perspective inside of the plan.

6.3. Gender Mainstreaming in Indonesia's Policies

Active participation of women in decision-making processes that seek Indonesia's social, economic and environmental change is still limited. While efforts have accelerated recently (e.g. quotas for women positions set by the Ministry of Owned Enterprises (MSOE) in 2021), there is still a strong need for gender mainstreaming in the planning, budgeting, and implementation of all programs and plans led by the Indonesian government, in order to eliminate existing gaps and enable the full participation of women in the development of the policies that define a large part of their lives.

As a party to the UNFCCC, Indonesia acknowledges that equal involvement of women and men is essential in UNFCCC processes and in developing and implementing national climate policies. During the 2019 UN Climate Change Conference, or COP25, Parties among them Indonesia, agreed on a 5-year enhanced Lima Work Program on gender and a Gender Action Plan (Decision 3/CP.25) to recognize the need for equal gender representation in all aspects of the Convention process (Fiscal Policy Agency of the Ministry of Finance of Indonesia, 2021). In 2022, the Government of Indonesia showed global leadership on advancing gender equality and women's empowerment agenda by hosting the G20 Summit under the theme "Recover Together, Recover Stronger". It acknowledged how the pandemic has hit women and girls harder, and the need to center post-COVID-19 recovery plans on gender equality and closing the gender gap (UNDP).

At the national level, the Government of Indonesia has already been working on the integration of Gender Equality and Social Inclusion (GESI) through the policies and regulations, in the different stages of the development and implementation of its programs and activities,

particularly those related to sustainable development and climate change, considering the differentiated impacts that the latter has on women (see table 3). (Fiscal Policy Agency of the Ministry of Finance of Indonesia, 2021).

Table 11. Indonesia's legal frameworks on gender equality

Policy/Regulation	Provisions
Presidential Instruction No. 9/2000 on Gender Mainstreaming in National Development	Emphasizes the importance of mainstreaming gender issues in state agency's policies and programs at all stages of development.
Minister of Finance Regulation No. 119/2009 on Instructions for Drafting and Reviewing RKA-KL	Provides instructions for the implementation of gender-responsive budgeting.
Minister of Home Affairs Regulation No. 15/2008 JUNCTO No. 67/2011 on Gender Mainstreaming in Sub-National Government	Identifies government responsibilities at each level to include mainstreaming gender, and calls for every government agency to set up a Gender Working Group (POKJA PUG) and appoint Gender Focal Point.
Collaborative Circulation Letter 2012 on National Strategy for Accelerating Gender Mainstreaming through Gender-Responsive Planning and Budgeting	Formulated and circulated by Ministry of National Development Planning, Ministry of Finance, Ministry of Home Affairs and Ministry of Women's Empowerment and Child Protection.
Minister of Agriculture Ministerial Decree No. 01/2013 on the Establishment of Gender Mainstreaming Coordination Team	A follow-up to the 2012 Collaborative Circulation Letter on the National Strategy for Accelerating Gender Mainstreaming through Gender-Responsive Planning and Budgeting.
Minister of Women's Empowerment and Child Protection Regulation No. 5/2014 on Guidelines for the Implementation of the Gender and Children Data System	Provides guidelines on how to implement the gender and children data system.
Head of BNPB Regulations on Disaster Management on gender, disability, and community	Regulations on Gender Mainstreaming in Disaster Management.
Technical Guidelines for Gender-responsive Climate Change Adaptation by BAPPENAS and KPPPA, 2015	Aim to strengthen stakeholders' understanding of gender mainstreaming and encourage gender-responsive climate change adaptation activities.

