STUDY REPORT

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Ensuring a Just Energy Transition in Indonesia: Lessons Learned from Country Case Studies

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Ensuring a Just Energy Transition in Indonesia: Lessons Learned from International Case Studies

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Executive Summary

Currently, the global energy system is going through a state in which more renewable-based power plants are being built compared to fossil fuel-based power plants. In some countries, renewable energy slowly replaces fossil fuels to supply electricity. This phenomenon is known as energy transition. By the end of 2019, renewable energy capacity reached 2,537 GW, increased by 176 GW from that of the previous year (IRENA, 2020).

There are many contributing factors to the trend, but one thing is clear that this trend increases renewable installations and will further introduce more opportunities and benefits. In terms of climate change risk, the continuous process of burning coal for electricity will accelerate global warming and impose greater risks for the economy and environment. Thus, it is crucial for countries to decarbonize their energy system as early and as fast as possible. However, it is understandable that for some countries like Indonesia, ditching coal is problematic due to the heavy reliance on coal as an export commodity that generates revenue for both national and sub-national governments as well as a major source of fuel for power generation. Currently, the government renews mining licenses, sets a high target of coal production and export, and keeps building coal power plants to increase domestic coal absorption. These measures could potentially lead to coal infrastructure lock-in that hinders the attempts to increase renewable energy generation capacity in the power system.

Considering the urgency to avoid a climate crisis, energy transition from fossil fuels to clean energy is necessary to limit the increase in global temperature. Technology innovation, improved efficiency, and large-scale deployment of renewables in the past decade have sped up the learning curve of the industry that lead to the declining generation cost of renewables. The declining cost of renewables–notably solar, wind, and battery storage–has significantly lowered the levelized electricity cost of renewables, enough to compete with fossil fuel-based power plants. The changing economics of renewables exposes natural gas and coal-based energy to the risk of becoming stranded assets. The emergence of disruptive technologies driven by 3Ds–decarbonization, decentralization, and digitalization–will make the distributed energy generation more resilient, technically feasible, and more affordable that could further make fossil fuel generation uncompetitive.

Furthermore, the divestment from fossil fuels movement, initiated by financial and funds or asset management institutions, has been on the rise lately as the concern over climate change increases. The risk of carbon lock-in for the existing infrastructures and stranded assets from fossil fuel investments becomes higher as renewables become more affordable, making them sustainable alternatives for electricity generation. These are the main reasons why energy transition should be accelerated to minimize future consequences. Further, it is also important to ensure the process as a just energy transition since many people are going to be affected with varying degrees of severity.

The energy transition is complex and multifaceted. Efforts to transform energy systems involve changes, not only to energy technologies and prices but also to the broader social-economic assemblages that are built around energy production and consumption (Miller & Richter, 2014).

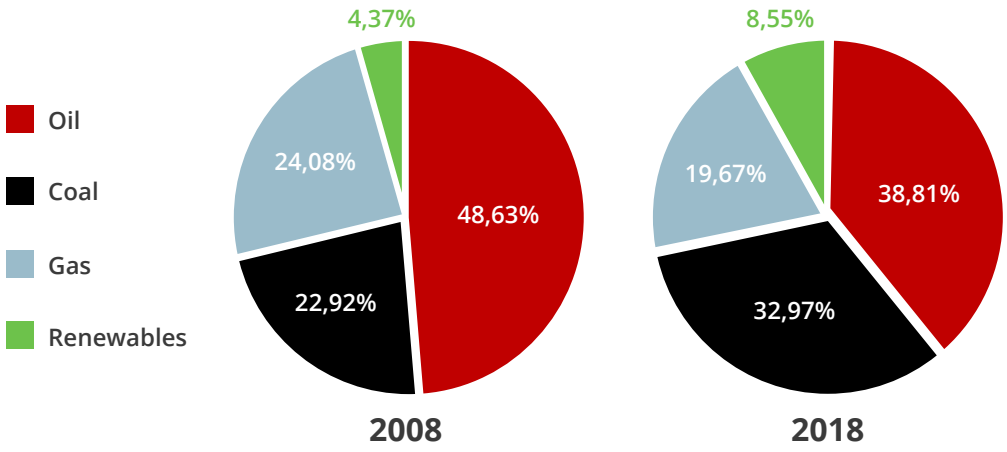
Since energy transition encompasses multi sectors with possible impacts on jobs, livelihood, prosperity, and development, it shall be conducted fairly and must also address the social costs and mitigate negative impacts on society. A just energy transition serves as a framework that guides the transition process and the mitigation of social costs, as the consequences from the process, which must be shared by all.

A just energy transition has many definitions based on the approach used since it has cross-sectoral effects. However, it has underlying values such as "leave no one behind" that will require many elements of the society to work together to start energy transition as early as possible. Initially, the term was introduced by the International Labour Organization (ILO) that highlights the provision of decent works to replace jobs lost due to economic transition. However, the definition becomes broader since the energy transition will also affect the environmental and social dimensions through the inevitable consequences of climate change on vulnerable people. It can cause shifts in the macroeconomic structure when the revenue from the extractive industries –in this case, the coal sector– falls and leads to slow or declining economic activities in respective countries or regions. If a country insists on keeping its business-as-usual practice, it could inflict further injustice on its people through the reversal of poverty reduction effort, limitation of market access, and asset lock-in effect (IASS, 2019). Therefore, it is important to develop a just energy transition plan that considers the economic aspects such as the labor market and state revenue. This can start from identifying the sectors that would potentially be affected by energy transition and establishing strategies to assist the sectors during the transition. A country can learn from other countries' experiences in transitioning energy systems.

