CANSEA Southeast Asia

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JUST ENERGY TRANSITION INDONESIA

Scoping Study

August 2023

Mentari, Palladium, Feri Latif, 2023

Author
Ario Tranggono

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Reviewers
Any Sulistyowati
Sandra Winarsa
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Editor
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Zulfikar Arief

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CANSEA Climate Action Network Southeast Asia
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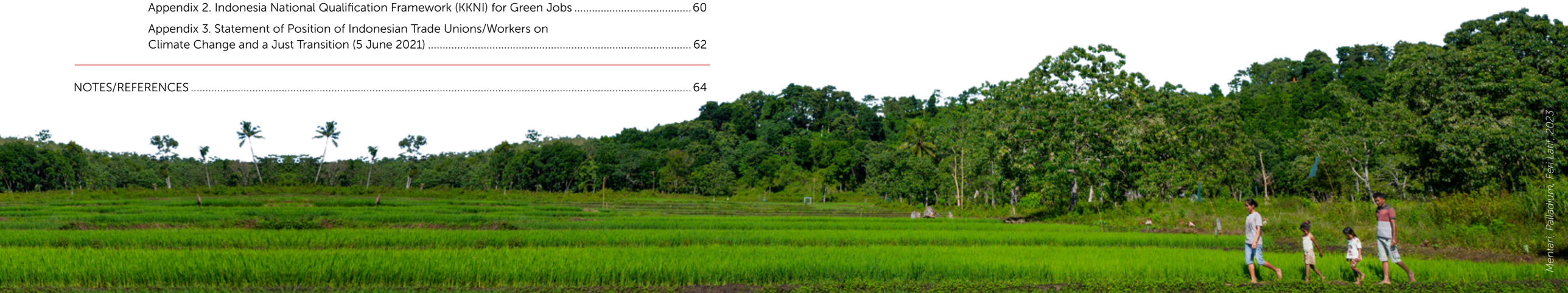


Mentari, Palabrum, Feri Latif, 2023

List of Abbreviation

ADB	Asian Development Bank
AMD	Acid Mine Drainage
AMDAL	Environmental Impact Assessment (Analisis Manajemen Dampak Lingkungan)
APHI	Forest Business Association (Asosiasi Pengusaha Hutan Indonesia)
ASEAN	Association of Southeast Asian Nations
B-30	Mixture of fossil fuel with biofuel of 30% (similarly B-5, B-35, B-100)
Bappenas	National Development Planning Agency (Badan Perencanaan Pembangunan Nasional)
BOE	Barrel of Oil Equivalent
BUMD	Local Government-owned Enterprises (Badan Usaha Milik Daerah)
BUMDes	Village Owned Enterprise (Badan Usaha Milik Desa)
CBO	Community Based Organization
CFPP	Coal-Fired Power Plant
CIPP	Comprehensive Investment and Policy Plan
CM	Coal Mining
CO_2e	Carbon Dioxide Equivalent
COD	Commercial Operation Date
COP	Conference of the Parties
CSO	Civil Society Organizations
CSR	Corporate Social Responsibility
DME	Dimethyl Ether
EBT	Energi Baru Terbarukan (New Renewable Energy)
EFOR	Equivalent Force Outage Rate
EHS	Environmental, Health and Safety
ENDC	Enhanced Nationally Determined Contribution
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ETM	Energy Transition Mechanism
GDP	Gross Domestic Product
GDRP	Gross Domestic Regional Product
GESI	Gender Equality and Social Inclusion
GFANZ	Glasgow Financial Alliance for Net Zero
GHG	Greenhouse Gas
GIIP	Good International Industry Practice
GNI	Gross National Income
GOI	Government of Indonesia
GWh	Giga Watt Hour
HTE	Hutan Tanaman Energi (Energy Plantation Forest)
ICMA	Indonesia Coal Mining Association
IDR	Indonesian Rupiah
IESR	Indonesia Essential Services Reform
ILO	International Labour Organization
IRENA	International Renewable Energy Agency
IPG	International Partners Group
IPPs	Independent Power Producers (of Electricity)
IRID	Indonesia Research Institute of Decarbonation
IUP	Mining Business Permit (Izin Usaha Pertambangan)
JET	Just Energy Transition
JETP	JET Partnership
KEN	National Energy Policy (Kebijakan Energi Nasional)
KKNI	Indonesian National Qualification Framework
KLHS	Strategic Environmental Assessment (Kajian Lingkungan Hidup Strategis)
kms	kilometer circuit (kilometer sirkuit)
KSO	Joint Operation Cooperation (Kerjasama Operasi)
kV	Kilo Volt
kWh	Kilo Watt Hour
LTS LCCR	Long Term Strategy Low Carbon Climate Resilience
Marves	Coordinating Ministry of Maritime Affair and Investment
MEMR	Ministry of Energy and Mineral Resources
Mentari	Toward Low Carbon Transition Indonesia (Menuju Transisi Rendah Karbon Indonesia)
MVA	Million Volt Ampere
MW	Mega Watt
MWh	Mega Watt Hour
NDC	Nationally Determined Contribution
NOX	Nitrogen Oxides
NRE	New and Renewable Energy
NZE	Net Zero Emission
OJK	Financial Service Authority (Otoritas Jasa Keuangan)
PCC	Presidential Climate Commission (of South Africa)
PKBL	Partnership and Environmental Development Program (Program Kemitraan dan Bina Lingkungan)
PLN	National Electricity Company
PLTB	Wind Power Plant (Pembangkit Listrik Tenaga Bayu)
PLTD	Diesel Power Plant (Pembangkit Listrik Tenaga Diesel)
PLTMH	Micro Hydro Power Plant (Pembangkit Listrik Tenaga Mikro Hidro)
RE	Renewable Energy
RPJM	Medium Term Development Plan (Rencana Pembangungan Jangka Menengah)
RPJMD	Subnational Medium-Term Development Plan (Rencana Pembangungan Jangka Menengah Daerah)
RPJMN	National Medium-Term Development Plan (Rencana Pembangungan Jangka Menengah Nasional)
RPJPN	National Long-Term Development Plan (Rencana Pembangunan Jangka Panjang Nasional)
RUPTL	Electricity Supply Business Plan (Rencana Umum Penyediaan Tenaga Listrik) of PLN
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SDGs	Sustainable Development Goals
SdOF	Sudden Outage Frequency
SESA	Strategic Environmental and Social Assessment
SFAP	Sustainable Finance Action Plan
SKI	Indonesia Competency Standard (Standar Kompetensi Indonesia)
SO2	Sulphur Dioxide
SP/SB	Labour Union (Serikat Pekerja/Serikat Buruh)
TENORM	Technologically-Enhanced Natural Occurring Radioactive Material
USD	United States Dollar

1. Executive Summary

In its commitment to overcoming the threat of climate change caused by greenhouse gas (GHG) emissions, Indonesia's Enhanced Nationally Determined Contribution (ENDC) document aims to reduce greenhouse gas emissions by 31.89% with its own efforts, and up to 43.20% with international assistance by 2030. Indonesia's climate commitment was also strengthened at the COP-26 in Glasgow by setting a target of achieving Net-Zero Emissions in 2060 or sooner. Just last year, at the international level both during the COP27 and G20 Summit, these commitments were again being declared.

As a follow up of the commitments, recently the Just Energy Transition Partnership (JETP) was launched which aims to mobilize USD 20 billion to help Indonesia implement its decarbonization efforts. The partnership comes from IPG member countries and the Glasgow Financial Alliance for Net Zero (GFANZ). The JETP Indonesia was established to help us to move away from coal-fired power plants while making efforts to develop renewable energy to meet the electricity needs of the Indonesian people. Indonesia is expected to be able to draw up an investment plan in which the composition of renewable energy to total energy will reach 34% by 2030. Accelerating the early retirement of coal-based power plants is included in the investment plan.

Indonesia's renewable energy (RE) resources are abundant. Until now, the utilization of renewable energy sources is less than 11,000 MW or less than 2% of the total RE potential. To boost such utilization, the government has prepared four main strategies, namely **1) primary energy substitution, 2) conversion of fossil fuel power plants, 3) capacity addition of renewable energy power plants, and 4) utilization of other renewable energy, particularly biomass and biofuel.**

The coal phase-out has a complex business process, and each phase of it has specific inputs and outputs. In the Indonesian context, there are at least five process groups involved, which are policy formulation (and implementation), environmental and social assessment, coal-fired power plant (CFPP) retirement, CFPP co-firing and coal mining phase-out (and mine closure). Plant closing also has consequences to the business relations with suppliers, contractors and non-formal businesses in the vicinity of the plant, which may involve job losses, decline of business, and social impacts. A careful consideration and action plan should be prepared to manage these kinds of impact. For the sake of awareness and preparation, impacted suppliers, contractors and surrounding informal businesses shall be informed of the closing, as early as possible. On the other hand, CFPP repurposing creates new opportunities in terms of job creation, supply chain (i.e., supplier and contractors) development, and the growth of induced non-formal businesses.

Off-grid also needs to be highlighted. Off-grid solutions are defined as those that use a distributed approach to ensure electricity, supply to a demand area, without needing to be connected to the state electricity company (PLN). Electricity flows to previously inaccessible remote areas can trigger the development of new economic activities. Developing an off-grid system will maximize the use of local renewable resources and enhance economic activity in the region. Therefore, this business model must focus on and target local and domestic industries. While both poor and non-poor households predominantly use electricity as their main source of lighting, there is still disparity in access to energy in rural areas, particularly among the poor. The inequality in access is further highlighted when comparing electricity access between urban and rural areas, with urban regions exhibiting a larger percentage of households with access to electricity compared to their rural counterparts. This persistent disparity underscores the need for targeted policies and initiatives to ensure that off-grid rural areas, especially those occupied by impoverished

communities, are adequately equipped with reliable and affordable electricity services, fostering inclusive development and improved living standards.

In Indonesia, the energy transition, and particularly the coal phase-out, involves very complex efforts among many stakeholders and their interests. Disruption generated by the coal phase-out could impact most of the energy/electricity stakeholders. The spectrum of disruptions is very wide and covers the most important aspects of livelihood in Indonesia. Since its impacts are far-reaching it is necessary to conduct such transition in a just manner. In this regard, inclusively involving all relevant stakeholders from the beginning of the transition process is a prerequisite to implement a smooth and effective JET.

A just transition needs reskilling, an aspect that needs to be prepared comprehensively. Retirement of CFPPs increases the demand for new and renewable resources, which, in its turn, creates many types of green jobs. To enter such green jobs market, new skill and competencies are required. Relevant institutions such as the Ministry of Manpower will have to conduct a mapping study of the jobs and its skill and competency requirements. In order to mitigate the impact, the government could provide incentives, for example by empowering people with a so-called 'Pre-work Card' (Kartu Prakerja) to improve their skill to be able to enter the green jobs market. The KKNI or Indonesian National Qualification Framework is a national general reference framework regarding qualifications. KKNI functions as a tool for enabling comparison of qualifications in Indonesia and among countries. Such framework for green jobs has been developed for renewable energy main key functions, particularly for three fields, namely solar (PLTS), wind (PLTB) and micro-hydro power generation (PLTMH)[1].

1.1. SUMMARY OF FINDINGS

Essentially, the research aimed to answer the main question: "How ready is Indonesia to implement a Just Energy Transition?". To answer the main question of the research, this study examines it within the three JET principles lens that comprises of **distributive, procedural and restorative justice.** Through the examination of relevant stakeholders, it became evident that, in general, they are not adequately prepared to execute a JET. Additionally, this study observes that there have been low levels of implementation of the just transition principles.

In general, based on relevant stakeholder interviews, focus group discussions, and literature review, the research uncovered six main findings.

1. Low level of implementation of JET principles. A detail assessment is available in Chapter 6.
2. Low level of readiness in implementation of identified stakeholder roles in JET. In general, most of the relevant stakeholders are not quite ready to implement JET in an effective and comprehensive manner and have an inclusive approach to shifting from fossil fuels to sustainable energy alternatives addressing social, economic, and environmental concerns. While to their roles, CSOs, independent research institutions, state-owned electricity company, and big coal mining companies show relative preparedness. The government of Indonesia, with relatively low readiness, plays the most critical role in enabling an effective and comprehensive JET.
3. Unavailability of an integrated JET policy. Unfortunately, such official JET policy is currently not available. Within this context, the gap will have to be closed by 1. setting an official definition regarding JET, to obtain a shared understanding for all relevant stakeholders, as well as 2. formulating an integrated JET policy that encompasses cross-institutional and cross-sectoral and an inclusive participation and collaboration of all

relevant stakeholders. Both are critical and a prerequisite obligation. Failure to address these issues may hinder the successful implementation of JET in Indonesia.

4. Inadequacy of inclusive engagement of relevant JET stakeholders. JET is a multi-sectoral and multi-disciplinary effort and involves many stakeholders. An inclusive, participative and collaborative engagement of all relevant stakeholders is paramount. Unfortunately, this kind of engagement is not yet established in Indonesia.
5. Inappropriate engagement of relevant business sectors. In the value chain of coal mining to coal-fired power plant, two main actors are significantly contributing to the formation of added value, namely coal mining and the coal-fired power plant. Within the JET context, those main actors are supposed to be engaged inclusively as equal partners amongst all relevant stakeholders. Unfortunately, this condition is not occurring yet. Until now, in practice, energy transition in Indonesia is heavily engaging government, country partners, and PLN only. Thus, other businesses along the coal mining to CFPP value chain are not properly involved.
6. Absence of good governance of JET implementation. Good governance is paramount for implementing JET in Indonesia, due to its wide coverage of sectors, disciplines and stakeholders. Two fundamental principles of good governance, namely transparency and accountability, should be integrated explicitly in the governance mechanism.
7. Insufficiency of robust electricity services for social and economic development. Regarding electricity provision and services, the findings show that there are significant gaps in service quantity and quality across Indonesia. In rural and remote areas, where on-grid electricity service is not available, off-grid systems are rarely available. Even when available, their service quantity and quality have a very basic condition. In some off-grid systems, the quantity is designed only for basic lighting at night. Such services cannot be utilized to promote electricity as a driver for social-economic growth, therefore livelihood and well-being in these rural and remote areas will be always significantly left behind. This exclusion of off-grid from the JETP investment priority exacerbates the existing gap in justice and equitable access to reliable and affordable energy for all.

1.2. SUMMARY OF RECOMMENDATIONS

Based on these findings, this research comes to the following recommendations:

1. **To promote and expedite the implementation of a JET in Indonesia, it is imperative to urge the Government of Indonesia to enact an integrated policy.** This policy, ideally in the form of a Presidential Decree, will have to establish shared strategic goals, directions, and a comprehensive understanding of JET implementation in Indonesia. The policy should encompass the following key components: JET Definition; Coordinating Ministry/Institution; Comprehensive Framework; Roles and Responsibilities; Inclusive Engagement Mechanism; JET Governance Framework; and Specific JET Goals. By enacting such an integrated JET policy, Indonesia can accelerate progress towards a sustainable and equitable energy future, ensuring that the benefits of JET reach all segments of society and leaving no one behind.
2. **To establish a multi-stakeholder platform under the President or the Coordinating Ministry/Institution** as an inclusive vehicle for participating and collaborating on the energy transition implementation in Indonesia.
3. **To promote inclusion of JET into the national and subnational medium-term development plan** (RPJMN and RPJMD) as a main narrative in the Plan, as well as inserting a formal paradigm of JET into these development plans.
4. **To promote advocacy to and enhance JET literacy of all relevant stakeholders** with particular attention to women, marginalized groups, labourers, local governments, and other impacted communities. This approach aims to empower stakeholders, enabling them to effectively mitigate the impacts of the energy transition while also seizing the opportunities it presents.
5. **To promote inclusive and participative engagement of all business sector stakeholders of the value chain of coal to CFPPs.** By such involvement, the risks, opportunities, burdens and other impacts of the energy transition could be mapped comprehensively. Through this kind of map, the distribution of benefits and burdens will be clearer and more transparent.
6. **To promote collaborative good governance guidelines** for JET implementation in Indonesia, that are inclusive, transparent and accountable.
7. **To promote the promulgation of an electricity policy that focuses on robust electricity service, particularly for off-grid areas and include the mini- and off-grid sector as part of the JETP investment plan.** The policy should include efforts to transform the electricity service to be able to achieve equal electricity quantity and service quality across Indonesia in order to support economic growth and sustainable development.
8. **To promote development of a comprehensive social plan to mitigate risks and to maximize opportunities of the coal phase-out,** particularly for main coal producer coal reliant regions (such as the provinces of South Sumatra, South Kalimantan and East Kalimantan). There is a strong binding of socio-economic activities of communities with the coal business, formally and informally.

2. Introduction

2.1. BACKGROUND AND RATIONALE FOR THE STUDY

Currently, the issue of climate change is the focus of the world's attention. In its commitment to overcome the threat of climate change caused by greenhouse gas (GHG) emissions, Indonesia Enhanced Nationally Determined Contribution (ENDC) document aims to reduce greenhouse gas emissions by 31.89% with its own efforts, and up to 43.20% with international assistance by 2030. Indonesia's climate commitment was also strengthened at the COP-26 in Glasgow by setting a target of achieving Net-Zero Emissions in 2060 or sooner. Just last year, at the international level both during the COP27 and G20 Summit, these commitments were again being declared.