Presidential Regulation No. 75/2015 and Presidential Instruction No. 10/2015 on National Action Plan for Human Rights (RANHAM)	Emphasizes the importance of considering vulnerable groups, such as women as the main beneficiaries for human rights advancement in all aspects of development.
Series of Minister of Marine and Fisheries (KKP) Regulations on gender mainstreaming within the ministries' work	Guidelines for the Implementation of KKP's Gender-responsive Programs and Activities. Mapping Guidelines for the Implementation of Gender Mainstreaming in Marine and Fisheries in Sub-National Regions. Roadmap for Mapping Gender Mainstreaming in KKP.
Minister of Environment and Forestry Regulation No. 31/2017 on Gender Mainstreaming in Environmental and Forestry Sector	Guidance for the Ministry's officials and staff to accelerate the implementation of gender mainstreaming in their programs and activities.
Presidential Regulation No. 18/2020 on National Mid-Term Development Plan 2020 – 2024	Emphasizes sustainable development and gender equality mainstreaming, as a catalyst for development towards a prosperous and just society.
Minister of Environment and Forestry Regulation No. 16/2020 on Strategic Plan 2020 – 2024	Recognizes the importance of reducing the gender gap in access to and control of resources, ensuring participation of women in the decision-making process, and strengthening stakeholders' understanding in the implementation of gender mainstreaming.
Indonesia's Nationally Determined Contribution (NDC) 2016 and Updated NDC 2021	Includes sustainable forest management that underlines the importance of the participation of women, local communities, indigenous peoples, and other vulnerable groups in the planning and implementation stages.

Source: Own depiction, based on (Fiscal Policy Agency of the Ministry of Finance of Indonesia, 2021)

Box 17: Knowledge gaps in the field of gender research

Intersectionality: While there is a growing body of literature on gender and environmental justice, there is a noticeable gap in research that employs an intersectional lens to understand the challenges faced by individuals at the intersections of gender, class, ethnicity, and other social categories. Existing studies often tend to focus on a singular dimension of identity, neglecting the ways in which these identities intersect and compound vulnerabilities. Future

research should strive to adopt an intersectional approach to comprehensively capture the experiences of diverse individuals affected by the coal sector phase-out.

Attention to Local Contexts: Local contexts matter as previous research has shown that gender roles, norms, and power dynamics vary significantly across Indonesia's coal regions, ethnic groups, and communities. In-depth, context-specific research can help to understand the localized impact of the coal phase-out on different groups. The research provides the basis to design targeted and effective policies that address the unique needs of diverse populations.

Exploration of Policy Implications: While there is a growing awareness of the need for gender-just policies in the context of the Indonesian coal phase-out, there is a dearth of research that systematically examines the effectiveness of existing policies and proposes new ones. Future research should collect data and evaluate the impact of current policies on different gender groups and identify gaps that need to be addressed. Some concrete examples:

- *Gendered impacts of coal phase-out policies:* Investigate how the phase-out of coal affects different genders in diverse ways. For instance, how do job losses in the coal industry affect men and women differently? Are there specific policy measures that can mitigate these impacts?
- *Gender and energy access*: Analyze how energy transition policies impact energy access for women in rural and urban areas. Consider the challenges women face in accessing clean energy alternatives and how these challenges intersect with socio-economic factors.
- *Women's participation in decision-making:* Examine the extent to which women are involved in the decision-making processes related to coal phase-out policies, and how their participation influences the outcomes. Explore the barriers and opportunities for women's inclusion in these processes.
- *Gendered divisions of labor in the renewable energy sector*: Investigate the extent to which women participate in and benefit from jobs in the renewable energy sector, and whether there are gender-based disparities in pay, job roles, and opportunities.

Additionally, exploring the potential unintended consequences of policies is crucial to ensure that they do not inadvertently exacerbate gender inequalities.

Longitudinal Studies: Longitudinal studies are essential for tracking changes over time and understanding the dynamic nature of gender relations during the transition away from coal. Such studies would shed light on the evolving challenges and opportunities faced by individuals and communities as the phase-out progresses, allowing for more informed and adaptive policy recommendations.

Stakeholder Engagement: Engaging with local communities, especially women and marginalized gender groups, is integral to developing a comprehensive understanding of the

gender dynamics associated with the coal phase-out. Research often falls short in involving these communities in the research process, limiting the depth and authenticity of the findings. Future studies can prioritize community-based participatory research methodologies to ensure that the voices of those most affected are heard and incorporated into policy recommendations.