This study observed the energy transition experiences of four countries namely Germany, South Africa, Australia, and Canada. There are some lessons that can be learned through their experiences. ***First*** is good governance in energy transitions, where the government establishes a clear plan based on comprehensive analyses on technical, economic, and social aspects to meet the transition objectives in a transparent manner by involving intensive public consultation. The plan's execution shall include long-term political commitment and coordination across all government levels. ***Second***, it is important for a country to create an enabling environment for investment in renewable energy to support its rapid deployment, help ensure energy security, and meet the climate objectives. ***Third*** is establishing social dialogue to collect the aspirations and concerns of the stakeholders before the execution of the transition plan. ***Fourth*** is the social protection and skill development policies to facilitate affected workers and communities through the transition. This can be done through new employment offers, retraining programs, or early retirement schemes for older workers and support for small businesses. ***Fifth*** is the economic transition and diversification. Here, the government shall provide several incentives to assist the emergence of new industries and expanding other sectors in order to diversify the economy. The ***sixth*** is the establishment of funding mechanisms to support just transition to support local development in the areas heavily dependent on coal.

As a coal producer and consumer, Indonesia needs to anticipate the impacts of energy transition and ensure a just energy transition domestically. Currently, fossil fuels dominate the primary energy supply while renewable energy development in the country is very slow relative to the world's trend (see graph below). The Indonesian energy sector continues the Business-As-Usual practice that does not fully recognize the need to shift away from fossil-based energy, despite the severity of the potential consequences of continuing the use of fossil energy.

With current conditions, we can expect several impacts that will occur if the country fails to plan and start the energy transition. The potential impacts include lower Gross Regional Domestic Product (GRDP), trade deficit, unemployment, and overall economic downturn. However, if the country manages to go through an energy transition earlier,



it can expect affordable system costs, economic diversification, growing green jobs, better air, water, and soil quality; and reduced health costs.

Therefore, it is wiser for Indonesia to go through the energy transition early to minimize the costs of stranded assets and anticipate the potential negative impacts of the disruption. At the same time, the country can expect to have a more just energy transition along with other positive opportunities. The table below provides several concrete recommendations to manage the energy transition in Indonesia based on case studies and literature.

Objectives	Actions
Understanding the entire spectrum of the energy transition and its impacts on the economy and coal industry by conducting researches or studies	• Policymaking based on experiences of countries that had gone through transition • Collaboration with stakeholders that have the expertise and experience relevant to the energy transition
Ensuring good governance in the energy transition process	• Development of transition plan in a transparent manner and by involving the relevant stakeholders. • Strategic Plan: development of vision and long-term goals (e.g., roadmap) emphasizing on the commitment to achieve the set goals • Tactical Plan: the creation of a task force to formulate agenda and coalition-building, networking, and negotiating with governments, employers, and workers (tripartism) as well as local communities and NGOs whose operation related to the energy transition • Operational Plan: the establishment of short-term targets required to achieve the long-term transition goals • Continuous monitoring and evaluation process
Building economic resilience through economic diversification and green job creation	• Development of renewable industry as a sustainable industry through the creation of demand supported by incentives (e.g., subsidy, FIT, and REC) • Infrastructure improvement as well as education and technology development to boost the competitiveness of new local industries and workers • Collaboration between local and central governments in identifying and supporting new and/or emerging industries to replace the coal industry and diversify the economy • Identification of incentive schemes for the development of potential industries to replace the coal industry
Setting up an active labor market, skills development programs, and social protection policies	• Establishment of labor market policies that support the affected workers • Creation of employment services to provide job-match and training for workers • Early retirement incentives for older workers
Establishing the energy transition fund	• Set up an endowment fund dedicated to supporting the transition process of coal-reliant regions • Utilization of financial instruments (e.g., carbon tax, green bonds, and budget transfer) as the sources of fund

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1 Introduction

The world's energy systems have changed significantly in the past decades. Coal once was considered as the cheapest energy source, now it is no longer the case in many parts of the world. The share of coal in the global electricity mix has been steadily declining from a peak of 40% in 2009 to 38% in 2019 (OECD/IEA, 2014; IEA, 2019). One of the main factors driving this change is the increased use of renewable energy in the power sector due to the declining costs of renewable generation. The installed capacity of renewable power plants in Indonesia had been ticking up to 9.9 GW in 2019 from 6.7 GW in 2009, although in terms of generation, the share of renewables has been stagnant at 11%–13% (IRENA Statistics, 2020; IESR, 2018).