As a follow up of the commitments, recently a JET Partnership (JETP) was launched which aims to mobilize USD 20 billion to help Indonesia implement its decarbonization efforts. The partnership comes from IPG member countries and the Glasgow Financial Alliance for Net Zero (GFANZ). The JETP Indonesia is intended to help us switch from coal-fired power plants and at the same time make efforts to develop renewable energy to meet the electricity needs of the Indonesian people. Indonesia is expected to be able to draw up an investment plan in which the composition of renewable energy to the total energy mix will reach 34% by 2023. Included in the investment plan is accelerating the early retirement of coal-based power plants.

2.2. OBJECTIVES AND SCOPE OF THE SCOPING STUDY

The main objective of the scoping study is to outline existing gaps in the current just energy transition progress taking from the three just principles lens towards the impacted communities. Target communities here are workers and their families, local communities (with a focus on women, youth and vulnerable groups), local and national civil society organizations and community-based organizations (CSOs and CBOs), trade unions and local government officials.

2.3. CONCEPTUAL MODEL

To answer the main question of the research regarding the readiness of Indonesia in implementing a JET. This study introduces a set of JET principles that comprises of distributive, procedural and restorative justice[2].

Distributive justice (D) deals with the unjust distribution of costs and benefits from the energy transition (revenue management, social and environmental impacts, issues around taxation, and transparency). This kind of justice comprises of four principles, namely:

a. Skills, assets, and opportunities to participate in industries of the future;
b. Transformative national economic and social policies that clearly consider how benefits and burdens will be distributed;
c. Provincial and local capacity;
d. Corporate responsibility.

Procedural justice (P) encompasses the idea of due process, good governance and the rule of law at different levels with regard to energy projects, systems and their transition. This kind of justice comprises of four principles, namely:

a. Health and environmental impacts to communities in coal and other fossil fuel impacted areas;
b. Shifting away from resource intensive sectors and fossil fuels;
c. More decentralized, net-zero-emissions economy;
d. Remedying past harms by building on, and enhancing, existing mechanisms.

Restorative justice (R) deals with support victims of damaging activities and restore them to their original position, for example, responsible decommissioning and livelihood restoration plans. This kind of justice comprise of four principles, namely:

a. Assisting communities to understand what the just transition entails;
b. Supporting worker and community organizations;
c. Collaborating actively with a range of stakeholders;
d. Supporting the design and implementation of just transition projects.

2.4. METHODOLOGY

In general, this research focuses on a qualitative approach where relevant data and information are collected through three primary sources: desk research, interviews, and focus group discussions. This study includes the development of case studies for a more focused and detailed analysis, the presentation of qualitative gap assessments for JETs in Indonesia, and relevant studies to fill or address such gaps.

For the case studies, PLN Indonesia Power is chosen as example for an on-grid system as PLN is the single authority and majority provider for electricity in Indonesia, while for the off-grid case the study selected the is stand-alone photovoltaic system of Mataredi Village, Central Sumba, East Nusa Tenggara Province as part of the UK-Indonesia MENTARI program contributing to Sumba Iconic Island 100% RE initiative. The study includes providing recommendations to close or eliminate any JET gaps.

During the research it was found that there is a massive amount of existing studies related to JET, globally as well as regarding Indonesia. In Indonesia, such studies have mainly been conducted by civil society organizations (CSOs) and (independent) research institutions. This phenomenon poses a challenge to the objective and purpose of this research. In this regard this research is positioned as complementing of such these researches.

The research is adopting the three key JET principles, which are distributive, restorative and procedural justice[3,4] and was conducted with the following approach:

1. Desk study to explore data and information from relevant literature such as research paper, policies, regulations, statistics, sustainability report, annual report, websites, and other relevant information sources.
2. Interview with prominent persons in the field of energy transition. Four resource persons were interviewed, which were Ms. Adhityani Putri of Yayasan Indonesia Cerah, Ms. Moekti Handajani Soejachmoen of the Indonesian Research Institute of Decarbonation (IRID), Mr. Fabby Tumiwa of Indonesia Essential Service Reform (IESR), and Mr. Arionmaro Simaremare of PLN as Acting Manager of Energy Transition.
3. Focus group discussion-attended by 15 participants from: Ministry of National Development Planning/Bappenas, Ministry of Women Empowerment and Child Protection, civil society actors active in energy transition and transparency accountability and women-based organizations.

3. Literature Review

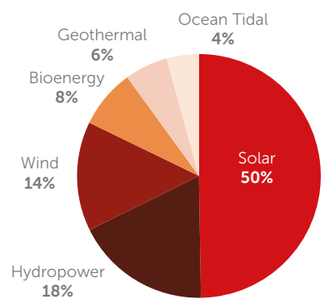
3.1 OVERVIEW OF THE ENERGY SECTOR IN INDONESIA (INCLUDING COAL)

The National Energy Policy (Kebijakan Energi Nasional or KEN) has set as target a new and renewable energy (NRE) mix of 23% for 2025 and 31% for 2030[5]. The aim is shifting to a more sustainable and clean energy, with lower GHG emissions as well as conventional air pollutants.

Additionally, the KEN aims at decreasing the government's financial burden in providing energy subsidies for consumers. Between 2011 and2014, the subsidies amounted to IDR 1,200 trillion (USD 78 million). In the period of 2015 to2020 some efforts were conducted to reduce expenses; however, the subsidies could not be eliminated, and during that period the amount was IDR 685 trillion (USD 44 million). Nowadays, the cost of electricity from NRE is quite competitive compared to fossil fuel sources, and it is predicted to be cheaper in the coming years. Accordingly, utilization of NRE will reduce national energy expenses, as well as energy subsidies.

Figure 1: Indonesia Renewable Energy Resources

Indonesia Renewable Energy Resources	
Solar	207,800 MW
Hydropower	75,000 MW
Wind	60,600 MW
Bioenergy	32,600 MW
Geothermal	23,900 MW
Ocean Tidal	17,900 MW



Source: Ministry of Energy and Mineral Resources, Handbook of Energy and Economic Statistics 2022

Indonesia's renewable energy (RE) resources are abundant. The potential of solar power is about 207,800 MW, while there is a potential of 75,000 MW of hydropower, 60,600 MW of wind power, 32,600 MW of bioenergy, 23,900 MW of geothermal power, and the ocean tidal and wave energy potential is about 17,900 MW. Until now, the utilization of renewable energy sources is less than 11,000 MW or less than 2% of the total RE potential. To boost such utilization, the government has prepared four main strategies, namely **1) primary energy substitution, 2) conversion of fossil fuel power plants, 3) capacity addition of renewable energy power plants, and 4) utilization of other renewable energy, particularly biomass and biofuel**[6]:

1. **Primary energy substitution**. To implement primary energy substitution, National Electricity Company (PLN), has conducted a co-firing strategy by mixing biomass fuel with coal in their coal-fired power plants (CFPP). In 2022, there were 36 CFPPs using co-firing technology and in 2024 the number is planned to grow to 52 CFPPs. An example of such substitution is using rice husk pellets that contains 3,700 kilo calories per kilogram of energy, which is closely equivalent with the coal energy content.

2. **Conversion of fossil power plants.** There are 5,200 diesel power plants producing about 2,000 MW, that are planned to be converted gradually into more sustainable plants. The first phase is aimed at the conversion of 225 MW of plants into solar and gas power plants, the second phase will convert 500 MW, and the third phase, which will be finished in 2025-2026, will convert 1,300 MW. In 2022 PLN started the procurement process to convert diesel power plants to NRE. However, during the process PLN had to face several obstacles, including:
   a. the number and complexity of PLTD locations,
   b. the scale of some projects is still too small for developers to attract their interest,
   c. limited infrastructure for some PLTD locations located in remote areas, which has a negative impact on construction duration, as well as logistical and transportation costs,
   d. the challenge of meeting the local content (TKDN) target of 60%, while the local market's ability to provide new solar modules is 40% -47%, as well as for batteries (which is only 10%). These obstacles create the risk of high bid prices from developers[7].

3. **Capacity addition of renewable energy power plants.** PLN is mandated by the government to carry out, as the main actor, to increase NRE capacity. For example, in 2022, the PLN has succeeded in completing the commercial operation date (COD) of NRE generators with a capacity of 172.26 MW spread over 23 locations in Indonesia. On the other hand, the development of solar power plants is focused on the ex-mining areas, building rooftops, and water dam areas. In the case of solar power plants, the private sector is involved. PT Bukit Asam, a state-owned coal mining enterprise, has a plan to develop a solar power plant with the capacity of 200 MW in Ombilin, West Sumatera and the ex-mining area Tanjung Enim in South Sumatera..

4. **Utilization of other renewable energy, particularly biomass or biofuel.** Regarding the utilization of biofuel, the government is quite ambitious. This program can be considered as a mature initiative where the mix of 5% biodiesel (B-5) was initiated in 2013. Today, a 30% mix of biodiesel is mandatory (B-30). For the future, an ambitious target of B-100 is targeted.

PLN Electricity Supply Business Plan (RUPTL) for 2021-2030

To boost renewable energy utilization in electricity generation, through Decree of the Minister of Energy and Mineral Resources 188/2021 the government validated the PLN Electricity Supply Business Plan (RUPTL) for 2021-2030. The Ministry of Energy and Mineral Resources and PLN claim that this RUPTL is the "greenest" ever, where the portion of renewable energy is quite ambitious. The main points regulated in the RUPTL include:

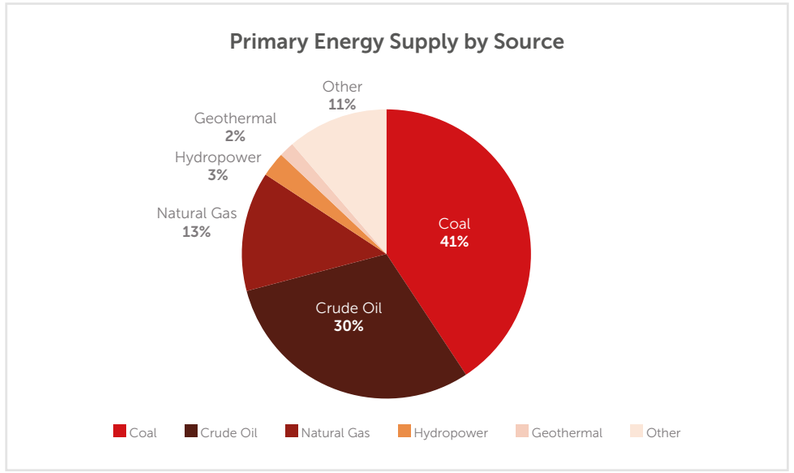
1. The projected average growth in electricity demand is 4.9%;
2. The total plan for building power plants is 40,575 MW, with the following details:
   a. Power plants sourced from new and renewable energy of 20,923 MW or equivalent to 51.6% of the total power plants;
   b. Power plants sourced from fossil energy of 19.652 MW or equivalent to 48.4% of the total power plants;
3. The target for the mix of new and renewable energy for power plants in 2025 is 23.0%;
4. The plan of total transmission network development is 47,723 kms;
5. The total substation development plan is 76,662 MVA;
6. The plan of total distribution network development is 455,547 kms;
7. The plan of total distribution substation development is 31,095 MVA.

The Role of Coal in the Energy Supply

In terms of primary energy, the total supply in Indonesia in 2022 was 1,831,619,126-barrel oil equivalent (BOE), where coal was the main energy source (41%), followed by crude oil (30%)

and natural gas (13%). The hydropower and geothermal share were 3% and 2% respectively, and other energy sources contributed to the remaining 11%. Coal is the main primary energy source and will continue to be so, until its predicted peak in 2030.

Figure 2: Indonesia Primary Energy Supply by Source



Source: Ministry of Energy and Mineral Resources, Handbook of Energy and Economic Statistics 2022

Most of the Indonesian coal production is exported to main coal user countries in Asia, such as to India and China. In 2022, the coal production was 687 million tons and the export were 497 million tons[8]. In this regard, Indonesia is the biggest coal exporter in 2022[9], above Australia with 350 million tons, Russia (192 million tons) and United States (76 million tons). Indonesia's share in coal exports is about 35% of the world's total coal export. In the same year, foreign trading surplus is significantly supported by the export value of coal. Therefore, coal is a very important commodity in driving national economic growth as well as local economies. The three biggest provinces (South Sumatra, South Kalimantan and East Kalimantan) and cities/regencies in those provinces enjoy this economic growth due to the coal business.

Table 1. Realization of Domestic Coal Utilization (million tons)[10]

Industry Type	2016	2017	2018	2019	2020
Electricity	75	83	91	99	105
Pulp and Paper	4	4	3	1	2
Metallurgy	0	0	2	10	13
Cement, Fertilizer, Textile	11	10	19	4	7
Other	No Data Available			24	5
TOTAL	**91**	**97**	**115**	**138**	**132**

For domestic consumption, coal is mainly (almost 80%) used for electricity generation. Metallurgy is the second biggest consumer with an almost 10% share, which is mainly used in the furnace arc for metal production, and more specifically steel. In Indonesia, coal is used to support basic industries that produce many essential products to support daily living.

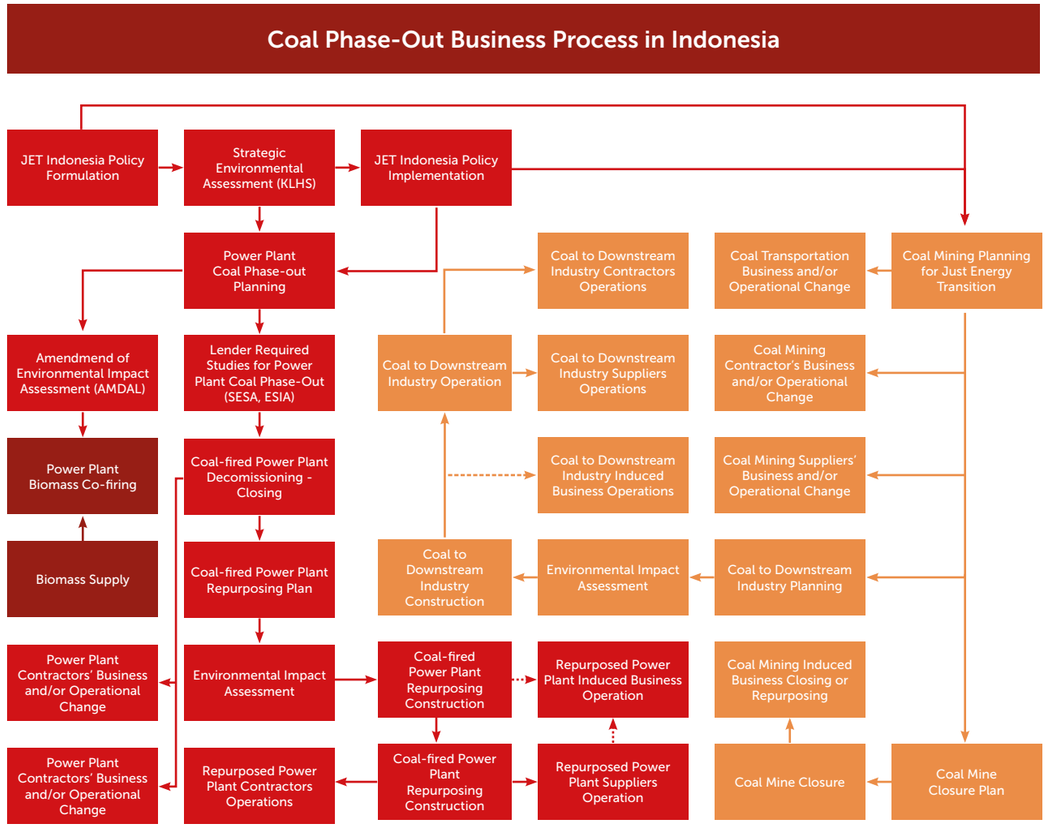
It is very clear that coal is a very important commodity in Indonesia. Phasing out of coal, in the world and in Indonesia, will have a significant impact on the national economy, local economy as well as well-being of relevant stakeholders. Therefore, the coal phase-out should be managed in a very proper and careful manner. A just transition of coal phase-out is an irreplaceable need.

3.2. OVERVIEW OF THE ON-GRID POWER SECTOR

Coal Phase-Out Business Process in Indonesia

The coal phase-out has a complex business process, and each phase of it has specific inputs and outputs. In the Indonesian context, there are at least five process groups involved, which are policy formulation (and implementation), environmental and social assessment, coal-fired power plant (CFPP) retirement, CFPP co-firing and coal mining phase-out (and mine closure).

Figure 3: Coal Phase-Out Business Process in Indonesia



Source: Author Analysis

Unfortunately, the Government of Indonesia (GOI) has not promulgated a formal JET policy or program. Since JET is involving many national and subnational government institutions as well as various stakeholders, formulation of an umbrella policy or program for JET is necessary in order to have an integrated and coordinated set of directions to effectively implement the JET itself.

To manage the inter-institutional coordination and harmonization, such a policy should be in the form of an Act/Law or at least Presidential Decree. In the case of the Sustainable Development Goals (SDGs) 2030 for example, Indonesia has issued Presidential Decree 59/2017 regarding Implementation of SDGs (recently replaced by Presidential Decree 111/2022).

Integration of Environmental and Social Assessment

As mandated by Government Regulation 46/2016, a Strategic Environmental Assessment (or Kajian Lingkungan Hidup Strategis or KLHS) shall be conducted. The SEA or KLHS is a set of systematic, comprehensive and participative analyses to ensure that sustainable development principles have become a basis and been integrated into the development of an area and/or policy, plan, and/or program.