7. Conclusions and policy recommendations

The information gathered in this report show that Indonesia in 2024 is still heavily dependent on coal. Consequently, a transition away from coal will bring massive challenges - for Indonesia's energy supply, for its economy and specifically for the communities in the coal mining regions. Based on the findings of this report, we have developed 8 recommendations about the coal transition in Indonesia that should serve as a point of orientation in a vastly complex development process.

1) Start now!

Even if a complete phase-out of coal mining in Indonesia may seem very far in the future – it is time to act now, to prepare for this transition. For one, we anticipate that the coal phase-out could easily accelerate. In many countries we have seen that governments adjusted their climate targets, to be more in line with the Paris climate agreement. This may well happen in Indonesia also and a **coal phase-out may come earlier than what most stakeholders expect today**. But most importantly: regional transition and economic diversification processes take decades (not years), so irrespectively of whether Indonesia phases-out coal in 2050 or earlier, it is time to support the economic transition in the coal regions starting now.

2) Do not fly blind: More data is needed to better understand the status quo and future challenges

For successfully supporting the transition to a climate-neutral future, policies must provide the right incentives for the system to change. Identifying these levers require a deep understanding of the situation in the country, and even more about the subnational level in the coal regions that will be most affected by the changes and will require targeted support. For instance, the very basic statistics e.g., about the numbers of workers, their age, gender and educational background in each sector are available at the national level, but only estimates on the provincial level and not at all on a regency or municipality level. These **missing basic datasets are currently a huge barrier for planning**, as not knowing the status quo means not knowing *who* needs support, but also no knowing *how much* and *when*. Earmarking more budget for systemically assessing this kind of data continuously would allow decision-makers to design targeted policies in the first place. In the mid- to longer term, having this data will also be necessary to assess the effectiveness of the created transition measures.

3) Set up targeted financial support

Given the almost 50% share of the coal sector in East Kalimantan for the GRDP, it is almost certain that a politically unaccompanied decline in coal production will lead to a severe

recession with all its negative consequences that the region is not prepared for. Aiming to diversify the local economy is one of the strategies to reduce dependency on coal, but this process needs time**. Establishing a dedicated fund or another financial support mechanism** (e.g., via ESG activities from coal companies) for the core coal regencies would allow those regions to speed up the readiness for a transition. Such a fund could support e.g., retraining opportunities of miners, help women of miners to start new businesses, or improve (social) infrastructure in the region.

4) Set up coordinating governance mechanisms

Sustainable transitions are complex processes. While the switch from fossil to renewable energy production is at the first glance only a technical question, the multiple external effects of this shift leaded to the realization that this process needs to be embedded into a wider process of a regional just transition, spanning over all sectors, based on long-term strategies and targeted support mechanisms. This proves to be challenging for traditional policy-making, as the coordination efforts required are horizontally across all ministry levels, but also needs to be undertaken vertically across governance levels. Many countries have therefore **established just transition commissions** as a first step to lead strategy development and coordinate efforts on the national level, and secondly **set up region-specific dedicated institutionalized 'transition agencies'**[21] that are responsible for coordinating between all relevant stakeholders and actors in the regions, but also act as drivers for economic diversification and innovation. A such, both policy instruments fulfill important intermediary functions, and especially linking the long-term orientation of the transition and climate targets with actions on the ground. Such a transition agency would also help in the Indonesian context to streamline efforts and thereby can increase transition governance efficiency.