Looking at the global market, renewable energy will inevitably make fossil fuels uncompetitive and continue to propel energy transitions around the world. While renewable energy can create new economic opportunities through the creation of new jobs and benefit the economy in general, the energy transition will also introduce some risks to the economy that once heavily relies on fossil fuels. Indonesia, for instance, is still using coal as one of its main commodities that helps improve its trade balance and for electricity generation. The coal industry has also been an important contributor to the economic development of coal-producing regions in the country. Energy transition, therefore, may expose the country and the regions to the risk of economic downturn, job losses, and potentially causing social unrest.

The policymakers and stakeholders must understand that careful planning to mitigate these risks is vital to make the transition just. The concept of just energy transition itself was first introduced by labor unions to raise awareness of the need to provide workers and community protection from the adverse effects of transition and the opportunity to generate adequate jobs, enhance welfare, and help reduce socio-economic inequalities (ILO, 2015). In a broader context, a just energy transition, therefore, should contemplate not only the justice of transition to coal communities but also to the entire ecosystem affected by the transition. Justice in the context of transition entails social inclusion and participation as well as an equal share of burdens and opportunities within society (Hirsch, Matthes, Funfgelt, 2017).

Albeit being well-understood, the realization of this concept is challenging. A just transition should include various facets, such as economic, social, political, and environmental aspects, which most of the time are arduous to address simultaneously. While some success stories are available from other countries, no one course of action can be replicated in all economies.

In the Indonesian context, the government has started to administer policies and regulations to increase the uptake of renewable energy in the power sector and improve energy efficiency. Considering the global trends in renewable energy, the Indonesian power sector will likely go through the same transition phases in the coming years. For that reason, the government of Indonesia needs to prepare the country to manage its impacts to ensure that no one is left behind in the transition process.

This report aims at establishing qualitative, evidence-based discussions about the prospect and impact of energy transformation on the Indonesian economy as well as providing lessons learned and recommendations that may help prepare both central and local governments to face the possible outcomes of the country's transition. This report is intended as a means to start discussions on how Indonesia can navigate the proper path of the energy transition.

The report starts with the meaning and reasoning of the energy transition, followed by examples of global energy transitions, from which we extracted lessons before exhibiting the status of the energy transition in Indonesia. The last part of this report provides analyses of transition impacts from the economic, social, political, and environmental standpoints and presents recommendations for policymakers to ensure a just energy transition in Indonesia.

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2 Energy Transition

The International Renewable Energy Agency (IRENA) defines energy transition as "a pathway towards the transformation of the global energy sector from fossil-based to zero-carbon by the second half of the century." Others interpret energy transition as changes in energy flows coordinated through the energy market (techno-economic aspect) which lead to changes in the extraction, transformation, and utilization of energy along with the associated knowledge, practices, and networks of energy technologies (socio-technical aspect) as well as changes in the policies that regulate the energy systems (socio-political aspect) (Cherp et al., 2018). All of these indicate that the energy transition is a complex process that involves multidisciplinary approaches.

While complex, it is worth knowing why the world has to go through the transition process. The Paris Agreement might have been recognized as the main driving force of energy transition. However, other factors such as declining renewable energy costs and increased air pollution have pushed more countries to move away from coal.

2.1. Why Energy Transition?

The energy transition is the solution to respond to changes in the global energy systems, to avoid risks caused by the inevitable change, and to seize the opportunities early on. If a country fails to plan its energy transition accordingly it will be impacted by the drivers of the energy transition. The following are some of the factors driving the transition in the global energy systems: climate change, plummeting renewable energy price, the emergence of disruptive technologies, divestment of fossil fuels, and increase of coal-related health costs.

Climate Change

Human activities are both, directly and indirectly, affecting the climate through the increase of carbon emissions to the atmosphere. This changes the composition of the global atmosphere and natural climate variability over comparable time periods. These changes have resulted in the increase of global temperature that could cause various natural disasters and irreparable damages on the environment that lead to the point of no return (Loria, 2018; Aengenheyster et al., 2018). Therefore, it is important for nations to put in effort in keeping or slowing down the changes in temperature in order to reduce the effects of climate change.

Internationally, nations have engaged in several agreements that resulted in national commitments to reducing carbon emissions. One notable agreement is Paris Agreement in which 174 countries and EU members signed a global climate deal to limit global warming to well below 2°C (UN, n.d.; European Commission, n.d.). This agreement is a follow-up action for the Kyoto Protocol, which requires industrialized nations to lessen the amount of their CO2 emissions.

Many countries have developed national action plans to reduce their respective CO2 emission and pledged to take part in realizing the Paris Agreement. By 2016, 190 parties have submitted their Nationally Determined Contribution (NDC) to reduce greenhouse gases (GHG) (UNFCCC, n.d.). Most have established laws and other Paris Agreement derivatives as a means of ensuring the implementation of their respective NDC. Some even developed a national carbon market to incentivize emission reduction. International commitments as well as policies and market strategies would help reduce climate change while taking economic reasons into consideration.

By 2023 and then every five years, the governments will assess the collective progress to reach the purpose of the Agreement. This will determine whether the governments should make the goal more ambitious or take more actions to realize the goal. Given the deadline, countries are starting to reduce their GHG emission by lowering their use of coal, which has a great contribution to the emission level. They are developing scenarios that involve policies and market strategies

to ensure a successful transition from coal to renewable power generation to meet their energy needs.