Some lenders, such as the Asia Development Bank (ADB), are requiring a similar study called Strategic Environmental and Social Assessment (SESA) as part of the risk assessment in the funding process. Equivalently, the World Bank has its own Environmental and Social Framework.

Therefore, the existence of a formal JET program is critical to perform KLHS as a risk assessment process to examine whether such policy is in accordance with sustainable development principles. Failing to conduct this process means information regarding risks and opportunities of environmental, socio-cultural and economic aspects of JET policy, in the strategic level, cannot be provided to the public.

In the case of Eskom (Electricity Supply Commission) South Africa, preparation of a full Environmental and Social Impact Assessment (ESIA), associated management plans and framework documents were aligned with the requirements set out in the:

- World Bank Environmental and Social Framework (ESF),
- World Bank Group General Environmental, Health and Safety (EHS) Guidelines,
- World Bank Group Industry specific EHS Guidelines and Good International Industry Practice (GIIP).

Due to the existence of some requirements (standards), a duplication of study regarding environmental assessment at the strategic level could occur between GOI's KLHS and ADB's SESA. In the micro/project level such analysis is also conducted, called Environmental Impact Assessment (Analisis Dampak Lingkungan or AMDAL). Similarly, the World Bank asks projects to conduct an Environmental and Social Impact Assessment (ESIA). Process integration is needed to avoid or minimize duplication that may hinder the coal phase-out investment process.

Coal Fired Power Plant (CFPP) Retirement and Repurposing

Based on JET policy and considering SEA and/or SESA, selected CFPPs then formulate a coal phase-out plan and feasibility study to scrutinize the economic risks and opportunities, while

environmental and social aspects are explored in an AMDAL and/or ESIA study. According to Eskom (South Africa) experience, at least two alternatives are available: to decommission/closing the coal-fired power plant or repurposing the plant/area into other business/activities. In case of the last alternative, in Indonesia, a new AMDAL (EIA) study may be required, depending on the risks of such a new business/activity.

In the case of plant closing, CFPP shall mitigate internal impacts, particularly related to job losses and employment relations. On the other hand, there will be a need for decommissioning containing environmental risks too, such as the possibility of occurrence of soil contamination by hazardous material/waste, remaining of plant contamination by hazardous waste, or TENORM (Technologically-Enhanced Natural Occurring Radioactive Material) from fly ash and bottom ash containment/dam.

Plant closing also has consequences to the business relations with suppliers, contractors and non-formal businesses in the vicinity of the plant, which may involve job losses, decline of business, and social impacts. A careful consideration and action plan should be prepared to manage these kinds of impact. For the sake of awareness and preparation, impacted suppliers, contractors and surrounding informal businesses shall be informed of the closing, as early as possible.

On the other hand, CFPP repurposing creates new opportunities in terms of job creation, supply chain (i.e., supplier and contractors) development, and the growth of induced non-formal businesses.

Due Diligence Assessment

In other countries, such as the United States, Canada, and other nations with well-established regulatory frameworks for environmental assessments, a kind of due diligence process is conducted to assess environmental risks of the site. One of the most common internationally accepted standards for this kind of study is ASTM E1527-21 and E1903-19 Standard Practice for Environmental Site Assessment (Phase I and II). These standards could be adopted in Indonesia to mitigate environmental risks of abandoned plants or for mitigating the environmental obligations that are latently contained by the property.

CFPP Biomass Co-firing

In fact, to reduce greenhouse gases from CFPPs, PLN has also conducted a co-firing strategy, blending coal with biomass for fueling the CFPP, with some technical retrofitting. The program creates new business opportunities with regard to biomass provision. At the end of 2022, biomass co-firing was implemented in 36 CFPP locations with a total capacity of 599,3 GW and 585,660 tons of biomass consumed. Until 2025, PLN targeted biomass co-firing at 52 CFPP locations (10.6 GW in total) with a biomass consumption of 9 million tons annually. PLN uses various types of biomass, such as: saw dust, wood chips, palm kernel, corn cobs, and processed solid waste, particularly using urban solid waste.

The Forest Business Association (Asosiasi Pengusaha Hutan Indonesia or APHI) estimates that every 5,000 hectares of energy plantation forest (HTE) is needed to provide biomass feedstock for 10 MW of electricity generation. Accordingly, for fueling 10.6 GW, an area of 5.3 million hectares of HTE is needed. As stated by APHI, in 2021, 13 APHI members allocate 142.17 hectares and Perhutani allocates 67,000 hectares for HTE. In this case, there is a

huge discrepancy of supply and demand of wood biomass. If the main source of biomass is woodchips or wood pellet, such phenomena shall be considered carefully to prevent deforestation due to high demand of wood biomass for co-firing.

According to PLN[11], provision of biomass for fueling the co-firing of CFPPs is not quite secured. There are high uncertainties of price and availability of biomass fuel in Indonesia. This condition should be solved and should be backed-up with relevant government regulations regarding provision of biomass for co-firing.

Coal Mine Closure

A similar condition arises for the coal mining business process. The difference is particularly on mine closure. There are several regulations that stipulate mine closure practices, such as Act 3/2020 regarding Mining, Government Regulation 78/2010 regarding Reclamation and Post-Mining Activities, Minister of Energy and Mineral Resources Decree (MEMR) 07/2014 regarding Implementation of Reclamation and Post-Mining of Mineral and Coal Mining Business Activity and MEMR Decree 26/2018 regarding Implementation of Good Mining Practice and Monitoring of Mineral and Coal Mining.

The regulations define post-mining activities as planned, systematic and sustainable activities at completion of part or all mining activities to restore the natural environment and social functions according to local conditions in the whole mining area. A post-mining plan is submitted as part of the whole mining operation. One of the important requirements of the post-mining is the compulsory provision of a post-mining guarantee fund.

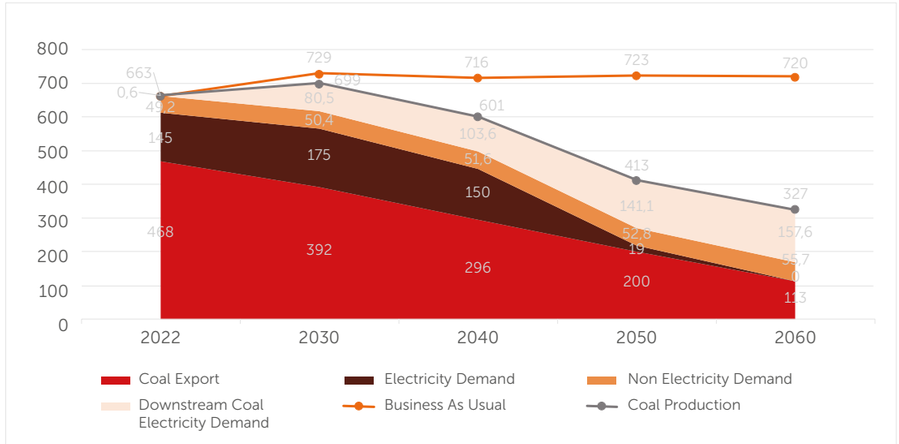
Regulations, such as Act 3/2020 regarding Amendment of Act 4/2009 regarding Mineral and Coal Mining, also set an obligation to miners to conduct community development and empowerment for communities surrounding the mining area. The allocation fund for such activities shall be agreed by the relevant government agencies. This mechanism forced mining companies to implement community development and empowerment during their mining operations.

Coal Mining Phase-Out Management

Even though there are two main processes that are relevant to JET, namely coal-fired power plants (CFPP) and coal mining (CM), JETP is heavily focused on CFPPs and take a lesser concern to CM. There is no facilitation or support from the government and/or international organizations for the coal mining industry (and its stakeholders) with regard to JET.

The Indonesian Coal Mining Association (ICMA)[12] made a projection for the NZE (Net Zero Emission) 2060 scenario. The Business-as-usual scenario shows that coal production in 2060 is 720 million tons, meanwhile applying the NZE scenario, coal production at the same year will be 327 tons. Hence, there is a decrease of 393 million tons. The labour intensity of coal mining is about 0.4 jobs/1,000 tons of coal production. Using this figure, NZE will be impacting coal mining jobs losses to the amount of 157,000 jobs, which is a significant figure. If the calculation is also covering impacts to suppliers, vendors, and non-formal businesses, the number will be higher. Furthermore, the impacts of the energy transition in terms of overall socio-economic aspects are very serious (including loss of income of national, provincial, and local governments from the coal production areas). It is necessary to manage this impact very carefully, particularly regarding mitigation of its social and economic impacts.

Figure 4: National Coal Projection Based on Net Zero Emission 2060 Scenario



Source: ICMA, 2022

3.3. OVERVIEW OF OFF-GRID SECTOR

Estimation of Off-Grid Electricity Demand

A research[13] of off-grid energy demand found that electricity consumption per household will be in the range of 63 kWh/year if the demand is for lighting only, 563 kWh/year for medium use of household electrical appliances, and about 1,054 kWh per household per year for normal use of such appliances. The last figure is almost the same with the national annual average electricity consumption of 1,173 kWh/capita. With an electricity ratio of 99,63 %, there are about 318,470 households in Indonesia that do not have access to electricity, spread over 199 villages across Indonesia. If these households are provided with off-grid renewable electricity, the demand will be 335,667.38 MWh/year. However, if the demand also considers the need for powering social and economic activities the figure will be significantly higher, at least multiplied by factor two.

The amount of investments needed to achieve 100% electrification for the period of 2022 to 2024 is estimated at IDR 11.7 – 20.9 trillion[14]. The number is calculated based on PLN's statement regarding investment needs of IDR 25-40 million per new customer in the 3T (frontier, outermost and least developed regions) off-grid area for unelectrified households. The funding is quite large in amount, however, according to some studies, it is a good investment. Research by IRENA found a positive correlation between the GDP and renewable energy consumption, where every 1 percent increase in renewable energy consumption can increase the total GDP by 0.105 percent[15].

Based on Presidential Decree 63/2020, in 2022-2024 there are cities and regencies determined as area with least developed villages. For these areas, electricity is one of the most urgent infrastructures that should be provided. Until now, electricity service in these areas is not or not sufficiently available, as most of them are located in the remote the provinces of Papua, North Maluku, Maluku, and East Nusa Tenggara. To electrify these areas, there are several specific constraints, particularly the long distance between houses and the uneven distribution of settlements, uncertain growth of electricity demand, and low access to the off-grid supply chain.

Off-Grid System Business Model

Off-grid solutions are defined as those that use a distributed approach to ensure electricity, supply to a demand area without needing to be connected to the state electricity company. Off-grid solutions include: small solar home systems (such as in the energy-saving solar lamp project); rooftop solar PV; battery swaps and solar lighting; and mini- or micro grid systems with single or hybrid energy sources transferred within a maximum distributing voltage of 380 volts (for social and residential consumption). A complete power service requires power generation, distribution and home or customer installations to be integrated. (MENTARI, 2023). Generally, off-grid RE business model is being implemented in areas that are not accessible from the national grid, decentralized in nature and separated from the PLN power system.

One of the biggest challenges of off-grid business model is training the local workforce to independently create, manage and maintain electrical installations. In addition, the regional grid also has to be operated independently as there is no PLN grid. Therefore, if renewable energy power plants are to be managed independently by communities, there will be a need for the transfer of expertise from renewable energy developers to local communities. Also, technology selection in this business model should be done carefully according to the level of local talent. Self-help management is essential as the target areas for off-grid business models are geographically difficult to reach.

Electricity flows to previously inaccessible remote areas can trigger the development of new economic activities. Developing an off-grid system will maximize the use of local renewable resources and enhance economic activity in the region. Therefore, this business model must focus on and target local and domestic industries.

Regarding funding, off-grid business model can combine government, private and international or philanthropic grants. Due to their relatively small size, communities can also participate in self-help funding programs[16]. In addition, revenue sources can also be generated outside of the core power generation business, such as ecotourism, waste management for fuel, electric cooperatives, and more.

Off-Grid Electricity Business Model Canvas

Off-grid renewable energy business owners may be a combination of cooperatives, BUMDes (village owned enterprise), central governments and local governments. Due to the relatively small scale, off-grid renewable ownership can also be done independently from the community through cooperative systems. New organizations can be established to carry out renewable energy development activities ranging from licensing to design, construction, operation and maintenance. Due to its isolated nature, the role of local communities in the form of BUMDes and cooperatives will be very central. Similar to the on-grid business model, local businesses can also participate in managing the off-grid energy infrastructure by providing support services.

Figure 5: Off-Grid Business Model Canvas

Business Model Canvas — Centre for Energy Studies, Universitas Gadjah Mada — **OFF - GRID Electricity Business Models**

Key Partners (Mitra Utama)
- Village Owned Enterprises (VOE)
- Local Government
- Contractors
- Joint-Venture Company
- National Government
- Project Sponsors

Key Activities (Aktivitas Utama)
- Private Sponsor Shareholding
- Project Company Establishment
- Electricity Service
- Technical Data Evaluation

Key Resources (Sumber Daya Utama)
- Power Plant
- Local Renewable Potentials & Resources

Value Propositions (Proposisi Nilai)
- Micro-Scale Electricity
- Renewable Technologies
- Clean Energy
- Flat Monthly Fee
- Local Business Establishment
- Decentralized Energy Distribution

Customer Relationship (Kemitraan Pelanggan)
- Electricity Production
- Electricity Selling

Channel (Saluran)
- Direct Contact with Local End Users
- Telephone

Customer Segment (Segmen Pelanggan)
- Industrial Sector
- Households
- Local Enterprises

Cost Structure (Struktur Biaya)
- Capital Expenses:
  - Buildings, Land Acquisition
  - EPC
  - Feasibility Study, Planning, and Licensing
  - Grid interconnection
  - Financing cost
  - Capital acquisition cost
- Operational Expenses: Maintenance, Equipment replacement, general administrative, labor

Revenue Streams (Arus Pendapatan)
- Main revenue stream:
  - Electricity sales from PT. PLN with price according to Ministerial Regulation
  - Capital injection and/or grants
  - Subsidy
  - Carbon kredit
- Additional revenua stream:
  - Revenue from outside electricity generation, e.g. eco-tourism, electricity education services, cooperative sales, etc. (by communities)

Source: UGM, 2021

For the case of full commercialization of off-grid systems, the following are some of the existing business models in the Indonesia market[17]:

1. **Joint operation cooperation contract model.** The joint operation cooperation model (known locally as the KSO model) is applied in PLN's business area and addresses the issue of villages or households still having no access to electricity. It also serves to revitalize

existing power plants, for example set up through donor grants, by ensuring the utility (PLN) can run them well. In this model, PLN keeps the business area license but allows an eligible entity, such as an independent power producer, to build and own the power plant and distribution systems on its behalf in the area. This avoids the capital risks that PLN would need to take to provide electricity for these areas. PLN either operates and maintains the power plant itself or appoints a subsidiary to operate it.

Either in PLN's own business areas or in 'greenfield' (not previously developed) business areas, this model is suitable for sites where demand is likely to grow (in level of kWh growth in the future) but the existing electricity supply is not yet reliable or where there is no electricity access at all. Unlike with rentals, distribution lines and substations can be built by investors and operated based on a contract period, as long as PLN includes these costs in its capital repayments to investors.

Table 2. Off-grid Joint Operational Cooperation Business Model

Model description	Joint operational cooperation
Tariff collection	PLN
Asset ownership	Project Investor/developer
Operation and maintenance	PLN
Subsidy delivered	PLN tariff
Business area licence	Not required (under PLN's area)

2. **Local-government or village-owned – private enterprise partnership model.** This model involves either village-owned enterprises (BUMDes) or local government-owned enterprises (BUMD) set up by provincial or district governments that are in a consortium with private investors or developers to establish a joint project company to manage the off-grid power supply. The project company builds the power plant, delivers the electricity, operates and maintains the plant, and collects the tariffs. The company owns the power plant assets and is responsible for the decommissioning process if the asset is not transferred to PLN when the power purchase contract ends. Shares are owned by both the local government-owned enterprise and the private investor that manages the project from the preparation stage through to implementation, operation and maintenance.

Table 3. Off-grid Local Government-owned Enterprise Business Model

Model description	Local government-owned enterprise
Tariff collection	Project company
Asset ownership	Project company
Operation and maintenance	Project company
Subsidy delivered	Capital and operating expenses
Business area licence	Required by application

While there are no specific regulations yet for the village-owned–private enterprise-partnership model, the enterprise itself follows the village administration, with consensus from the community. If there is no local government or village-owned enterprise, the village can create one prior to running this business model. Likewise, local governments

can create local enterprises to cooperate with the private enterprise and this comes under the local government administration. The competence within local government staff or village-owned enterprises will vary and they are likely to need further training and capacity building to be able to build-own-operate the off-grid power plant. Therefore, it would be ideal if the private enterprise already has longstanding experience in the off-grid business.

3. **Micro independent power producer model.** In this model, the selected area is not yet connected to a PLN grid although it is in a PLN business area. A number of PLN business areas still include some villages with unreliable power supplies or no access to electricity at all. For example, Mata Redi in East Nusa Tenggara has no electricity access although it is in a PLN business area and neighboring villages have electricity. In villages like this, the micro independent power producer model is introduced to provide a reliable and green supply to the site or replace the current system with a more efficient power plant by tapping into the growing demand. As the name implies, this model caters for a low-scale or village-level system with no more than a thousand households (under the Indonesian Standard Industrial Classification 35111, solar PV plants of less than 1 MW are reserved for cooperatives and small to medium size enterprises only).