4) Reform the energy policy framework to increase the share of renewables

In other coal regions around the globe, one of the first steps to get started with the transition are investments into renewables, but in Indonesia this is hardly seen, even though the potential for renewables in Indonesia is huge. The reason why the falling costs of renewables have not created a boom yet (as it is happening in many other countries) are the framework conditions that does not make a business case for harvesting energy from solar radiation, wind, geothermal and other renewable energy sources. First**, energy subsidies and the incentives for coal production** provided within the domestic market obligation and the PPAs that require PLN to receive energy from independent power producers in non-flexible long-term service contracts **are main barriers for the transition**. Second, the financing costs for renewables are higher than in most other countries due to **a need to import almost all parts of those new technologies**. In the mid to long-term, establishing at least a part of renewable value chains

[21] For instance, examples for such transition agencies are the ‚Zukunftsagentur Rheinisches Revier` in Germany, the ‚Just Transition Institute' in Spain or ‚Mpumalanga Green Energy Cluster' in South Africa.

domestically will lower costs, but more important is a reform of the framework conditions in the energy sector and a phase-out of ineffective and expensive subsidies for fossil energy. Exploring possibilities to oblige coal companies to become renewable energy companies could be one way to ensure financing and renewable build up, but also lower political opposition for transition planning.

5) Do not forget about the 'just' part in just transition

While for now, the economic situation in the coal regions and technological aspects of the transition are the most prominently discussed topics, a just energy transition cannot be realized without a strong focus on the people in the most affected regions. This requires a better understanding of the framework conditions of the situation on the ground (and a need for better data about this situation, see above), and then targeted measures that support the most vulnerable. First and foremost**, potential unemployment** needs to be addressed pro-actively by policy e.g., by ways to allow **reskilling and training,** supporting workers to find new jobs and help also secondary affected (such as women of miners, drivers of coal trucks etc.) to adjust to new circumstances. Additionally, a **broader support for educational facilities** is considered as beneficial for the transition.

6) Ensure proper mine rehabilitation

Proper mine rehabilitation is key to provide a good economic basis and quality of life for local communities. Avoiding hazards (like toxic remedies, polluted water, dangerous holes) is the bare minimum of rehabilitation. Turning former mines in agricultural and forest land, clean lakes or even touristic destinations is one key pillar of any economic diversification strategy. Existing regulations need to be enforced strictly. Mining companies need to cover the costs for reclamation (otherwise this consists an indirect subsidy for coal mining, the cost of which are to be borne by the local communities). Proper mine rehabilitation needs to be planned not after mine closure, but already during the time of mining. Thus, even if effects may be long-term, immediate action is vital.

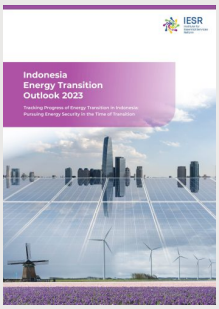
7) Make the transition gender-just

Making the transition gender-just is an essential step in ensuring that the energy transition is indeed a just energy transition, in particular by ensuring that the benefits and burdens of this transformation are equitably distributed across all segments of society. This inclusivity is essential as women and marginalized gender groups often bear disproportionate impacts during economic transitions while at the same time their agency and contributions are underestimated. **A more equitable transition empowers women economically, politically, and socially, contributing to overall resilience and fostering sustainable development in Indonesia.** To foster a Just Energy Transition, Indonesia's policies will need to recognize gender differentiated impacts, otherwise they risk reproducing inherent existing injustices. The

transition hereby presents also a window of opportunity to increase equity between men and women, e.g., by actively supporting women to join jobs related to renewable energy and ensuring participation in decision-making processes.

Core sources

IESR 2023 - Indonesia Energy Transition Outlook 2023



The Indonesia Energy Transition Outlook (IETO) 2023, evolved from the Indonesia Clean Energy Outlook (ICEO), tracks Indonesia's journey towards clean energy deployment. It evaluates the enabling environment for energy transition, focusing on the shift towards renewables in response to Indonesia's net-zero emissions pledge by 2060. With PLN's emphasis on renewable power plants in its 10-year plan, IETO 2023 reflects Indonesia's evolving energy landscape amid COVID-induced electricity demand shifts.

Read more

IEA 2022 - An Energy Sector Roadmap to Net Zero Emissions in Indonesia

A comprehensive roadmap detailing Indonesia's energy transition, including elements such as people-centered transitions, reduced coal use, financing needs and critical minerals. The roadmap also comprises a scenario net-zero by 2050 scenario for Indonesia.