Renewable Generation Cost is Plummeting, whereas the Risk of Stranded Assets is Escalating

The cost of renewable energy technologies is plummeting significantly over the last decade, which in turn reduced the cost of renewable-based electricity generation. IRENA (2019) recorded that the global weighted average Levelized Cost of Electricity (LCOE) of utility-scale solar PV projects fell from USD 0.37/kWh in 2010 to USD 0.085/kWh in 2018, declining by 77% in eight years. A similar trend can be seen in the onshore wind projects where the LCOE decreased from USD 0.084/kWh to USD 0.055/kWh in the same period. If stretched further, the LCOE for onshore wind has fallen by 82% since 1983 (IRENA, 2019). These global trends show that renewables become more competitive even without financial assistance from the governments.

Looking at solar PV, auctions on utility-scale projects have seen remarkable results. In the past, IRENA predicted that the auction price in 2019 would reach USD 0.05/kWh. Exceeding the prediction, in 2019, Portugal set the world record by rewarding a bid of USD 0.0165/kWh at a PV auction. Previously, in the same year, Brazil held the record of USD 0.0175/kWh for solar PV projects, just a week after California broke the record of USD 0.01997/kWh (IEEFAa, 2019; Willuhn, 2019a; Willuhn, 2019b; Weaver, 2019). This trend shows that countries are racing to claim the cheapest solar energy in the world.

Such renewable energy trends increase the risk of stranded assets in the coal industry. A recent study by Carbon Tracker (2020) found that globally, coal developers risk $600 billion capital costs to waste as electricity from new renewable-based power plants is cheaper than that from new coal power plants. A study found that Japan faces a potential $71 billion stranded asset problem for coal since renewables are predicted to be cheaper than new coal power plants starting from 2022 (IEEFA, 2019). Another study also concluded that the potential stranded risk of planned and existing coal-fired power capacity in Indonesia, Vietnam, and the Philippines could reach up to $60 billion or half of the planned coal investments across the three countries (Carbon Tracker, 2018). Among the three countries, Indonesia is the most exposed to the risk–the country could lose $35 billion. These costs of coal stranded assets would burden the consumers if the costs are passed on to them.

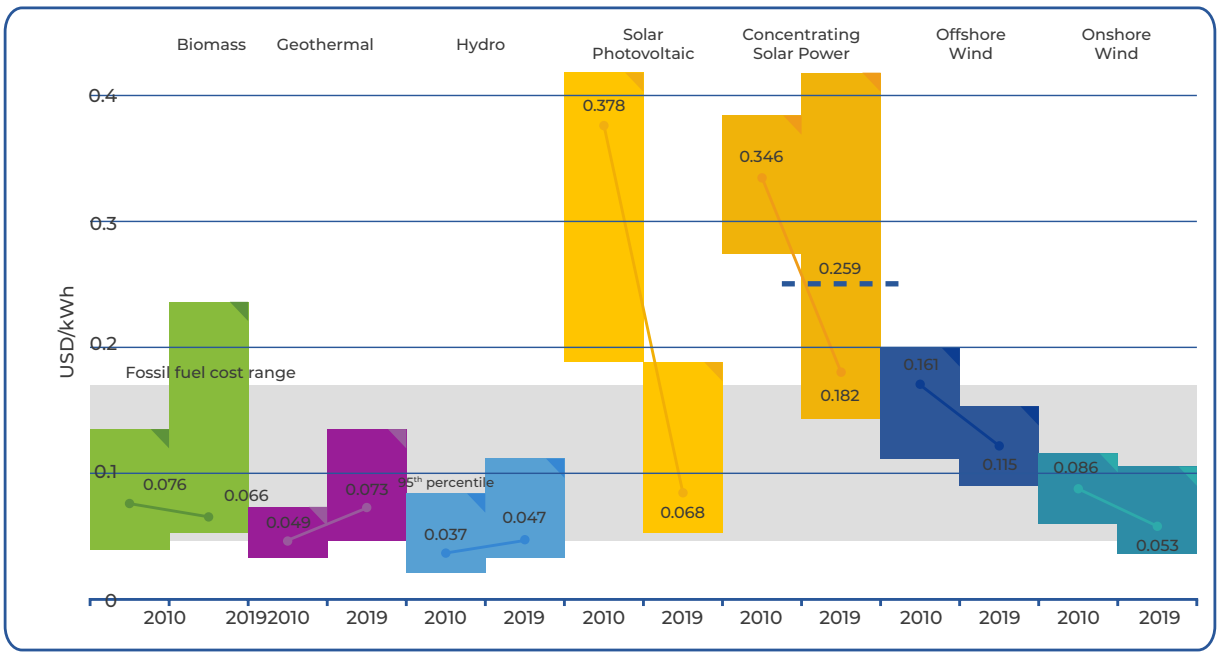

Figure 1. Global weighted average LCOE from 2010 to 2019 (source: IRENA, 2020)

The Emergence of Disruptive Technologies

There are at least three main driving forces in the transformation of the energy sector, known as "3Ds": decarbonization, decentralization, and digitalization. The global efforts to decarbonize the energy systems, the increased use of distributed energy resources (DERs) such as solar and wind energy, and the adoption of the Internet of Things, Artificial Intelligence, and Blockchain technologies help accelerate the transformation of energy systems and the integration of renewables and distributed energy into the grid.