The micro independent power producer model is based on the independent power producer framework typically used in Indonesia. Micro independent power producers are different in that their small, free-standing, on-site source of power (preferably renewable energy-based) is suited to the rural electrification program where areas are not yet connected to any utility grid. This is not the same as a micro-utility that needs to own their business area first since micro independent power producers harness PLN's business areas and act as generating companies.

Table 4. Off-grid Independent Power Producer Business Model

Model description	Independent power producer
Tariff collection	PLN
Asset ownership	Project Investor/developer
Operation and maintenance	Project Investor/developer
Subsidy delivered	PLN tariff
Business area licence	No need (under PLN's Wilus)

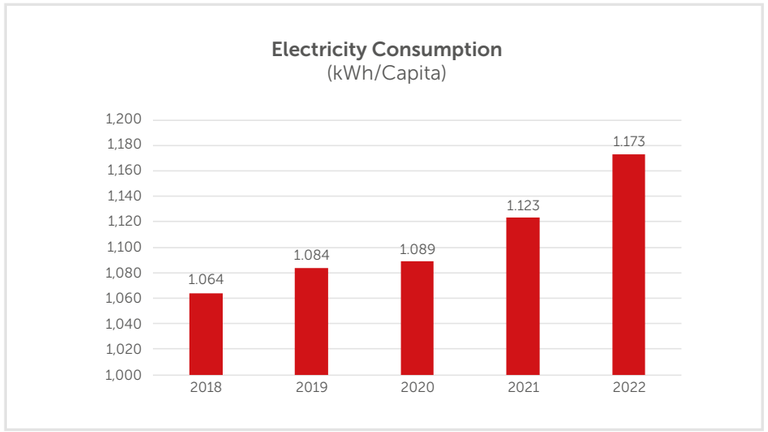
Integrating Gender Equality and Social Inclusion (GESI) issues into off-grid power projects is essential to ensure inclusive and sustainable initiatives that women and marginalized groups can participate in meaningfully and benefit from equally. Before any of these business models are implemented, the actors involved in these projects – project implementers, micro independent power producers, local government and village-owned enterprises, managing organizations, and so on – need to be trained and socialized on integrating GESI in their off-grid power projects. This will ensure that all project implementers understand the issues and share the same mindset and capacity in incorporating them into their projects. Some of GESI considerations are:

- Use targeted subsidies to ensure that women and marginalized groups benefit fully from the off-grid power projects and the projects have a broader impact on the community;
- Ensure meaningful participation of women and marginalized groups at all stages and levels;
- Formalize and embed GESI principles in the management of the off-grid enterprises;
- Consider households' ability to pay in deciding on tariffs;
- Include gender equality and social inclusion analyses and monitoring plans.

3.4. THE CONTEXT OF THE JET DISCUSSION AMID SOCIAL-TECHNOLOGICAL TRANSITION

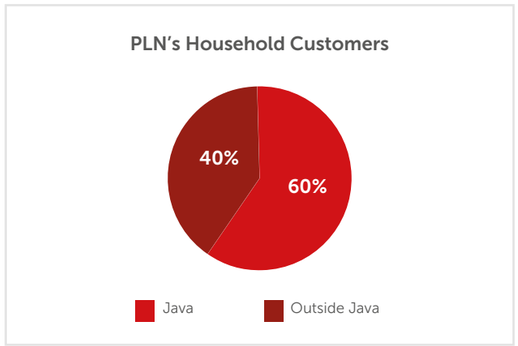
Electricity Distribution Gaps

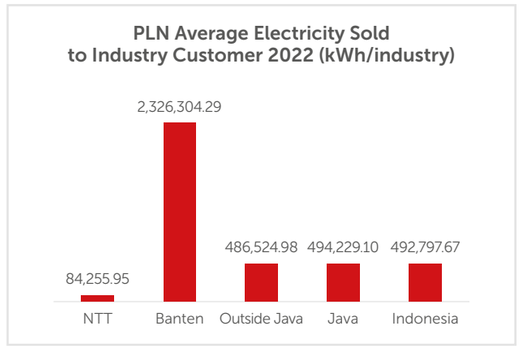
Figure 6: Indonesia's Electricity Consumption (kWh/Capita)

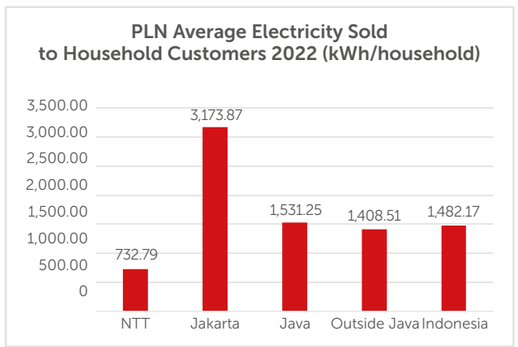


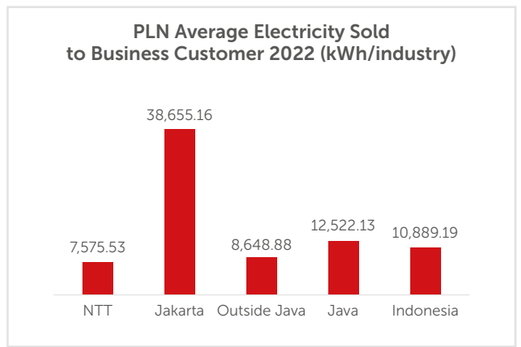
Source: Ministry of Energy and Mineral Resources, Handbook of Energy and Economic Statistics 2022

Figure 7: PLN Average Electricity Sold by type of Customers









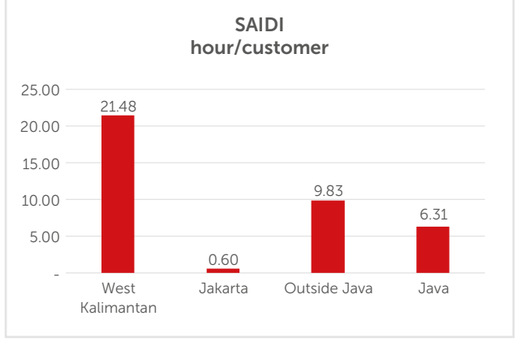
Source: PLN, Statistik PLN 2022 (processed)

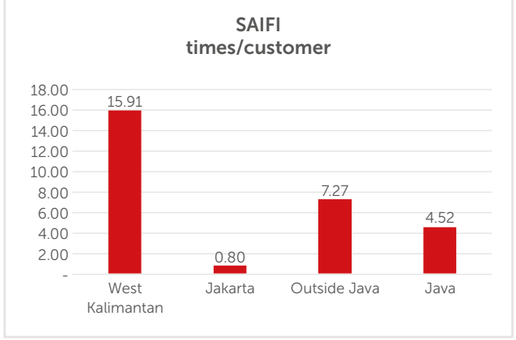
Electricity service in Indonesia is not equally distributed in terms of quantity and quality. Looking closely at the Indonesian demography, 56% of the Indonesian population lives in Java (about 153.34 million), while the remaining 121.43 million lives outside of Java (which covers only 7% of the total area of Indonesia). In 2022, the total of PLN's household customers was 78,327,897, of which 31,318,815 customers were located outside Java and 47,009,082 within Java. PLN Statistics 2022 indicates, that the total electricity sold in Java was 188,948.21 GWh and outside Java it was 84,813,27 GWh. These figures show that electricity consumption per capita was 1,224.23 kWh for Java and 698.45 kWh outside Java. This suggests that the average electricity consumption of individuals in Java is almost twice the consumption of customers outside Java.

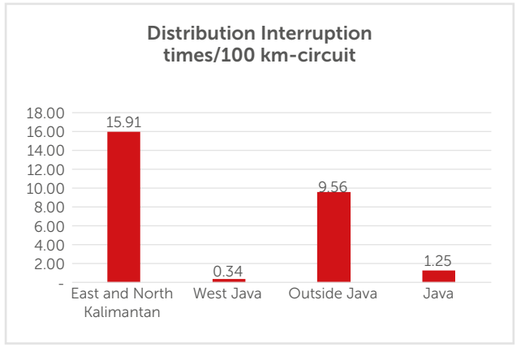
Electricity Service Quality Gap

The electricity service quality data show a similar picture, where in Java the service is more reliable than outside Java. The frequency of electricity system interruption outside Java is about 1.61 times that of Java. For the year of 2022, the System Average Interruption Frequency Index (SAIFI) for Java is 4.52 times/customer and outside Java it is 7.27 times/customer. The difference is soaring when comparing provinces with the lowest SAIFI and the highest one. Jakarta has the lowest SAIFI with 0.8 times/customer and West Kalimantan is 15.91 times/customer. Other indicators of electricity service quality also show this pattern, such as for System Average Interruption Frequency Index (SAIDI) and Distribution interruption.

Figure 8: Electricity Service Gap







SAIDI : System Average Interruption Duration Index
SAIFI : System Average Interruption Frequency Index

Source: PLN, Statistik PLN 2022 (processed)

Low Electricity Consumption

1,173
kWh/Capita
National Electricity Consumption 2022

1,268
kWh/Capita
National Electricity Consumption Target 2022

3,672
kWh/Capita
ASEAN Electricity Consumption

The electricity consumption per capita in 2022 was 1,173 kWh, an increase of 50 kWh as from 2021, but below the 2022 target of 1,268 kWh/capita. However, the figure was far below the ASEAN average electricity consumption of 3,672 kWh/capita, or less than half of ASEAN. Compared to developed countries, the ratio there is much higher, i.e., Japan with 7,190 kWh/capita.

There should be a massive electrification effort from all relevant stakeholders to decrease this discrepancy. The Ministry of Energy and Mineral Resources (MEMR) is planning to increase electricity consumption through the electric vehicle program, the distribution of induction stoves, and the distribution of electric cookers. The approach is primarily aimed at a consumptive type of electricity utilization. This indicates that MEMR is working in a sectoral manner, just for fulfilling its main role, function, and authority in governing electricity.

However, the productive approach such as boosting industry and commerce, agriculture electrification, or internet and communication improvement will have more leverage than the consumptive approach. Unfortunately, to do so the current approach needs an intensive integration and coordination among government ministries and institutions as well as relevant stakeholders, something that is currently lacking from government institutions.

The electricity ratio in 2022 was 99.63%, an increase of 0.18% from 2021 of 99.45%. MEMR's 100% electrification target will be achieved in 2023. Installed electricity capacity from new and renewable energy is 12,53 GW, or 14,11% of the total electricity capacity of 81,2 GW.

Poor vs Non-Poor

While both poor and non-poor households predominantly use electricity as their main source of lighting, there is still disparity in access to energy in rural areas, particularly among the poor. The percentage of non-poor households with electricity stands at 99.37 percent, slightly higher than that of poor households at 97.42 percent. This indicates that 2.58 percent of poor households especially in rural areas still lack access to electricity.

The inequality in access is further highlighted when comparing electricity access between urban and rural areas, with urban regions exhibiting a larger percentage of households with access to electricity compared to their rural counterparts. This persistent disparity underscores the need for targeted policies and initiatives to ensure that off-grid rural areas, especially those occupied by impoverished communities, are adequately equipped with reliable and affordable electricity services, fostering inclusive development and improved living standards.

Energy Transition in Indonesia

In Indonesia, the energy transition, and particularly the coal phase-out, involves very complex efforts among many stakeholders and their interests. Disruption generated by the coal phase-out could impact most of the energy/electricity stakeholders. The spectrum of disruptions is very wide and covers the most important aspects of livelihood in Indonesia. Since its impacts are far-reaching it is necessary to conduct such transition in a just manner. In this regard, inclusively involving all relevant stakeholders from the beginning of the transition process is a prerequisite to implement a smooth and effective JET.

Table 5. Impact of disruptions from Coal Phase-Out in Indonesia on Several Stakeholders

Stakeholders	Typical Disruption
Government (national and subnational)	• Disturbances to economic growth • Labour and employment risks • Policy and governance changes • Locally-generated revenue changes (subnational government)
Electricity company and coal mining company	• Business model changes • Technological changes • Supplier changes • Contractor changes
Labour (electricity and coal mining companies)	• Job loss risk • Skill changes
Supplier and contractors (electricity and coal mining companies)	• Business opportunity loss • Business model changes • Service changes • Skill changes • Wage changes
Informal sector related to electricity generation and coal mining business	• Business loss • Livelihood changes • Business model changes
Women and other marginalized groups	• Additional burden; domestic responsibilities and reduced economic opportunities. • Participation opportunity loss
Community and electricity users	• Price changes • Service changes

Source: Author Analysis

The energy transition is expected to support regional economic growth through three key drivers:

1. Direct investments in regions with renewable energy potential;
2. Improved access to energy;
3. Energy transition-related industrial growth close to mineral resources.

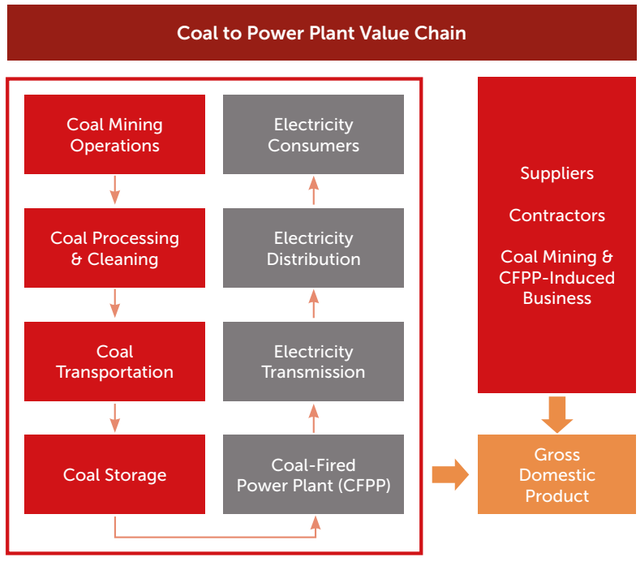
Besides the risks of energy transition, the above opportunities should be utilized in optimum manner to support sustainable development in Indonesia.

Coal to Power Plant Value Chain

The coal to power plant value chain involves many business activities, both formal and informal. The value chain contributes to gross domestic product at national, provincial and local level through tax and levies, non-tax income, royalties and foreign exchange reserves.

It is obvious that the chain involves many stakeholders. The coal mining value chains contains four key processes, which are; mining operations, coal processing and cleaning, coal transportation, and storage. At every stage of the value chain, value is added by suppliers, contractors, as well as induced business, including the informal ones. Along the chain, every value added involves many stakeholders. For example, in the CFPP operation of PT Indonesia Power, a subsidiary of PT PLN, engaging with 1,780 local supplier companies across Indonesia with a total procurement value of IDR 22,331 billion (USD 1,4 million).

Figure 9: Coal to Power Plant Value Chain



Source: Author Analysis

3.5 Definition of JET and why it is needed

Currently, an official and agreed definition of JET is not available in Indonesia. A well-defined JET definition is essential to address the country's unique challenges, promote inclusivity and equity, support sustainable resource utilization, align policies and regulations, attract investments, and ensure social acceptance. It emphasizes the importance of tailoring the transition framework to suit Indonesia's specific needs and aspirations.

Adopting a definition that is commonly used in the developed countries that are mostly focusing on job security and decent work is contextually not fit or not sufficient within the Indonesian environment. A proper definition for JET, fitting for the Indonesian environment would have to include the following aspects:

1. **Addressing local context and need.** A specific definition catering to the Indonesian context is necessary to ensure that the transition plan considers and addresses the unique challenges and opportunities the country faces[18]. The 'Just' dimension, particularly with regard to democracy of transition and utilization of natural resources to support sustainable development, should become a dominant aspect.
2. **Policy and regulation alignment.** The same condition is valid regarding policies and regulations. There is no single formal policy or regulation that stipulates such definition. The absence of a clear JET definition may lead to inconsistencies and fragmentation in policies and regulations related to the energy transition. A formalized definition can facilitate the alignment of various policies and regulations to work coherently towards achieving the country's energy transition goals. However, some aspects of JET are promulgated in several different regulations, such as: descent work and labour on Act 13/2003 regarding Labour, environmental aspects on Act 32/2009 regarding Environmental Protection and Management, Act 30/2009 regarding Electricity, Act 4/2009 and 3/2020 regarding Mineral and Coal Mining, and Act 30, and Act 30/2007 regarding Energy.
3. **Inclusive and equitable transition.** A clear JET definition can promote inclusivity and equity during the transition process. By explicitly focusing on 'just' dimensions and democratic principles, the definition can ensure that women, marginalized groups, and workers in the traditional energy sector are not left behind and are provided with fair opportunities for employment and growth in the emerging renewable energy sector.
4. **Investor confidence and funding opportunities.** A transparent and well-understood JET definition can enhance investor confidence, it offers clarity on the government's commitment and can attract more private and international investments leading to a smoother and faster transition.

4.
Findings

4.1 GENERAL FINDINGS

Essentially, the research aims to answer the main question: "How ready is Indonesia to implement a JET?". Through the examination of relevant stakeholders, it is evident that, in general, they are not adequately prepared to execute a JET. Additionally, this study observes that the implementation of the just transition principles is currently at a low level.