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CELIOS 2024 - Energy Transition Readiness Index in Indonesia: Mapping Current Conditions and Navigating the Future of the Energy Sector

The report covers Indonesia's energy policy evolution, challenges, and ongoing discussions on the New and Renewable Energy Bill. It identifies hurdles such as administrative barriers and unclear financing while noting limited progress in energy diversification, with coal and natural gas still dominant.

Read more

PAGE 2023 - Green Jobs and Just Transition Readiness Assessment in the Energy Sector in Indonesia

The report is a part of the ILO's support for the Government of Indonesia through the Partnership for Action on Green Economy (PAGE). This report evaluates Indonesia's green job and Just Transition policies and activities at a national level. It assesses the readiness of these frameworks at a macro level and analyzes their specific readiness in the energy sector.

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Annex

The following table gives a comprehensive overview over key stakeholders in the Indonesia coal sector. It is based on (GIZ, 2023) and (Ángel et al., 2023).

Table 12. Key stakeholders of the coal sector in Indonesia

Political Power		Economic Power			
International Organizations	Governmental Institutions	Public Sectors	Private Sector	Economic Actors	Funding Agencies
United Nations Development Programme (UNDP)	Ministry of Agriculture (Kemenhub-Kementerian Pertanian)	State-Owned Electricity Company (PT. PLN - Perusahaan Listrik Negara)	Indonesian National Shipowners´Association (INSA)	Indika Indonesia Resources (PT Indika Energy)	PT Sarana Multi Infrastruktur (PT. SMI)
United States Agency for International Development (USAID)	Ministry of Energy and Mineral Resources (MEMR - Kementerian Energi Dan Sumber Daya Mineral)	The Association of Indonesian District Governments (APKASI/APEKSI - Asosiasi Pemerintah Kabupaten Seluruh Indonesia)	PT Batulicin Nusantara Maritim	Adaro	The Environmental Fund Management Agency (BPDLH - Badan Pengelola Dana Lingkungan Hidup)
The Friedrich-Ebert-Stiftung (FES) Regional Office for International Cooperation	Ministry of Environment and Forestry (MoEF - Kementerian Lingkungan Hidup dan Kehutanan)	Corruption Eradication Commission (KPK - Komisi Pemberantasan Korupsi)	PT Berau Coal	Sinar Mas	WB
CPI	Ministry of Finance (MoF - Kementerian Keuangan)	Financial Service Authority (OJK	PT Bukit Asam	PTBA/Inalum	Asian Development Bank (ADB)

		- Otoritas Jasa Keuangan)			
DFAT	Ministry of Health (Kemenkes - Kementerian Kesehatan)	Deoeridag	PT Kideco Jaya Agung	Indonesian Coal Mining Association (APBI-ICMA – Asosiasi Pertambangan Batubara Indonesia)	Tara Climate Foundation
Global Green Growth Institute (GGGI)	Ministry of Manpower (Kemnaker - Kementerian Ketenagakerjaan)	KMarves	PT Adaro Indonesia	Banpu Bayan	The Bali Center for Sustainable Finance (BCSF)
UK Mentari	Ministry of National Development Planning (BAPPENAS - Kementerian Perencanaan Pembangunan Nasional)	DHL	PT Borneo Indobara	Xurya Daya ID	Kreditanstalt für Wiederaufbau Development Bank (KfW)
United Nations Office for Project Services (UNOPS)	Ministry of Public Works and Housing (Kementerian Pekerjaan Umum dan Perumahan Rakyat)	Dinakertrans	PT KPG	Alva Energi	Clean Technology Fund (CIF)
The Economic and Social Commission for Asia and the Pacific (ESCAP)	Ministry of State-Owned Enterprises (KBUMN - Kementerian Basan Usaha Milik Negara)		TML Energy	Bumi Resources	Arkora
The Global Energy Alliance for People and Planet (GEAPP)	Ministry of Transportation (Kemenhub - Kementerian Perhubungan)		Sedayu Energi	PT Pertamina Geothermal EnergyPGE	The Indonesia Business Council for Sustainable Development (IBCSD