The emergence of DERs and blockchain technology, for instance, has disrupted the conventional power utility business models and introduced an opportunity to reshape the energy sector. With these technologies, it becomes more likely for anyone to participate in the energy transition process. More people now install rooftop solar PV on their buildings. Additionally, there has been a growing number of communities and enterprises that have started to use blockchain technology as a tool to establish peer-to-peer (P2P) energy markets that allow them directly buy and sell power between one another–usually power generated from DERs. In Asia, Thailand has become a pioneer in introducing the technology in the energy market (Andoni et.al., 2019).

Furthermore, the recent development of storage systems has also provided the solution to the intermittency concern of variable renewable energy such as solar and wind energy. At the same time, the increased use of efficient appliances will certainly reduce greenhouse gas emissions coming from the power sector.

The development and innovation of these technologies will inevitably disrupt the existing energy markets (UNCTAD, 2019). If they fail to adopt these technologies early, the traditional utilities will see their businesses falling apart and may have to bear the burden of fossil assets becoming stranded assets (IRENA, 2017).

Divestment from Fossil Fuels

In recent years, there has been a trend of energy investment shifts from fossil fuels to renewables. A few institutional investors and pension funds withdrew their new investments from fossil fuel assets. At the end of 2019, there were already over 100 financial institutions around the world that have decided to nearly triple their divestment from fossil fuels while also increasing renewable investments by 10.9% by 2029 (Potter, 2019). This follows more than 1110 institutional investors with more than $11 trillion of assets who have committed to divest from fossil fuels (Arabella Advisors, 2018; Cadan et al., 2019).

These financial institutions have recognized the risks of stranded assets from fossil fuels investments as a result of the increasingly cheaper, domestic, and sustainable alternatives, which are showcased by renewables. Renewables are considered as a low-cost solution to meet the increasing demand for energy. The move is also seen as an attempt to encourage governments to meet their obligations under the Paris Agreement (IEEFA, 2019). Furthermore, the Final Investment Decisions (FIDs) for new coal power plants have seen a significant declining trend from 2016 onwards. The decline in FID signals that there are fewer projects being executed since project sponsors are not confident in the projects' future (Rodger, 2019). India and China, two big markets for coal, have reduced their investments in coal in recent years (IEA, 2019).

This trend will significantly affect the viability of fossil fuel projects around the world. For a country like Indonesia that relies on fossil fuel to generate electricity, it will find difficulties in financing new coal-fired power plants as more financial institutions shy away from this kind of project. When the funding is available, it is more likely that such capital comes with a high-interest rate. This will further make coal projects less attractive and unaffordable.

Increased Coal-related Health Costs

The burning of fossil fuels for energy production has been recognized as the source of primary (impacting the local community) and secondary (instigated by primary cause entailing wider impacts) air pollutants (Healthy Energy Initiative, 2015). The use of coal to produce electricity will likely increase the number of premature deaths as well as major and minor illnesses as air pollution is one of the leading causes of death worldwide. These health effects are often ignored when countries are planning to build coal-fired power plants as if they are not directly linked with the economy. However, numerous studies have found that the more people affected by coal combustions, the more costs the economy must bear.

Globally, coal has caused premature deaths to more than 800,000 people per year (Endcoal, n.d.). In some coal-oriented economies, the deaths can go up to more than 15,000 people annually (Rohde and Muller, 2015; McQuate, 2019). Illnesses caused by combustion could reduce workdays for employees, which in turn will affect productivity. The health risk per person is even larger when considering the pollutants exposure for those working directly with conventional energy sources, or living in poverty, as they have greater exposure and poor access to health care (Healthy Energy Initiative, 2015).

have greater exposure and poor access to health care (Healthy Energy Initiative, 2015).

However, while coal emits dangerous pollutants to the environment, the industry only pays a fraction of the associated health costs, and the rest is borne by the society and the healthcare system (ABC Australia, 2018; Greenpeace International, 2018). This might be caused by the lack of social pressure towards the industry, as people are not aware of the health costs of fossil fuel combustion. A study found that when people are informed about the neurological risks of combustion, such as a delay in brain development on children, they become more concerned about fossil fuel use and more likely to change their stance on the subject (Kotcher et al., 2019).

Unfortunately, there are only a few studies that capture the real health costs that come from fossil use. Health issues caused by combustions are not easy to measure since they might be a result of other health complications or that there is not enough case reported.

Although the number is difficult to calculate, it was estimated that coal increases health costs by 10% in countries where coal takes up a significant portion in the energy mix (Conca, 2012). The additional health costs could rival the total electricity costs annually. Therefore, it is important to reduce coal use for electricity to avoid doubling the price to accommodate the health issues that come with it.