In general, based on relevant stakeholder interviews, focus group discussions, and literature review, the research uncovered six main findings.

1. Low level of implementation of JET principles.

From the perspective of JET principles, if we consider all relevant stakeholders in Indonesia, its implementation is relatively at a low level; most of the JET principles are not implemented properly in Indonesia.

Table 6. Analysis Level of Readiness for Implementing JET Principles in Indonesia

JET Principles	JET Principle Code	Level of Readiness for Implementation*	Indication*
Distributive Justice			
Skills, assets, and opportunities to particivpate in industries of the future	D1	Low to Medium	- Formal mapping regarding skills, assets and opportunities is not available yet, even though Bappenas and relevant stakeholders have prepared green jobs occupation mapping, a few of them have detailed competency standards. Moreover, since the occupation mapping is newly developed the system and infrastructure to implement the framework is not yet available. - PLN and its sub holding are preparing their internal human resources to implement the energy transition; however, it does not include their suppliers, contractors, and their relevant stakeholders. - Coal mining companies have made statements in their annual and sustainability reports regarding their commitment and initial JET planning, including the preparation of human resources and relevant competences. Again, the approach is mostly internal and exclusive. A more inclusive policy and commitment is needed to cover all relevant stakeholders. - Several CSOs and independent research centers have conducted advocacy and awareness raising regarding this principle. - Subnational governments are relatively not aware regarding this JET principle.
Transformative national economic and social policies that clearly consider how benefits and burdens will be distributed	D2	Low	- Relevant policy is not yet available. - Map of benefits and burdens of energy transition to relevant stakeholders, as a prerequisite to formulate and implement JET policies, is not yet available.
Provincial and local capacity	D3	Low	- Relevant national institutions and ministries have not yet involved subnational governments in JET implementation. - Provincial and local governments (city/ regency) have not yet prepared their internal capacity to be able to implement energy transition in a just manner or prepared relevant development planning.
Corporate responsibility	D4	Low	- PLN and its sub holdings are preparing their internal human resources to implement the energy transition[19]; however, this does not include their suppliers, contractors, and their relevant stakeholders as well as informal sector. - IPPs are relatively not prepared yet regarding change management for JET[20, 21]. Recently, Cirebon Electric Power signed a Memorandum of Understanding with the Asian Development Bank (ADB) to early retire their power plants within the ETM framework. - Coal mining companies have made statements in their annual and sustainability reports regarding their commitment and initial JET planning; however, they will only implement it in the upcoming years[22].
Restorative Justice			
Health and environmental impacts to communities in coal and other fossil fuel impacted areas	R1	Low	Good governance regarding health and environmental impacts to communities is not properly implemented. According to some studies, CFPPs emission is contributing to illness and fatality to their surrounding communities; Reclamation and post-mining management is recently not transparent and accountable in a proper manner.
Shifting away from resource intensive sectors and fossil fuels	R2	Low to Medium	- In accordance with RUPTL 2021-2030, PLN has systematically shifted from fossil fuel power plants towards new and renewable energy power plants. - Some mining companies have shifted their business to a more diversified one and into a more sustainable business.

JET Principles	JET Principle Code	Level of Readiness for Implementation*	Indication*
More decentralised, net-zero-emissions economy	R3	Low	In general, JET in Indonesia is more centralistic rather than decentralized; A more national issue rather than a subnational one. Two of the main JET programs, JETP and ETM, are centralistic in manner; the recent CIPP draft does not contain a decentralization plan.
Remedying past harms by building on, and enhancing, existing mechanisms	R4	Low	A comprehensive aspect of social, economy, environmental as well as technology as part of a governance system for remedying past harms is not recently available.
Procedural Justice			
Assisting communities to understand what the just transition entails	P1	Low	- Ministry of Energy and Mineral Resources has conducted just a few number of dissemination events regarding JET in a sporadic manner. - Some CSOs (i.e., Yayasan Indonesia Cerah, CELIOS, IESR, IRID) have conducted public advocacy, campaigns and education to relevant stakeholders, including to a few local governments. - According to CELIOS' public survey, the public still does not have knowledge and have no literacy regarding a just transition.
Supporting worker and community organisations	P2	Low to medium	- Formal policy and planning from relevant ministiesy regarding mitigation of energy transition impacts to workers and community organizations (particularly informal sector) is not yet available. - National competency qualification framework (KKNI) for green jobs, particularly renewable energy has been available for some jobs. - CFPPs and coal mining companies have prepared their internal human resources for implementing a just transition. - Labour union has made a statement of position regarding a just transition for labour and worker. - Plan for mitigating energy transition impacts to informal sector and community organization is not yet available.
Collaborating actively with a range of stakeholders	P3	Low	A formal engagement and collaboration plan from relevant ministries and/or institutions is not yet available.

JET Principles	JET Principle Code	Level of Readiness for Implementation*	Indication*
Supporting the design and implementation of just transition projects	P4	Low to Medium	- The JETP Secretariat is in the process of developing a comprehensive investment and policy plan (CIPP) for JETP in Indonesia with the scope of the plan specifically related to JETP funding. A comprehensive plan for overall JET in Indonesia is not yet available.

* Note:
- Low: Low readiness of implementation, indicated by an initiation and/or preparation phase for implementing JET principles.
- Medium: Relevant plan(s) are available and/or resources mobilization phase and/or there is an indication of sporadic implementation of JET principles.
- High: Relevant plan(s) are implemented with appropriate resources and governance system(s).
- Advanced: JET principles implementation is measured, monitored and evaluated as well as continually improved in a systematic manner.

Source: Author analysis

2. Low level of implementation of identified stakeholder roles in JET.

According to their specific roles, every stakeholder of JET should be proportionally involved in a participative and collaborative manner. The specific competence of the individual stakeholders is an important asset of a successful JET. Such roles should be formally defined and declared by the stakeholders. The implementation of their role is a key indicator of stakeholder readiness in implementing JET. The table below describes a qualitative degree of implementation of JET in Indonesia, based on three just principles, namely distributive (D), procedural (P) and restorative (R) justice. This research found that, in terms of readiness, the implementation of JET in Indonesia is at the low-level stage.

Table 7. Identified JET Stakeholders' Roles and Its Level of Implementation

Stakeholders	Main Role(s) in JET	Relevant JET Principles*	Level of Implementation
Government of Indonesia	Enact a formal definition of JET in Indonesia	D2	None
	Formulating an integrated JET policy and roadmap for Indonesia	D2, P4	None
	Incorporating JET into national medium-term development plan (RPJMN) and other relevant development plan(s)	D2, P4	None
	Assigning a single national institution for coordinating and integrating just transition in Indonesia	D2, P4	None
	Creating a conducive implementation and investment climate for New and Renewable Energy (NRE)	P4	Low
	Formulating JET good governance principles, systems and standards, particularly for properly and effectively manage risks and opportunities of JET implementation	D2, R4, P4	None

Stakeholders	Main Role(s) in JET	Relevant JET Principles*	Level of Implementation
	Establishing a multi stakeholder platform for an inclusive, participative and collaborative JET	P3, P4	None
Subnational government	Incorporating JET into subnational medium-term development plan (RPJMN) and other relevant development plan(s)	D3, R3	None
	Formulating alternative development plan for properly managing the JET's risks and opportunity, comprehensively considering environmental, social and economic aspects in an integrated manner.	D3, R1, R2, R3, R4	None
	Preparing resources, particularly human resources (competences and skills) for implementing JET	D1, P4	None
Labour/labor unions	Mapping of risk, skills and education gap, and opportunities of JET to jobs (create and loss, welfare, competence and skill change, occupational health and safety condition, and exit strategy employees that are not prospected to be joining the workforce within the energy transition.	D1	None
	Establishing a tripartite institution on just transition in Indonesia, in cooperation with government and relevant business sectors.	D1, P4	Medium
Community	Understand better what JET means for them.	P2	Medium to High
	Voicing/expressing their concern regarding JET and pressuring relevant stakeholders particularly on environmental, health, gender and vulnerability, livelihood, and other relevant socio-economics impact of JET implementation		
	Planning and implementing JET in their communities	P2, R4	Low to Medium
Relevant local business and informal sector	Planning their business transition due to risks and opportunities of JET	P2, R4	Low
Civil society organizations, including independent research institution	Advocate and monitor the JET processes, approaches and deliveries.	P1	Medium to High
	Conducting relevant research and public surveys	P1	Medium
	Preparing relevant policy papers	D2, P4	High
Universities and government related research institutions	Conducting relevant research and public surveys	P1	Low
	Preparing relevant policy papers and dissemination forum	D2, P4	Low
	Preparing relevant (university and polytechnic) curriculum for higher education of JET (degree level, non-degree course, and short course)	D2, P4	Low

Stakeholders	Main Role(s) in JET	Relevant JET Principles*	Level of Implementation
Electricity companies	Preparing relevant strategy, roadmap and plan for implementing JET	D1	Medium to High
	Preparing environment, social and governance assessment of risks and mitigation of JET implementation	D3, R1, P1, P2, P3	Medium to High
	Preparing resources, particularly human resources (competences and skills) for implementing JET, as well as relevant research	D1, P4	Medium to High
	Implementing JET principles into corporate social responsibility in a systematic and comprehensive manner	D4, R1, P1	Low
Coal mining companies and their association	Preparing relevant strategy, roadmap and plan for implementing JET	D1	Medium to High**
	Preparing the environment, social and governance assessment of risks and mitigation of JET implementation	D3, R1, P1, P2, P3	Medium**
	Preparing resources, particularly human resources (competences and skills) for implementing JET	D1, P4	Medium to High**
	Implementing JET principles into corporate social responsibility in a systematic and comprehensive manner	D4, R1, P1	Low

* D, R and P codes are representing **D**istributive, **R**estorative and **P**rocedural Justice
** Big mining companies, particularly the top ten companies, have made some preparation including preparing roadmap that relevant to JET, as well as shifting their coal business into a more sustainable and diversified business.

Source: Author analysis

In general, most of the relevant stakeholders are not quite ready to implement JET in an effective and comprehensive manner. While to their roles, CSOs, independent research institutions, electricity companies, and big coal mining companies show a moderate level of preparedness. The government of Indonesia, with relatively low readiness, plays the most critical role in enabling effective and comprehensive JET. The most important gaps that need to be closed are **1). setting a formal definition** regarding JET, to become a shared understanding for all relevant stakeholders, as well as **2). formulating an integrated JET policy** that encompasses cross-institutional and cross-sectoral and an inclusive participation and collaboration of all relevant stakeholders. Both are critical and a prerequisite obligation. Failure to address these gaps may hinder the successful implementation of JET in Indonesia.

3. Nonexistence of integrated JET policy.

There is no formal definition nor paradigm for JET, which could be a latent but critical hindrance to implement the transition in a smooth and effective manner. Lack of such definition makes relevant stakeholders not having the same understanding and direction in realizing a just transition in Indonesia. The definition, paradigm, criteria and indicators as well as norms should be formalized in an integrated policy.

4. Inadequacy of inclusive engagement of relevant JET stakeholders.

JET is a multi-sectoral and multi-disciplinary efforts and involving many stakeholders. An inclusive, participative and collaborative engagement of all relevant stakeholders is a prerequisite and key approach are irreplaceable need paramount. Unfortunately, this kind of engagement is not yet established in Indonesia.

The JET euphoria triggered by the multi-country partnership of JET Partnership (JETP) and Energy Transition Mechanism (ETM) of the Asian Development Bank (ADB) has been a tipping point of JET awareness in Indonesia and has become a massive focal point in the media. Suddenly, JET has become a popular topic in daily conversations, press media, and social media. However, this popularity has not been followed by the required inclusive and massive engagement of all relevant stakeholders. Those who will be most impacted by the coal phase-out, such as local government, labor, local business and informal sector, for instance, that will be impacted the most of coal phase-out are not involved in the JETP policy making and planning process.

5. Absence of good governance of JET implementation.

Good governance is paramount for implementing JET in Indonesia, due to its wide coverage of sectors, disciplines and stakeholders. Two fundamental principles of good governance, namely transparency and accountability, should be integrated explicitly in the governance mechanism. Unfortunately, this governance mechanism has not (yet) been implemented with JET in Indonesia.

6. Insufficiency of robust electricity services for social and economic development.

Regarding electricity provision and services, the findings show that there are significant gaps in service quantity and quality across Indonesia. Java has, generally, an abundance of electricity supply, supported with higher quality of services, particularly regarding system disruption and reliability. In contract, most other areas in Indonesia, the condition of the electricity provision and services are far below the level in Java.

For example, household consumption in Jakarta is 4.34 times of East Nusa Tenggara's. The gaps are wider in the electricity consumption of business and industry electricity consumption, where the ratio of highest and lowest provincial electricity ratio is 5.1 and 27.6 respectively. The same trend is seen for service reliability, which is much better in Java than outside. The frequency of electricity system interruptions outside Java is about 1.61 times of Java. For the year of 2022, the System Average Interruption Frequency Index (SAIFI) for Java is 4.52 times/customer and outside Java it is 7.27. The difference is amplified when comparing provinces with the lowest and highest SAIFI. Jakarta has the lowest SAIFI with 0.8 times per customer while West Kalimantan has 15.91 times per customer.

In rural and remote areas, where on-grid electricity service is not available, off-grid systems are rarely available. Even when available, their service quantity and quality have a very basic condition. In some off-grid systems, the quantity is designed only for basic lighting at night. Such services cannot be utilized to promote electricity as a driver for social-economic

growth, therefore livelihood and well-being in these rural and remote areas will be always significantly left behind.

Furthermore, off-grid solutions are not included among the five investment focuses (which are development of transmission network, early CFPP retirement, dispatchable RE acceleration, variable RE acceleration, development of RE supply chains) identified in the energy transition plan of JETP. This exclusion exacerbates the existing gap in justice and equitable access to reliable and affordable energy for unelectrified rural remote communities. As a result, these communities continue to face significant challenges in meeting their energy needs and accessing opportunities for development and improving their living standards.

4.2 LEVEL OF IMPLEMENTATION OF JET PRINCIPLES IN INDONESIA

D1. Skills, Assets and Opportunities to Participate in Industries of the Future

A just transition needs reskilling, an aspect that needs to be prepared comprehensively. Retirement of CFPPs increases the demand for new and renewable resources, which, in its turn, creates many types of green jobs. The Institute for Essential Services Reform (IESR) has identified potential of three million green jobs to be created until 2025, however the retirement of CFPPs contributes to 2 million jobs lost. Hence, there is a net gain of one million (green) jobs. These jobs include RE installation, operation and maintenance, jobs for energy efficiency specialists, researchers, scientists, and engineers working on developing new technologies such as energy storage, grid management, and sustainable transportation, as well as community professionals engaged in educating communities about renewable energy and sustainability, fostering a culture of energy awareness and conservation. IRENA emphasizes the need for gender-responsive policies, targeted training programs, and inclusive practices in the renewable energy sector. By prioritizing gender equality and social inclusion, a JET can ensure that the benefits of green jobs are shared fairly and equitably among all members of society.

GGGI[23] conducted a broader scope of study under the RUKN scenario. The development of new renewable energy capacity added by 2030 generates about 7.2 million job-years, comprises of 3.7 million direct (i.e., in the RE power plant), 1.72 million indirect (i.e., supplier and contractor) and 1.74 million induced job-years (i.e., formal and informal sector where direct and indirect job employees spending).

To enter such green jobs market, new skill and competencies are required. Relevant institutions such as the Ministry of Manpower will have to conduct a mapping study of the jobs and its skill and competency requirements. In order to mitigate the impact, the government could provide incentives, for example by empowering people with a so-called 'Pre-work Card' (Kartu Prakerja) to improve their skill to be able to enter the green jobs market.

D2. Transformative National Economic and Social Policies that Clearly Consider How Benefits and Burden will Be Distributed

Indonesia shall harmonize its economic growth with energy management. Economic growth should not be hindered when Indonesia makes an energy transition from fossil energy to renewable ones. Another important aspect is the discrepancy in the level of energy distribution and services in Indonesia, particularly between Java (and Bali) and outside of Java. There should be enough energy availability for every citizen all over Indonesia in order to optimize their own prosperity through energy. In the case of off-grid electricity systems, availability of energy is very low and only enough for very basic utilization such as lighting. There is not enough electricity available for accomplishing business activities such as for running small machines, refrigerating, or other electrical equipment. This condition creates a vicious cycle that is trapping communities in the off-grid system into sustained poverty.

D3. Provincial and Local Capacity

Recently, the central government has not properly involved sub-national governments (province, city, and regency) in the JETP planning process. In order to ensure smooth implementation of the JETP program, they should be inclusively involved as early as possible, since the beginning of program. Anchoring the JETP program with an umbrella policy, such as Net Zero Emission 2060 should be conducted to synchronize all relevant programs in an integrated manner. A formal regulation to involve all relevant stakeholders (relevant ministries and institutions, business, civil society organizations, philanthropy organizations, and other stakeholders), at least in the form of a Presidential Decree, should be promulgated to integrate all relevant activities and resources. Actually, in terms of achieving the Sustainable Development Goals (SDGs), such approach has been carried out. These facts indicate that the JETP program is conducted in a partial and sectoral approach that could hinder Indonesia's readiness in implementing a smooth JET.

The JET engagement should be more comprehensive, not only focusing on the leading ministry and CFPPs but also involving a wider group of stakeholders including local governments, provincial governments, labour unions, impacted communities, mining companies and other relevant stakeholders.