	Provincial Development Planning Agency (BAPPEDA - Badan Perencanaan Pembangunan Daerah Kota Lhokseumawe)		Kencana Energi	National shipping company (PT BAg - PT Pelayaran Bahtera Adhiguna)	PT Budi Gema Gempita
	National Energy Council (DEN - Dewan Energi Nasional)		Sky Energi	KADIN APLSI APINDO	Musi Prima Coal
	Regional government		Bara Coal	NE Nexus PERHAPI	

Societal power

Academia	Knowledge Actors & Research Institutions	Community & Vulnerable Groups	Workers and Trade Unions	Civil Society	
North Sumatra Academia	Centre for Energy and Mining Law studies (PUSHEP – Pusat Studi Hukum Energi Dan Pertambangan)	Women in Mining & Energy (Wime)	National Trade Union Confederation (KSPN - Konfederasi Serikat Pekerja Nasional)	Institute for Essential Services Reform (IESR)	UN Women
Bengkulu University	Kopernik	Society of Renewable Energy (SRE)	KPSI	Asia Foundation	Climateworks
Institut Teknologi Bandung	The Dala Institute (PT Dala Riset Global)	Sumsel	The Confederation of Indonesia Prosperity Trade Union (KSBSI - Konfederasi Serikat Buruh Seluruh Indonesia)	The Indonesian Forum for the Environment (WALHI) (Wahana Lingkungan Hidup Indonesia)	Auriga Nusantara Foundation (AURIGA – Yayasan Auriga Nusantara)

Indonesia University	National Research and Innovation Agency (BRIN – Badan Riset dan Inovasi Nasional)	Konsorsium Pengampu	Confederation of Indonesia Trade Unions (KSPI - Konfederasi Serikat Pekerja Indonesia)	The Voice of Indonesian Coal Industry at Home and Abroad (APBI - Asosiasi Pertambangan Batubara Indonesia)	The Indonesian Renewable Energy Society (METI - Masyarakat Energi Terbarukan Indonesia)
Mulawarman University	Economic Research Institute for ASEAN and East Asia (ERIA)	Kantor Kalyanamitra	Public Relations Association of Indonesia (APRI/APPRI) (Asosiasi Pengelolaan Rajungan Indonesia)	Mining Advocacy Network (JATAM)	Pinus
Institut Teknologi Sepuluh Nopember	World Resources Institute (WRI) Indonesia	The Coalition for Clean and Fair Elections (BERSIH)	Kopsbara	Indonesia Corruption Watch (ICW)	Women in Geothermal (WING) Indonesia Association
Gajah Mada University	Centre for Strategic and International Studies (CSIS)	Action for People Ecology and Emancipation (AEER - Aksi Ekologi & Emansipasi Rakyat)	Indonesian Women´s Business Association (IWAPI) (Ikatan Wanita Pengusaha Indonesia)	The Indonesian Forum for Environment (WALHI – Wahana Lingkungan Hidup Indonesia)	Jatam
Universitas Gadjah Mada (UGM)	The SMERU Research Institute (SMERU)	Dayasigi	Indonesia Business Coalition for Women Empowerment (IBCWE)	Indonesia´s Sustainable Districts Association (LTKL – Lingkar Temu Kabupaten Lestari)	Indonesian Women's Coalition
University Sriwijaya (UnSri - Universitas Sriwijaya)	Bandung Institute of Technology (ITB – Institut	PERHAPI	HAPSARI	Indonesian Institute for Energy Economics (IIEE)	The Indonesia Institute for Forest and Environment (RMI)

	Teknologi Bandung)				
University Mulawarman (UnMul - Universitas Mulawarman)				Koaksi	HaKI
				Madani Berkelanjutan	TuK
				Women in Mining and Energy	Indonesian Solar Energy Association (AESI – Asosiasi Energi Surya Indonesia)

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