2.2. Progress and Status

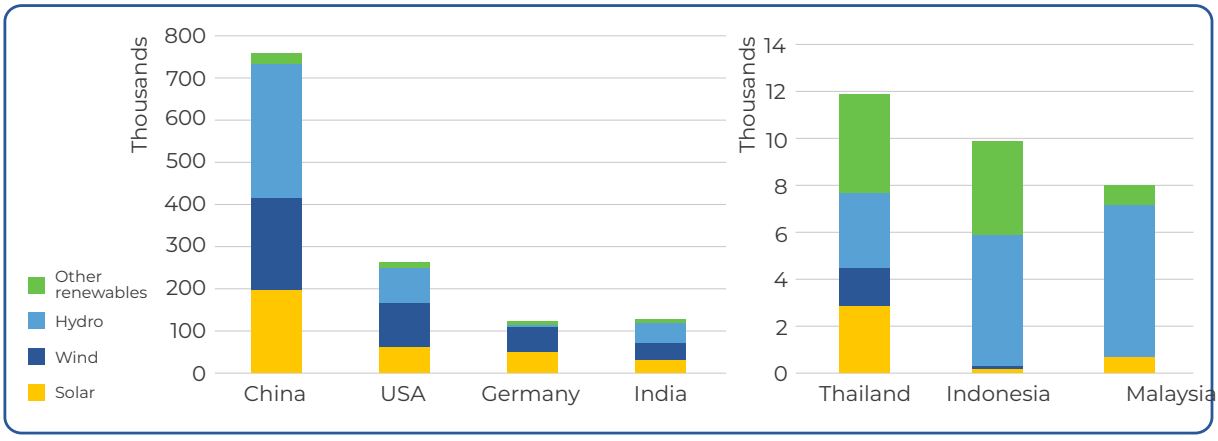

Figure 2. Renewable energy installed capacity (MW) in leading countries and selected SEA countries in 2018 (source: IRENA, 2020)

With the drivers of energy transition mentioned above, the global market has seen a significant increase of renewable installed capacity from 1,226 GW in 2010 to 2,537 GW in 2019 or rose by 107% in nine years (IRENA, 2020). China, the United States, Germany, and India are some countries that lead the renewable energy development around the world. As seen in Figure 3, China had installed 759 GW of renewable energy by 2019, accounting for 30% of the world's renewables installed capacity (IRENA, 2020). Meanwhile, India had installed 128 GW by 2019.

In Southeast Asia, Thailand is leading the development of the renewables with 11.9 GW of installed capacity by 2019. In the same year, Indonesia had installed 9.9 GW of renewables, ranked the second position in the region. However, the renewables development in Indonesia is considered small as the country has great renewables potential of more than 700 GW (IRENA, 2017).

In terms of investment, the world has seen remarkable growth in renewable energy from only USD 45 billion in 2004 to USD 325 billion in 2017 before declining to USD 288 billion in 2018 (IRENA, 2019). Since 2010, renewable investment has always been higher than USD 200 billion. The growth has been aligned with a dramatic decline in renewable energy prices, particularly for solar and wind energy, in recent years (see Figure 4).

Data from IRENA also show that almost all types of renewable technology have weighted average Levelized Cost of Electricity (LCOE) that are in the range of fossil fuel LCOEs. In 2018, hydropower, bioenergy, and geothermal had weighted average LCOEs at USDc 4.7/kWh, USDc 6.1/kWh, and USDc 7.2/kWh respectively. Meanwhile, solar and onshore wind energy, which are relatively new technologies in the power sector, had weighted average LCOEs at USDc 8.5/kWh and USDc 5.5/kWh respectively (IRENA, 2019). With these declining renewable generation costs, it is the right time for countries to seize the opportunity to develop the renewable energy sector.

Although the world's installed capacity of coal power plants still increased in 2019, the proposed capacity has been declining at an unprecedented rate (see Figure 5). Between the years 2010 and 2013, there were around 1,400 GW of coal power projects proposed annually. This number fell to 1,083 GW in 2014 before plunging to only 300 GW in 2019. The plants under construction had also declined by 39% since 2014. The retired coal-fired power plants, by contrast, had been cumulatively increasing to 268 GW between 2011 and 2019 (Carbon Brief, 2020). All these trends show that, globally, coal power plants have started to be losing traction in the power sector.