A JET policy should be incorporated into the long and medium-term national development plans (RPJPN and/or RPJMN). Actually, the National Development Planning Agency (Bappenas)'s Low Carbon Economy concept allows to accommodate a just energy transition into the development planning and implementation. The simulation results of the low carbon economy approach of Bappenas shows that this provides higher economic growth compared to the business-as-usual approach.

D4. Corporate Responsibilities

Corporate responsibility is mandatory in Indonesia as regulated by Act 40/2007 regarding Limited Liability Company and Government Regulation No. 47 of 2012 on the Corporate Social Responsibility of Limited Liability Companies.

The Financial Service Authority (OJK) also mandated financial services institutions, listed companies and public companies to formulate a Sustainable Finance Action (SFA) Plan, where corporate social responsibility is becoming one aspect of the regulation (POJK 51/2017

regarding Implementation of Sustainable Finance for Financial Service Institution, Emitent and Public Company). The regulation also stipulates that reporting the implementation of the SFA Plan through yearly sustainability reports is mandatory.

The Mineral and Coal mining sector has the obligation to implement community development and empowerment for communities surrounding the mining area.

State owned companies have the obligation to implement Partnerships and Environmental Development Programs (PKBL) by allocating some portion of their profit for funding such programs.

R1. Health and Environmental Impacts to Communities in Coal and Other Fossil Fuel Impacted Areas

In general, environmental management is stipulated in Act 32/2009 regarding Environmental Protection and Management and its amendment in Act 6/2023 regarding Job Creation.
Both are described in detail within Government Regulation 22/21 regarding Implementation of Environmental Protection and Management. Dozens of regulations that are relevant to environmental management of CFPPs and coal mining operations, including the specific one regarding requirements of hazardous waste management. The governance of this sector is quite transparent and accountable.

CFPPs Environmental and Social Impacts[24,25]

Coal-fired power plants emit more than 60 different air pollutants. Even though power plants operate air pollution control equipment, not all the emission is completely removed. Dominant air pollutants are particles that mainly came from fly ash, conventional gases air pollutants (Sulphur oxides, nitrogen oxides, carbon monoxide, hydrocarbons), and greenhouse gases (mainly carbon dioxide). Sulphur oxides and Nitrogen oxides are the key pollutants in the formation of acid rain that can harm water bodies, forests and agricultural plantations, as well as buildings and materials.

Coal-fired power plants produce large quantities of SO2 and NOX, the key pollutants in the formation of acid rain. Acid rain acidifies water bodies, and harms forests and coastal ecosystems. SO2 and NOX contribute to the formation of particulates (fine particles). NOX helps form ozone (smog) and nitrates. Ozone impairs the lung function and reduces the yields of many economically important agricultural crops. Nitrate deposition over-enriches water bodies, causing algal blooms that kill fish and reduce biodiversity.

Particulates (fine particles)

Coal-fired power plants are a major source of particulate pollution. Many scientific studies have shown that raised levels of particulates result in increased illness and premature death from heart and lung disorders, such as asthma and bronchitis. The largest share of particulate emissions comes not from direct emissions, but from the conversion of SO2 and NOX into fine particle sulphate and nitrate in the atmosphere.

Trace Elements

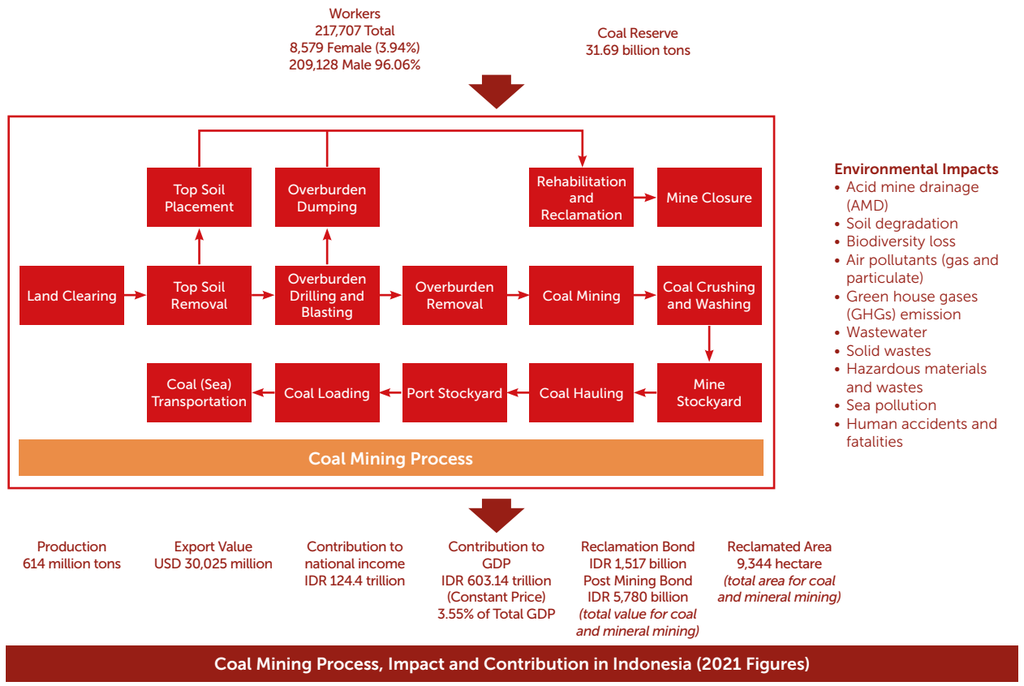
Coal contains numerous persistent, bio-accumulative trace elements that are released during combustion and end up in the atmosphere and water bodies. These include mercury, dioxins, arsenic, radionucleotides, cadmium and lead. Methylmercury can lead to neurological disorders, developmental issues, and adverse impacts on cardiovascular health. Dioxins are harmful to both humans and wildlife, potentially causing cancer, reproductive and developmental issues, and immune system disruption. Human exposure to arsenic, primarily through contaminated water and food, can lead to various health problems, including skin lesions, cancers, cardiovascular diseases, and developmental issues. Radionuclide exposure can increase the risk of cancer and other radiation-related health issues.[26]

PLN Indonesia Power spent IDR 65,245 million for environmental management and protection, including a water pollution control cost of IDR 9,414 million, an air pollution control cost of IDR 17,974 million, and hazardous waste management costs of IDR 16,790 million and non-hazardous waste management cost of IDR 11,328 million and biodiversity conservation cost of IDR 9,738 million.

This conservation program includes the protection of the Javan hawksbill, Bali myna, lovebirds, olive ridley turtles, white taro cows, Tukik, Javaloosa, Javan rhinoceros, mangroves, coral reefs, endemic trees and rare plants. Biodiversity protection and conservation programs implemented in all production sectors have improved the biodiversity index from 2.46 to 2.63, a 6.91% increase in 2022.

Coal Mining Environmental and Social Impact

Figure 10: Coal Mining Process, Impact and Contribution in Indonesia (2021 Figures)



Coal mining causes degradation to natural ecosystems and alter the landscape extensively, particularly due to the excavation of the top soil. Practically, all the coal mining in Indonesia uses open the mining method, disturbing large areas of land contributing to biodiversity losses. Damage to human health can occur due to contamination from air pollutants, wastewaters, acid mine drainage, noise and vibration, and chemicals as well as hazardous wastes and materials. Greenhouse gases emission also contributes to mining environmental impact, particularly from the operation of heavy trucks and equipment. Mining is also dangerous and has relatively high injury and mortality rates. Its occupational health and safety hazards include respiratory illnesses, exposure to toxic fumes and gases, noise-induced hearing loss, heatstroke as well as accidents and fatalities.

On the other hand, coal mining contributes to the national income, providing jobs for males and females, and creating mining-induced business. In 2021, There were 217,707 workers involved in coal mining, most of them male workers, with only 3.94% women[27]. In the same year, coal mining in Indonesia produced 614 million tons, where most of the production was exported with a total value of USD 30,025 million. The industry shares 3.55% to Indonesia's gross domestic product (GDP) with a value of IDR 603.14 trillion. As mandated by government regulation, miners shall prepare reclamation and post-mining fund in the form of reclamation bond and post-mining bond. The value of such bonds are IDR 1,517 billion (USD 99 thousand) and IDR 5,780 billion (USD 379 thousand) respectively.

Renewable Energy Power Plant Waste Generation

As like fossil fueled power plants, renewable energy-based power plants also generate waste, including hazardous waste, in a smaller amount. Given an example of solar power, according to IRENA in End of Life Solar PV Panels (2016), it is projected that waste generation of solar panel modules is about 60 tons per MW.

Table 8. Hazardous Waste Types from PLTS [28]

No	Hazardous Waste Type	Hazardous Waste Code Number	Remarks
1	**Solar panel:** Heavy metals (lead, copper, zinc and tin)	Not Registered Yet	This specific hazardous waste is not registered and identified yet at Ministry of Forestry and Environment
2	**Battery:** Heavy metals: lead, lithium, zinc Other: explosive materials, flammable, and corrosive (such as sulfuric acid)	A102d	
		B326-1	Dry cell battery: utilization of used battery, battery that not fulfill technical specification, and expired battery
		B327-1	Wet cell battery: utilization of used battery, battery that not fulfill technical specification, and expired battery
3	Transformator oil and used oil	B105d	Used oil (from hydraulics, machinery, gears, lubrication, insulation, heat transmission, grit chamber and/or separator and its mixture)

No	Hazardous Waste Type	Hazardous Waste Code Number	Remarks
4	Electronic component (inverter, solar charger controller, battery management system) **Hazardous waste:** mercury, heavy metals (lead, copper, zinc and tin)	A328-1, A328-2, B328-4, B328-5	Mercury contactor/switch, fluorescent lamp (Hg), printed circuit boards, cable waste and its insulation.

R2. Shifting Away from Resources Intensive Sectors and Fossil Fuels.

Several mining companies, particularly the big ones, are very aware of how the energy transition will affect their business. Such companies prepare a kind of transition plan to transform their coal business into a more sustainable one. Coal down streaming (coal to Dimethyl Ether/DME or to Methanol) and development of other mineral down-streaming (Nickel and Aluminum smelter), as promoted by government regulation is an attractive option. However, diversification into other types of industry such as involving in the electric vehicle ecosystem is also favorable for some coal mining companies.

Indika Energy, for example, aggressively invests in the non-coal business by getting engaged in the production of electric vehicles. The company is committed to increase their revenue from non-coal to 50% by 2025 and to become a carbon neutral company by 2050.

PT. Bukit Asam (PTBA) also aggressively expands its green portfolio by collaborating with other state-owned enterprises in developing solar power generation, namely PT Jasa Marga (Persero) Tbk, PT Angkasa Pura II (Persero), PT Timah Tbk and the Semen Indonesia Group.

PT Adaro Energy Indonesia Tbk, in cooperation with PT Kayan Patria Pratama and Sarawak Energy Berhad, is developing Indonesia's largest hydropower plant of 1,375 MW capacity, which is the Mentarang Induk Hydropower Plant at Malinau Regency, North Kalimantan Province. The hydropower plant is set to supply power to the North Kalimantan Green Industrial Estate.

Below is a list of coal mining companies that are conducting a business shifting process to mitigate the impact and disruption of coal phase-out to their business. Although some companies are still engaging in the natural resource exploitation, in general, coal mining companies are having more diversified business and are moving towards a more sustainable business. It seems that they are the most prepared sectors in terms of preparing themselves to implement the energy transition.

Table 9. Coal Mining Companies Business Shifting[29]

Company	Business Shifting
Indo Tambang Raya Megah (ITM)	- Biomass power plant - Exploration of solar power plant development - Exploration of wind power plant development - Exploration of gas power plant development
Bukit Asam	- Utilization of Carbon Capture, Utilization and Storage (CCUS) - Down streaming: coal to gas (DME) - Solar power plant development
TBS Energi Utama	- Electric motor cycle and battery swapping stations - Solar power plant
Adaro	- Aluminum smelter - Biomass power plant - Solar power plant - Hydroelectric power plant
Indika Energy	- Electric battery industry - Development of electric vehicles (two wheels, four wheels, and bus) - Solar PV installation - Development of green port - Development of hybrid solar PV
Bumi Resources	- Down streaming: coal to methanol - Solar power plant development - Utilization of CCUS
Harum Energy	- Electric vehicle - Nickel smelter

R3. More Decentralized, Net-Zero Emission Economy.

In the case of transition from fossil to non-fossil fuel, particularly coal. The energy transition will heavily impact the mining companies and associated companies and communities in the main coal producing areas (East Kalimantan, South Kalimantan, South Sumatra). The magnitude of the impacts will have to be identified carefully and accurately in order to properly mitigate such impacts. This is the essence of just in the JET. In these areas the gross domestic regional product (GDRP) is very closely related to the coal production rate and its selling price due to flows of royalties and other incomes to provincial and local governments. In 2018, the contribution of coal mining to the GDRP of Kutai Kartanegara Regency (East Kalimantan) was 32% while in Paser Regency the contribution was soaring to 70%. At the national level, the contribution of coal to the national income is also high. Non-tax income from the minerals and coal sector in 2022 was IDR183.35 trillion, where 80% (IDR146.68 trillion) of the figure came from coal royalties. The amount is higher than the oil and gas share of IDR131.2 trillion.

A more bottom-up approach is needed in order to accommodate all stakeholder's aspirations and participation in the JET. Decentralization of the JET is also necessary. In this case, JET governance can be transferred to provincial and local governments with high transparency and accountability. A more detailed mesoscale and microscale policy should be formulated to implement the JET as well as mitigating JET impacts properly.

The informal sector, as one of the stakeholders, will be significantly impacted by the coal phase-out program. A detailed analysis will be needed regarding the coal demand declining rate and its scenarios, types of impact of the decline, the magnitude of impacts, how many formal and informal jobs are lost and create in order to mitigate such impacts. In this case, involvement of local governments is very critical to implement a smooth transition by formulating relevant development plans that take into consideration the long-term impacts of the coal phase-out, particularly for coal producer areas. The analysis will need to outline alternatives for diversification of income sources to create a sustainable growth of the GDRP, particularly for four provinces (East Kalimantan, South Kalimantan, South Sumatra, and Aceh) and their relevant regencies.

R4. Remedying Past Harm by Building On, and Enhancing, Existing Mechanisms

As a country that is rich with natural resources and its exploitation, coal mining companies in Indonesia have various experiences in managing the environmental impact of the mining operation, particularly open pit mining. One of the biggest challenges is to manage various sizes of mining, from artisanal and small-scale mining companies. In general, medium and big mining companies are more cooperative and more compliant to relevant regulations since they are managed in a more professional manner.

There are two main regulations regarding reclamation and post-mining activities, which are Government Regulation 78/2010 regarding Reclamation and Post-Mining and Minister of Energy and Mineral Resources Decree 7/2014 regarding Implementation of Reclamation and Post-Mining at Mineral and Coal Mining Business. The main requirements stipulated by such regulations are: calculation of reclamation, planning of reclamation, planning of post-mining and mine closure, reclamation implementation, mine closure implementation, and the provision of a reclamation and post mining fund.

Thousands of mining companies in Indonesia have not provided a reclamation and post-mining fund[30]. According to the Ministry of Energy and Mineral Resources, in 2019, there were 4,403 mining companies that had a mining business permit (IUP), and 3,120 (71%) of them did not provide such a fund. This condition indicates unproper governance of mining impacts in Indonesia. The government (national and subnational) cannot enforce their own regulation effectively. If this condition continues, the land ecosystem in the mining areas will be deteriorate badly. The above condition will be more severe if we consider artisanal and small-scale mining companies that, obviously, do not have enough funds to implement good reclamation and post-mining practices.

Indonesia has experience with mine closure processes that can be examined for lesson learned. Kelian Equatorial Mining (gold mining) in Kalimantan has completely finished their mine closure process in 2005[31]. Newmont Minahasa Raya (also a gold mining company) also has conducted their mine closure process a long time ago in 2004. Their mine closure plan and implementation can be used as a model or lessons learned for the improvement of good mining governance in Indonesia, particularly in reclamation and post mining.

In this case, since such governance is quite poor, the government should conduct an in-depth and thorough review regarding reclamation and post-mining practices, by engaging all relevant stakeholders and make sure that the burden of the mine closure is shared in a just manner. Without such collaboration, national and subnational governments are not able and capable to enforce their own rules, today and in the future.

P1. Assisting Communities to Understand the Just Transition on Transparency and Accountability

The JETP funding mechanism should be managed in a transparent and accountable manner. Public dissemination regarding the funding mechanism should be carried out inclusively. Basically, the JETP funding comes from two sources: USD 10 billion from government of partner countries and another USD 10 billion from the private sector of partner countries using a market mechanism. However, it's important to note that the U.S. government, as IPG partner, has encouraged private sector entities within the country to contribute to JETP funding using a market-based mechanism[32].

Practically, all the funding is based on the market mechanism. According to the Ministry of Energy and Mineral Resources, in May 2023, JETP increased its funding commitment to USD 21.7 billion, comprised of USD 11.7 billion from public funding and USD 10 billion from commercial funding. Public funding will be in the form of grants, technical assistance funding, soft loans and loan guarantees. Commercial funding will be facilitated by GFANZ (Glasgow Financial Alliance for Net Zero) that consists of Bank of America, Citi, Deutsche Bank, HSBC, Macquarie, MUFG and Standard Chartered. The CIPP (Comprehensive Investment and Policy Plan) will be officially published on 16 August 2023.

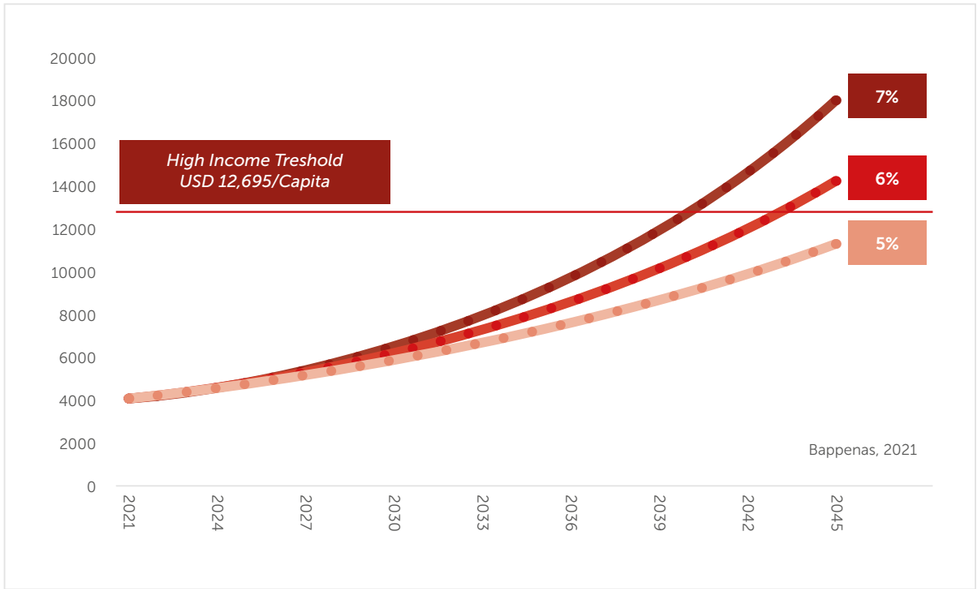
Considering that the main player of JETP is PLN, a state-owned company, such funding condition should be informed to the public transparently: how is the real funding mechanism (is it government to government, government to business, business to business, or blended finance?), what is the duration and how is its payment mechanism, its interest rate, and other funding issues in order to ensure that the public has a good understanding and awareness. IESR suggests that the grant portion in the JETP financing scheme should be more than 10 percent (more than two billion USD)[33]. However, PLN said that the book value of early retired CFPPs is more than 5 billion USD, and this amount should be covered with grants to make PLN's financial condition is not heavily disrupted[34].

P2. Supporting Worker and Community Organizations

Green Jobs Development

On 15 June 2015, the President of the Republic of Indonesia launched the Final Draft of Long-Term National Development Plan (RPJPN) 2025-2045. The plan, containing 8 development agendas, 17 development directions, and 45 main development indicators, is set to realize the Golden Indonesia Vision (Visi Indonesia Emas 2045)[35]. Becoming a high-income country is one of the main goals of such vison. According to the World Bank, the threshold for a high-income country is USD 12,695/capita in terms of Gross National Income (GNI), using the Atlas Method. In 2021, Indonesian GNI/capita was USD 4,140, and the country was categorized as lower middle-income country (with USD 1,086 – 4,255 of GNI/capita).

Figure 11: Gross National Income Projection (USD/Capita - Atlas Method)



The National Development Planning Agency (Bappenas) has made a projection, using different economic growth rates. Using the existing growth rate of about 5%, the projection is indicating that Indonesia cannot escape from the "middle income trap" before 2045[36]. The Business-as-usual economic approach is not capable to deliver a higher growth rate. To overcome this situation, a fundamental economic transformation is needed. According to Bappenas there are six main strategies for such transformation, which are:

1. Human resources development,
2. Economic productivity improvement,
3. Relocation of the national capital (IKN Nusantara),
4. Digital transformation,
5. Domestic economic integration, and
6. Green and low carbon economy.

To support these strategies, the development of capable human resources, particularly related to green jobs, is necessary.

Indonesia National Qualification Framework (KKNI) for Green Jobs

Collaboration between the National Development Planning Agency (Bappenas), German International Cooperation Agency (GIZ) and relevant stakeholders has resulted in formulating a National Occupation Map in the Indonesian National Qualification Framework (KKNI) in the field of green jobs. The map was drafted to map-out, in detail the various positions/ occupations/professions in various sectors, sub sectors and functional areas in all kinds of jobs. It is aimed to become a reference for:

- Ministry/technical institutions for formulating the Indonesian National Work Competency Standards (SKKNI) in the field of green jobs;

- The business sector for developing human resource professional careers in the field of green jobs and for the process of planning or recruitment of competency based human resources;
- Educational and vocational institutions for developing curriculums and learning processes in order to provide outputs that match with industry's needs; and
- Professional certification institutions for developing certification schemes to be used to formulate competency test materials, prepare assessors, and conduct profession assessments.

Until 2022, there were five functional areas developed for green jobs, including agriculture, manufacture, construction, renewable energy, service (tourism), and one cross-sectoral area. In total there were 191 occupations identified, with 70 of these already having their own SKKNI or SKI (Indonesia Competency Standard) and 121 occupations that do not have competency standards. Among the identified occupations, the renewable energy occupation is the most complete in terms of availability of competency standards. Out of 71 identified occupations, 52 have competency standards (73%).

The KKNI or Indonesian National Qualification Framework is a national general reference framework regarding qualifications. KKNI functions as a tool for enabling comparison of qualifications in Indonesia and among countries. Such framework for green jobs has been developed for renewable energy main key functions, particularly for three fields, namely solar (PLTS), wind (PLTB) and micro-hydro power generation (PLTMH)[37]. Unfortunately, most of occupations did not have competency standards yet. Only six occupations had complete competency standards, and these are therefore ready for implementation in industry, education, training, certification and recruitment.

Table 10. Identified Green Jobs Occupation in Indonesia

Identified Green Job Occupations	Number of Occupations	Competency Standards are Available		Competency Standards Are Not Available
		SKKNI	SKI	
Cross-Sector	73	6	2	65
Agriculture	11	5	0	6
Manufacture	15	0	0	15
Construction	12	5	0	7
Renewable Energy	71	52	0	19
Service (Tourism)	9	0	0	9
Total	**191**	**68**	**2**	**121**

P3. Collaborating Actively with a Range of Stakeholders

Involvement and Leadership

The JETP initiative is currently at the planning stage and working on formulating a Comprehensive Investment and Policy Plan (CIPP). The CIPP is divided into five areas namely: (1) transmission network development, (2) early retirement of CFPPs, (3) development of baseload type of new and renewable energy, (4) development of variable types of new and renewable energy and (5) development of a new and renewable energy supply chain. Five working groups are led by international organizations, the Policy WG is led by the World Bank,

the Funding WG is led by the ADB, the Technical WG is led by IEA, the Electrification and Efficiency WG is led by WRI, and the Just Transition WG is led by UNDP.

Indonesia's transition pathways have to be economically and socially feasible and follow an achievable timeframe. It can build investors' confidence with a transparent and inclusive CIPP planning process, one that is realistic about the needs of target investors and respects the needs of affected communities, and not just a small circle of political and business interests.

Women and the Marginalized Groups

The number of households in 2022 was projected at 88.37 million households. In the same year, the proportion of women who became the head of household were 12.72%[38] or 11.24 million women, more specifically, 13.73% in rural areas and 11.83% in urban areas[39]. In the Indonesian culture, women are the main users of energy, particularly for cooking and operating home electrical appliances. The quantity of women who use electricity is increased if we consider informal business sector activities, where the number of women entrepreneurs is growing and now reaches 42.67% (34.10% in the formal sector)[40]. According to the latest statistics, these facts show that women are important stakeholders in the energy sector in Indonesia. Inclusion of women in the energy decision making is critical in formulating effective energy policies.

Indigenous communities in Indonesia often reside in areas rich in natural resources, including energy resources like forests and land suitable for renewable energy projects. However, energy decision-making processes can frequently exclude them, leading to land grabbing, displacement, and environmental degradation. The lack of consultation with indigenous people can result in projects that disrupt their traditional livelihoods and cultural practices. The rights and interests of indigenous communities must be prioritized in energy planning and decision-making, ensuring proper consultation and benefit-sharing mechanisms. Disabled individuals in Indonesia may face challenges in accessing energy services due to physical barriers and a lack of accessible infrastructure. Including disabled individuals in energy planning discussions can provide valuable insights into their unique needs[1]. While the elderly population may have specific energy needs, such as heating and cooling for health reasons. Power outages and disruptions can be particularly problematic for them.[2]

Green jobs, often associated with renewable energy projects, energy efficiency initiatives, and sustainable development, can provide opportunities for greater gender inclusion compared to traditional fossil fuel industries. It is widely recognized that the renewable energy sector generally has a more even gender distribution compared to fossil fuel-based energy production, which historically has been male-dominated. This shift can be attributed to the relative novelty of the green energy sector and its emphasis on sustainable practices and diverse skill sets.

Institutional Aspects

The main institution of the JETP in Indonesia is the JETP Secretariat. This institution is established based on a Joint Statement by the Government of the Republic of Indonesia and International Partner Group members of the Indonesia JET Plan, signed in Bali 15 November 2022. With this kind of institution, the JETP Secretariat is not an official state institution. Therefore, the Secretariat function has more to do with the proposition and promotion of JET, without official

[1] Accessibility and Renewable Energy in Developing Countries by the United Nations.

[2] Energy Poverty and Vulnerable Groups in the Asia Pacific Region by the Asian Development Bank

and formal authority in that field. By involving a small group of stakeholders, without active participation by provincial and local governments, relevant ministries and institutions, higher education (particularly vocational education), coal mining, impacted labours, and impacted communities the Secretariat engagement approach seems exclusive and not participative.

A study conducted by CELIOS[3] (Center of Economic and Law Studies) in three provinces and involving three regencies in North Sumatra, Central Java, and East Java found that local governments (province and regency) are not involved in the JETP agenda, particularly regarding the risks of early retirement of CFPPs towards labour jobs and to local contractors and suppliers surrounding the power plant. Local governments are not even involving in analyzing and managing local revenue generation loss and creation due to the retirement.

Another study conducted by the same institution, found through intensive survey that many respondents are still unaware of the JET Partnership (JETP) funding scheme. A total of 76% of respondents have reported that they are not aware of the JETP funding for energy transition in Indonesia. Interestingly, the survey also found that women have a higher awareness of JETP compared to men, 79% compared to 69% of awareness[41].

P4. Supporting the Design and Implementation of Just Transition Projects

The source of fund from JETP commitment of USD20 billion should be considered as a kind of financial modalities or concessional finance. The amount will not be enough for covering funding needs for a net zero emission program which is USD 28 billion per year, in average, until 2060. In Indonesia, JETP will be implemented through the Comprehensive Investment and Policy Plan (CIPP) which has identified five main areas to accelerate the energy transition, as follows:

1. Transmission lines and grid deployment. Expansion of transmission lines within and between power systems, advanced control center (ACC) to accommodate VRE, development and implementation of Smart Grid (including implementation of Advanced Metering Infrastructure (AMI), Distribution Automation System (DAS), roadmap extends beyond 2025);
2. Early coal-fired power plant retirement. Phasing down of the coal-fired power plants to meet CO2 emission target by 2030;
3. Baseload renewable energy deployment acceleration. Foundational renewable infrastructure and will be prioritized for the short term; hydroelectric, geothermal power plants and other baseload energy power plants (including biomass, nuclear);
4. Variable renewable energy deployment acceleration considering the readiness of grid infrastructure; solar power plants, wind and other sources of VRE (e.g., tidal or ocean current);
5. Renewable value chain enhancement. Enabling infrastructure and operations related to the transition.

From the information above, it seems that CIPP is a technical document, just aspects of the transition are not explicitly mentioned. The list also indicates that the main actors in JETP are only the government and PLN. Again, JET is a complex effort that should engage all relevant stakeholder inclusively. An exclusive engagement is not acceptable.

To overcome this condition, an inclusive multi-stakeholder platform of JET in Indonesia should be established. The platform should become a vehicle of inclusive engagement for stakeholders to participate and collaborate in implementing JET in Indonesia.

[3] CELIOS and Yayasan Cerah Indonesia, Percepatan Transisi Energi Berkeadilan: Tantangan dan Peluang untuk Daerah, 2023

5.
Conclusions and Recommendations

Mentari_Palladium, Feri Latif, 2023

CONCLUSIONS

In summary, the main conclusion of this research is, in general, Indonesia is not adequately prepared to implement JET, this indication supported by two findings:

1. **Inadequate engagement of relevant stakeholders**. Most of relevant stakeholders are not effectively carrying out their specific roles in the JET process. This lack of engagement hinders successful execution of the implementation plan. Under existing project scheme (JETP and ETM), the main actors and stakeholders of energy transition is limitedly exclusive to National Government and PLN only.
2. **Insufficient implementation of JET principles.** Most of JET principles are either not implemented or only implemented at a low level.

RECOMMENDATIONS

Based on findings, this research comes to the following recommendations:

1. To promote and expedite the implementation of a JET in Indonesia, it is imperative to urge the Government of Indonesia to enact an integrated policy. This policy, ideally in the form of a Presidential Decree, will establish shared strategic goals, directions, and a comprehensive understanding of JET implementation in Indonesia. The policy should encompass the following key components:
   a. JET Definition: Clearly define the concept of JET to establish a common understanding among all stakeholders;
   b. Coordinating Ministry/Institutions: Recommend the designation of Bappenas, similar to their role in implementing Sustainable Development Goals (SDGs) through Government Regulation 111/2022[42];
   c. Comprehensive Framework: Develop a framework that addresses the full spectrum of risks and opportunities associated with JET implementation from both upstream and downstream aspects;
   d. Roles and Responsibilities: Outline the roles and responsibilities of all relevant stakeholders involved in the JET process to ensure effective coordinated efforts;
   e. Inclusive Engagement Mechanism: Establish a mechanism that fosters inclusive participation of all relevant stakeholders, including communities, civil society organizations, private sector and academia, in the decision making and implementation process;
   f. JET Governance Framework: Establish a governance framework that ensures transparency, accountability and effective monitoring and evaluation of JET initiatives; and
   g. Specific JET Goals: Set specific and measurable goals for the JET, aligning with national and international commitments to address climate change and promote sustainable development.

   By enacting such an integrated JET policy, Indonesia can accelerate progress towards a sustainable and equitable energy future, ensuring that the benefits of JET reach all segments of society leaving no one behind.
2. To establish a multi-stakeholder platform under the President or the Coordinating Ministry/Institution as an inclusive vehicle for participating and collaborating on the energy transition implementation in Indonesia.
3. To promote inclusion of JET into the national and subnational medium-term development plan (RPJMN and RPJMD) as the key narrative in the Plan, as well as inserting a formal paradigm of JET into such development plan.

Table 11. Proposed JET Paradigm

Transition Aspects	From	Towards
Energy Service	Unequal distribution and service quality	Robust energy service for Economic Development
Energy Sources	Fossil based	Renewable energy based
Governance	Centralistic Heavily subsidized High carbon emission	Decentralized Market mechanism Low carbon economy
Energy Sources	Fossil based	Renewable energy based
Engagement	Exclusive	Inclusive Participative Collaborative
Jobs	Grey jobs	Green jobs
Impact Management	Risk based	Risk and opportunity based

Source: Author analysis

4. To promote advocacy and enhance JET literacy to all relevant stakeholders with particular attention to women, marginalized groups, labours, local government, and other impacted communities. This approach aims to empower stakeholders, enabling them to effectively mitigate the impacts of the energy transition while also seizing the opportunities it presents.
5. To promote inclusive and participative engagement of all business sector stakeholders of the value chain of coal to CFPPs. By such involvement, the risks, opportunities, burden and other impacts of the energy transition can be mapped comprehensively. Through this kind of map, the distribution of benefits and burdens will be clearer and more transparent.
6. To promote a collaborative good governance guideline for JET implementation in Indonesia, that is inclusive, transparent and accountable.
7. To promote promulgation of an electricity policy that focuses on robust electricity service, particularly for off-grid areas and includes the mini and off-grid sector as part of the JETP investment plan. The policy should include efforts to transform electricity service to be able to achieve equal electricity quantity and service quality across Indonesia in order to support economic growth and sustainable development.
8. To promote development of a comprehensive social plan to mitigate risks and to maximize opportunities of the coal phase-out, particularly for main coal producer coal reliant regions (such as the provinces of South Sumatra, South Kalimantan and East Kalimantan). There is a strong binding of socio-economic activities of communities with coal business, formally and informally. Community based organizations in the region should be actively involved in the transition processes, particularly in decision making. Marginal groups such as women, youth, indigenous communities, diffable should not be left behind. Another important aspect regarding this issue is funding. Learning from South Africa, 26% of the total JETP funding goes to the social component. Since coal production in Indonesia is bigger than South Africa, and the coal related impacted areas are larger too, the portion for social related funding could be higher.