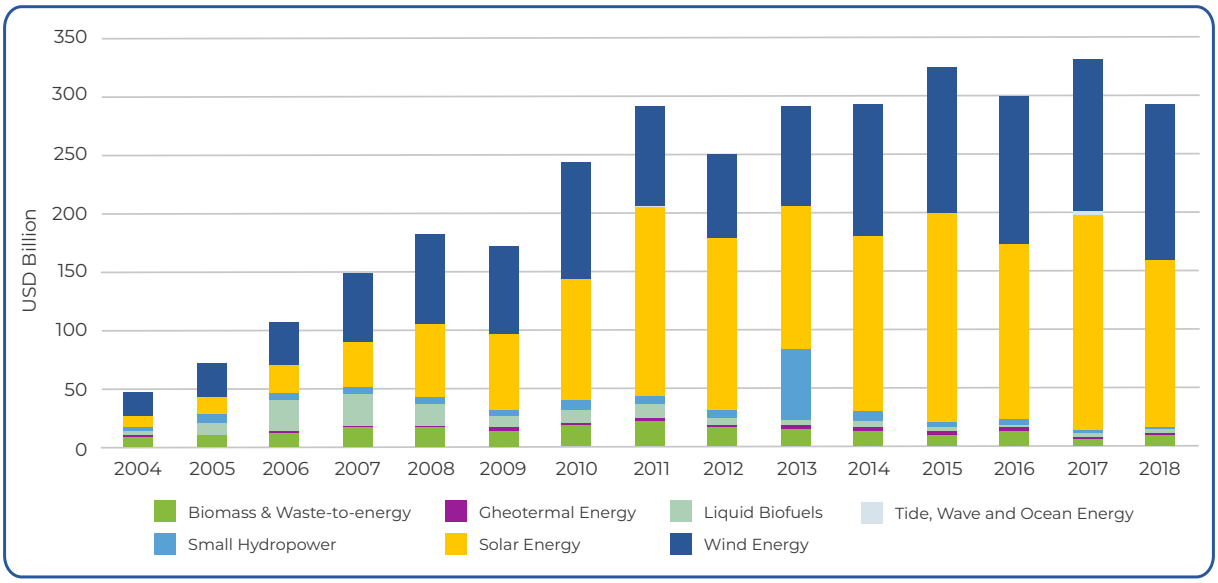

Figure 3. Global renewable investment (source: IRENA, 2019)

Aligned with the lowering capacity, investment in coal-fired power plants also continues to decline. The IEA report in 2019 shows that lower coal power investments in China and India led to around a 3% drop in global coal power investment in 2018, reaching its lowest point since 2014. The decline in new coal capacity was mainly due to overcapacity and stricter air quality standards imposed by China. The same report also reveals that FIDs for new coal-fired power plants have hit their all-time low this century (IEA, 2019). If the trend continues and more countries are committed to phasing out coal, the energy transition will certainly be a possibility.

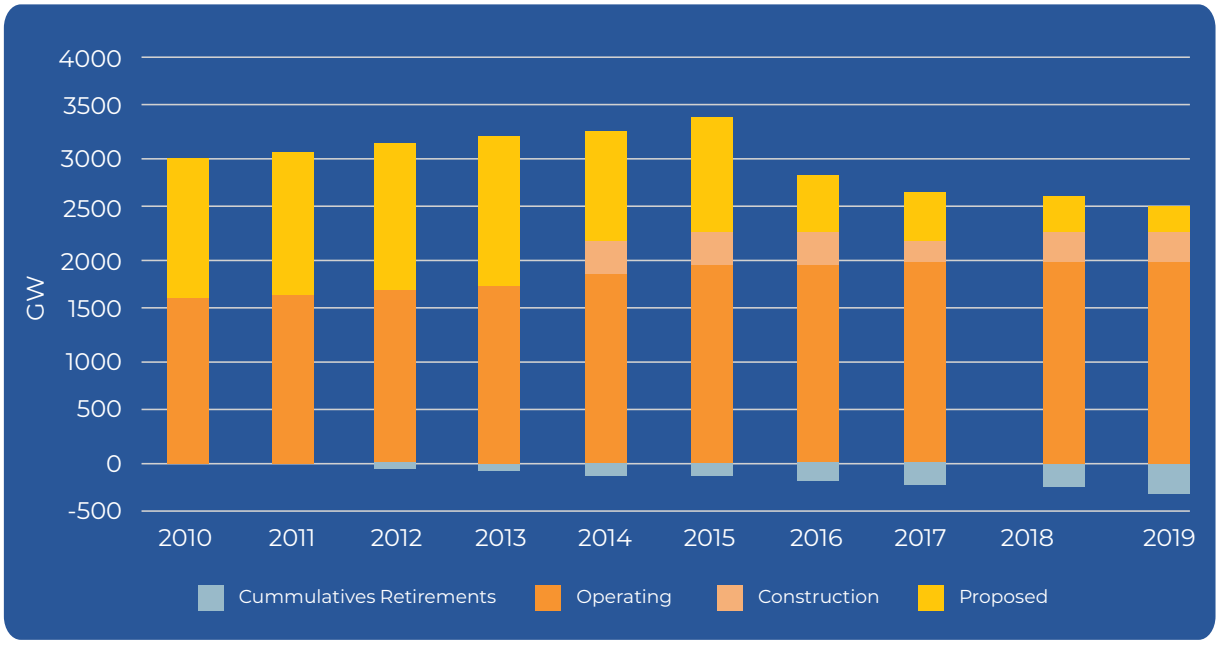

Figure 4. Global coal-fired power plant capacity from 2010 to 2019 (source: Carbon Brief, 2020)

2.3. A Just Energy Transition

Due to the complexity of the issue, the demand for justice takes various forms with underlying values such as “leave no one behind” or “rights-based action” that can serve as a starting point for alliance formation to achieve a just transition for everyone (Hirsch, Matthes, Funfgelt, 2017). By one definition, a just energy transition is “a path that reconciles the material needs of the poorest people on the planet with the need to safeguard the stability of the earth’s climate” (Jakob and Steckel, 2016). Meanwhile, according to the Stanley Foundation, a just energy transition should address three challenges namely unemployment, environmental degradation, and inequality (Stanley Foundation, 2017).