6.
Appendix

APPENDIX 1. INPUT, PROCESS, OUTPUT AND IMPACTS OF ELECTRICITY POWER GENERATION. CASE STUDY OF PT. PLN INDONESIA POWER

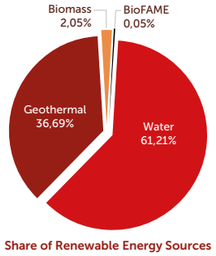
Input, Process, Output and Impacts of Electricity Power Generation Case Study of PT PLN Indonesia Power

An electricity generation plant or power plant is part of our modern life. Its function is critical for humanity, as a source of electricity, which without it our daily living will be drastically changes. Most of our machines, equipment and devices are relying on electricity. On the other hand, the plant also have some impacts to our social, economic and environmental aspects. It provides jobs for thousands of people, creates direct business relation as well as indirect ones, contributes to local and national income, and disbursing for community development and empowerment. Unfortunately some negative impacts also occur. Power plant operations containing high occupational risks potentials. Incidents, acci-dents, and even fatality happened many times. On the other hand, power plants are main contributor to green house gases (GHSs) and conventional air pollutants emission. Waste generation in the form of wastewater, liquid waste, solid waste, and hazardous waste is side results of such operations. Power plant also disturbing our ecosystems by utilization and withdrawing of natural resources such as oil, gas, coal, geothermal, and water. Biodiversity alteration also take place due to land clearing process. In some cases, social conflict are found particularly regarding land tenure with local community or indigenous community.

Employment
- Total Employee: 12,952
- Outsourcing Employee: 8,730
- Contract Employee: 33
- Permanent Employee: 4,189
  - Female: 431 (10.29%)
  - Male: 3,758 (89.71%)

Training & Development
- Total Training Hours for Employees: 404,552 hour
- Training Hours/Employee: 97 hour/year

Satisfaction & Engagement
- Employee Satisfaction Index: 80.9%
- Employee Engagement Index: 86.0%



Share of Renewable Energy Sources

Good Governance
- Number of Employee Participating in Anti-corruption training: 490 person/year (2022)
- Anti-corruption and anti-bribery communication to board of commissioner, board of director, and all employee: 100%
- Whistle Blowing Follow-up: 100%

Management System Certifications
- ISO 9001:2015 Quality Management System
- ISO 14001:2015 Environmental Management System
- ISO 45001:2018 Occupational Health and Safety Management System
- ISO 28001:2007/SNI ISO 28001:2009 Supply Chain Security Management System
- SMK3/OHSMS (Government Regulation 50/2012)
- ISO 55001: 2014 Asset management system
- ISO 27001:2013 Information Security Management
- ISO 50001:2018 Energy Management System
- ISO 22301:2019 Business Continuity Management System
- ISO 37001:2016 Anti-Bribery Management System

Fuel
- Coal: 12,848,609 ton
- High Speed Diesel: 56,922 kiloliter
- Marine Fuel Oil: 25,049 kiloliter
- Natural Gas: 59,941 BBTU
- BioFame: 2,666 kiloliter
- Biomass: 132,941 ton

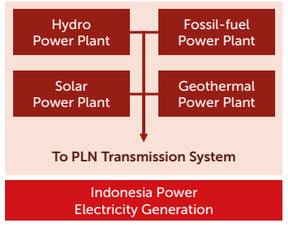
Local Supplier Development
- Number of Local/national Suppliers: 1,780
- Ratio of Local/National Supplier: 99.27%
- Total Procurement Value: IDR 24,881 billion
- Local/National Procurement Value: IDR 22,331 billion (89.75%)

Environmental & Social Disbursement
- Environmental Management Cost: IDR 65,245 million
- CSR Fund Disbursement: IDR 47,696 million
- Community Service: IDR 12,198 million (25.6%)
- Community Relation: IDR 12.235 million (25.7%)
- Community Empowerment: IDR 23,263 (48.7%)

Biodiversity
- Biodiversity Index: 2,63
- Biodiversity Conservation of Endangered Species

Occupational Health & Safety
- Total Working Hours: 29,203,879
- Lost Working Days: 12,000
- 2 Fatal Accident in Contractor Operation

CSR Management System
- Corporate Social Responsibility Roadmap
- Implementing ISO 26000 Social Responsibility



Water & Wastewater
- Water withdrawal: 2,881,392 million liter
- Wastewater volume: 2,127,238 million liter
- Water conservation: 603,361 meter^3

Waste & Hazardous Waste
- Hazardous Waste Generation: 1,086,152 ton (including FABA)
- Hazardous Waste Generation: 781 ton (excluding FABA)
- Reuse/utilisation of fly ash and bottom ash (FABA): 107,565 ton
- Non-Hazardous Waste Generation: 3,604 ton
- Non-Hazardous Waste Reuse/Utilisation: 2,021 ton (56.1%)

Capacity & Production
- Installed Capacity in Java – Bali: 9,031.41 MW
- Electricity Generation: 37,510.12 GWh
- Electricity from Renewable Energy: 7,456.50 GWh (19.88%)

Economic Contribution
- Operating Revenue: IDR 40,509 billion
- Income: IDR 5,764 billion
- Tax Payment: IDR 1,871 billion

Reliability & Performance
- Equivalent Availability Factor (EAF) % 92,03
- Scheduled Outage Factor (SOF) % 5,95
- Equivalent Forced Outage Rate (EFOR) % 1,30
- Sudden Outage Frequency (SdOF) 1,31 times
- Thermal Thermal Efficiency % 32,09
- Net Heat Rate kCal/kWh 2.680,01
- Customer Satisfaction Index: 87.23%

Energy & Emission
- Energy Utilisation: 470.557.694 GJ
- Energy Intensity: 12,544.82 GJ/GWh
- Energy reduction from efficiency program: 3,521,720 GJ
- GHGs Emission (Scope 1 and 2): 73,152,623 ton
- GHGs Intensity: 0.862 Kg CO2e/kWh
- GHGs Emission Reduction: 4,103,245 ton CO2e
- Conventional Air Pollutants Emission: 405,032 kg
- Conventional air pollution intensity: 0.0048 kg/kWh

Notes[43]:
- EFOR measures the forced outbreak of the engine or the unpreparedness of the unit to operate due to disruption. Thus, a lower EFOR value indicates a better reliability of the generating unit that can handle disturbances faster.
- SdOF shows the number of disruptions that happen during a certain period, especially the frequency of repeated disruption. Thus, lower SdOF value reflects better Company's operational management in mitigating disturbances.
- Thermal efficiency shows the electricity level generated (output) during the utilization of fuel (input) on a power plant in a certain period. Thus, the higher the Thermal Efficiency rate, the more efficient the power plant is.
- Net Heat Rate measures the efficiency of fuel consumption in the calorific rate required for each net production kWh generated by the generating unit in a certain period. Thus, lower value of Net Heat means a more efficient power plant.

APPENDIX 2. INDONESIA NATIONAL QUALIFICATION FRAMEWORK (KKNI) FOR GREEN JOBS

KKNI	MAIN FUNCTION AREA: GREEN JOBS		
	MAIN KEY FUNCTION: RENEWABLE ENERGY		
	SOLAR POWER GENERATION - PLTS	WIND POWER GENERATION - PLTB	MICRO-HYDRO POWER GENERATION - PLTMH
IX	**Green Productivity Master Specialist,** Sustainability Senior Specialist		
	Senior Expert of Various Renewable Energy Electricity Generation		
VIII	Green Productivity Specialist, Sustainability Specialist, Environmental Specialist, Nature Conservation Specialist (2133.03), Environmental Protection Expert (2133), **Environmental Engineering Expert (2143),** Ecology Expert (2133.01), Environmental Sanitary Engineering Expert (2142.07), Conservation Scientist (2133), Policy Analyst, Water Resources Specialist, **Environmental Impact Assessment (AMDAL) Document drafter (Team Leader of AMDAL Drafter (KTPA)**		
	Expert of Various Renewable Energy Electricity Generation		
	Green Productivity Analyst, Sustainability Executive, Energy Policy Analyst, Environmental Engineer, Environmental Project Manager, Air Quality Engineer, Environmental and Occupational Health and Hygiene Professionals (2263), Environmental Protection Professional (21233), Ergonomic Specialist, Electric Power Generation Engineer (2151), Environmental Consultant, Environmental Engineer (2143), Environmental Project Manager Mining Remote, Carbon Consultant, **Environmental Impact Assessment Formulation Team (ATPA), Environmental Auditor**		
	Biofuels Production Manager; Biofuels Technologist; Energy Efficiency Specialist; Renewable Energy and Energy Efficiency Specialist; Biofuels Specialist		
	Primary expert of PLTS; Solar energy engineer.	Primary expert of PLTB; Wind Energy Engineer.	Primary expert of PLTMH.
VI	Sustainable Managers/Technical Specialists, Ergonomist, Waste Diversion Consultant, Environmental Consultant (2133.07), Environmental Analyst (2143.02), Radiation Protection Expert (2263), Air Pollution Analyst (2133), Environmental Adviser (2133), Environmental Manager, Green Information Technologist, Urban And Regional Planner, Sustainability Manager, **Analyst of Measurement Test and Environmental Quality**		
	Energy Analyst		
	Senior technician of off grid PLTS system design; Senior technician of on grid PLTS system design; Senior technician of PLTS installation (solar installer); Senior technician of inspection and testing of subsystem and system of PLTS; Senior technician of system maintenance of photovoltaic PLTS.	Senior technician of system design of small scale PLTB; Senior technician of system design of medium and large scale PLTB; Senior technician of installation of PLTB; Senior technician of inspection and testing of PLTB subsystem; Senior technician of inspection and testing of PLTB system; Senior technician of system maintenance of PLTB.	Senior technician of planning of off grid PLTMH under 100 kW; Senior construction of PLTMH construction; Senior technician of mechanical and electrical of PLTMH and its supporting equipment; Senior technician of inspection and testing of PLTMH subsystem; Senior technician of inspection and testing of PLTMH system Senior technician of PLTMH maintenance.

KKNI	MAIN FUNCTION AREA: GREEN JOBS		
	MAIN KEY FUNCTION: RENEWABLE ENERGY		
	SOLAR POWER GENERATION - PLTS	WIND POWER GENERATION - PLTB	MICRO-HYDRO POWER GENERATION - PLTMH
V	GP Analyst/Technician, Environmental Advisor, Environmental Impact Analyst, Environmental Program Manager, Natural Resources Planner, Natural Resources Policy Analyst, Waste Diversion Program Manager, Environmental Program Manager, Environmental Technician, Technician of Nature Conservation, Environment Protection Technician, Forest And Conservation Technician, Analyst of Air Pollution (2133.02), Environment Health Officer (2263), Occupational Health and Safety Adviser (2263), Occupational Hygienist (2263), Occupational Health and Safety Inspector (3257), Sanitary Inspector (3257), Green Data Analyst, Environmental Coordinator, Environmental Program Co-Ordinator, Waste Reduction Program Co-Ordinator, Waste Diversion Program Co-Ordinator, Recycling Residuals Management Co-Ordinator, Recycling Program Co-Ordinator, Regional Recycling and Waste Reduction Program Co-Ordinator, Recycling Coordinator, **Environment Supervisor**		
	Energy Auditor		
	Planning: Technician of location survey of off grid PLTS; Technician of electrical system design of off grid PLTS; Technician of civil engineering of off grid PLTS; Technician of design evaluation of off grid PLTS; Technician of location survey of on grid PLTS; Technician of electrical system design of on grid PLTS; Technician of evaluation of on grid PLTS. **Installation and Construction:** Technician of construction of civil component of photovoltaic PLTS; Technician of mechanical component of photovoltaic PLTS; Technician of electrical component of photovoltaic PLTS. **Inspection and Testing:** Technician of inspection of PLTS subsystem; Technician of inspection and testing of PLTS system.	**Planning:** Technician of feasibility study of small scale PLTB utilization; Technician of small scale PLTB design; Technician of location study of medium and large scale PLTB; Technician of electrical system design of medium and large scale PLTB; Technician of civil work of medium and large scale PLTB. **Inspection and Testing:** Technician of inspection and testing of mechanical subsystem of PLTB; Technician of inspection and testing of electric subsystem of PLTB; Technician of inspection and testing of civil engineering subsystem of PLTB. **Maintenance:** Maintenance technician of small scale PLTB; Maintenance technician of medium to large scale PLTB; Wind Turbine Technician.	**Planning:** Technician of location study of under 100 kW PLTMH; Technician of civil work construction of under 100 kW PLTMH; Technician of mechanical planning of under 100 kW PLTMH; Technician of electrical planning of under 100 kW PLTMH. **Installation and Construction:** Technician of civil works construction of PLTMH; Technician of mechanical component installation of PLTMH; Technician of electrical component installation of PLTMH. **Inspection and Testing:** Technician of inspection and testing of civil engineering subsystem; Technician of inspection and testing of mechanical and electrical subsystem.

KKNI	MAIN FUNCTION AREA: GREEN JOBS		
	MAIN KEY FUNCTION: RENEWABLE ENERGY		
	SOLAR POWER GENERATION - PLTS	WIND POWER GENERATION - PLTB	MICRO-HYDRO POWER GENERATION - PLTMH
IV	Junior Analyst/ Technician, Sustainable Operation Supervisor (Au), Environmental Program Development Supervisor, Waste Reduction and Recycling Officer, Energy Program Officer, Chemical Processing Plant Controller (3133), Safety Health and Quality Inspector (3152), Conservation Officer (2133), Environmental Auditor (2133), Environmental Supervisor Chief Sustainability Officer (CSOS)		
	Power System Operator (3131), Electric Power Plant Operator (3131), Generating Station Operator (3131)		
III	Sustainability Officer, Conservation Officer, Incinerator and Water Treatment Plant Operator (3132), Incinerator Operator (3132), Liquide Waste Process Operator (3132), Pumping-Station Operator (3132), Sewage Plant Operator (3132), Waste Water Operator (3132), Water Treatment Plant Operator (3132), Water Quality Analyst (2133),		
	Solar Installer		Hydroelectric Power Plant Operator (3131)
II	Sustainability Operator Team Leader (Au), Recycling Worker, Park Ranger (2133)		
I	Sustainability operator (Au), Refuse Materials Collection, Hazardous Materials Work		

***Bold Phrases** are occupation that has had complete competency standards, therefore is ready for implementation in industry, education, training, certification and recruitment.

APPENDIX 3. STATEMENT OF POSITION OF INDONESIAN TRADE UNIONS/WORKERS ON CLIMATE CHANGE AND A JUST TRANSITION (5 JUNE 2021)

With regard to the commemoration of World Environment Day which falls on Saturday, 5 June 2021, the Indonesian trade unions (Serikat Pekerja), which is incorporated into 7 confederations and 17 federations, issued a statement expressing their joint concern for the environment while at the same time emphasizing several important elements related to aspects of employment that are inseparable from this and asked the Indonesian government through the Ministry of Manpower, to make the following concrete suggestions:

1. Immediately form a climate change and just transition committee on a fourpartite basis with a composition of government, labour union, worker and business sector. This committee is needed to address every existing climate change and business climate policy so as not to be detrimental to employment and ensure decent work as a priority.
2. To respond to the coal phase out plan (reducing fossil fuels by ending coal mines in 2050), the Ministry of Manpower must immediately carry out comprehensive, accurate data collection on the number and location of coal companies, the number of workers affected and efforts to minimize the big impacts that it will bring about, especially the scenario of a just transition of businesses and jobs that will be lost/moved as a result of this policy. These efforts must involve workers/labor unions and employers from an early age to have a dialogue to minimize the negative impacts that will arise in the future.
3. The Ministry of Manpower must be clearer and more directly involved in the NDC (Nationally Determined Contribution) policies for the 2021-2025 and LTS LCCR (Long Term Strategy Low Carbon Climate Resilience 2050) policies. **In this case, the** labour union assesses the government's lack of seriousness in accommodating the Just Transition elements that have been committed to in the preamble of the Paris Agreement and the Silesia Just Transition Declaration 2018, judging by the lack of discussion of Just Transition in the two important country documents and not reflecting a serious commitment to prepare for anticipation of the negative impacts that arise in the detailed scenario of reducing carbon emissions in the 5 priority sectors. Efforts to minimize negative impacts must contain the basic principles of Just Transition:
   - access to information for business actors and workers whose companies are affected by mitigation policies, so that they know early on
   - social protection for workers who lose their jobs, are structured, laid off or have reduced incomes as a result of their affected jobs
   - schemes and access to small and medium enterprises, especially informal ones for workers who have lost their jobs and are unable to return to work
   - social dialogue as an effort to get the best solutions with a win-win solution approach if the company where they work is affected by mitigation policies
   - Training facilities and skill updates for workers who have the potential to change jobs.
4. The Ministry of Manpower needs to develop programs and budgets, as well as establish a division in charge of this issue to intervene more strongly in existing policies while demonstrating a clear commitment to the issues of climate change and a just transition, for a safer Indonesia with guaranteed jobs that are environmentally friendly, so that every existing policy can synergize with these principles.
5. It is necessary to follow up on the initial document that was formulated in a tripartite manner at the Bogor December 2019 (Bogor Declaration) in order to have technical guidelines for implementation that are more practical and implementable.

The above statement is not just a usual statement. It is a very powerful proposition to address most of labour related JET. The proposition points in the statement should be implemented by relevant stakeholders, particularly government, labor and labor union, and business sector.

Notes/References

Endnotes

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18 Office Park, 15th floor, Unit B.
Jl. TB Simatupang No.18. Jakarta
Selatan 12520 Indonesia
T: +62-21 27876233
F: +62-21 27876242
info@hsi.foundation
www.hsi.foundation