The International Labor Organization (ILO) has its own definition of a just energy transition that focuses on replacing jobs lost due to transition with decent works. In 2015, it set out principles of a just transition in the *Guidelines for a Just Transition Towards Environmentally Sustainable Economies and Societies for All*, which emphasizes on some key policy areas needed in the transition process such as macroeconomic policy, skills development, social protection, active labor market policy, and social dialogue Energy transition affects both environmental and social dimensions as it can deal with the implication of the inevitable consequences arising from climate change on vulnerable groups of people. Therefore, It is imperative for the elements of the society to take on the energy transition as early as possible since rapid shifting to clean energy becomes an unavoidable change to keep global warming below 2°C. The government has to take preventive actions and design policies that take into account the needs and rights of people

who are most vulnerable to the climate change impacts and disruptive changes instigated during the transition process (Hirsch, Matthes, Funfgelt, 2017).

In addition, as energy transition may lead to the fall of revenues from production and sales of coal or fossil resources and therefore, lead to slow economic activities, the just transition concept should also highlight the economic and social issues. If unaddressed, the slower economic activities will enlarge the inequalities and injustice in the local communities (Stanley Foundation, 2017). The economic diversification and restructuring of fossil fuel-based economy are some of the measures that help mitigate the risk. Therefore, it is important for the government to develop a just transition plan that integrates economic development in the context of energy transition.

Looking at the trends in the global market, energy transition may inevitably take place around the world. The transition may cause some shifts in the macroeconomic structure. This poses some risks to countries that are unprepared for this transformation, such as unemployment, and economic downturn. Therefore, without proper preparation, energy transition could cause an unjust energy transition within the border. However, a country might face a dilemma. On one hand, the attainment of a just energy transition is challenging as energy is important for development and that is the reason why many countries, particularly the developing ones, are ramping up their energy production and have been reluctant to implement climate change measures (Jakob and Steckel, 2016). They still continue fossil-based energy production because it is seen as the cheapest way to produce electricity and provide energy access for their people.

On the other hand, a late transition will inflict further injustice on the people in these countries. Unmitigated climate risks caused by the increased CO2 emission from non-green energy systems would likely reverse most of the efforts to reduce global poverty that has been made in the past decades (Jakob and Steckel, 2016; IASS, 2019). It will also limit the market access for developing countries as in a decarbonized global economy, the carbon content of products will be an important factor (IASS, 2019). Furthermore, carbon-intensive infrastructure may cause a lock-in effect for the developing countries as the global transition will make fossil assets less valuable and its revenue dwindles, which could result in the specter of domestic economic crises and recession as well as political instability (Mercure et al, 2018; IASS, 2019).

It is important, therefore, to expand the concept of just energy transition into economic aspects such as the labor market, the state revenue, and the market of goods and services related to the sector other than the energy supply and demand aspect. It is also worth noting that in developing countries, there are gaps in financial and technical aspects of just transition mostly because the issue is comparatively new to them and that transitional justice requires multi-trillion investments (Hirsch et al., 2017). As every transition poses challenges and opportunities that are unique to each country, a just energy transition can only be attained by considering local circumstances.

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3 Energy Transition Policy: Country Case Studies

3.1. Germany

Through the stipulation of the Renewable Energy Act in 2000, Germany has been accelerating its renewable energy development and becoming one of the pioneers in the energy transition. The story of German Energiewende (energy transition), however, can be stretched as far as the 1950s when the hard coal mining industry in the country began to see a decline due to fierce competition between domestic hard coal and cheaper oil and hard coal from overseas.

As part of the economic recovery process post-World War II, the German coal mining sector boosted its hard coal production from around 38.9 Mt in 1945 to 152 Mt in 1956. In the same period, employment rose from 294,000 in 1945 to 604,000 in 1957. The so-called post-war German economic miracle has been attributed to the expansion of hard coal production in that period (Storchmann, 2005). In 1958, however, Germany overturned policy on coal price regulation and liberalized prices. The change created a price disadvantage for domestic hard coal as imported hard coal (mainly from the US) and oil were cheaper than locally-produced coal, escalating the market-driven transition in the German hard coal sector.

In efforts to slow down the decline in domestic hard coal production, the hard coal industry together with the steel industry (main consumer of German hard coal), politicians, and unions lobbied the government to provide subsidies for the German hard coal industry. These subsidies were to be used to help offset price gaps between domestic and imported coal. In total, the German government had provided approximately €165 billion of subsidies for hard coal sales between 1968 and 2018 (Oei, Brauers, Herpich, 2018).

The strong influence of hard coal and steel industries in the political system had slowed down the transition from hard coal as well as economic diversification efforts in the region. However, with the widening price gaps, the hard coal production in Germany plummeted with production in the 2000s dropping below that in 1945 before reaching its end in 2018. Due to the declining coal production and increased mechanization, employment in the German hard coal mining industry had halved over ten years at around 300,000 in 1967. Some measures such as early retirement and retraining programs were taken to help impacted workers.

As the main hard coal producer in Germany, the Ruhr area was hit hard by the decline in coal production. Prior to 1958, the Ruhr area produced up to 123 million tonnes of hard coal annually, the largest in the country. In 1957, there were 138 privately-owned hard coal mines in the region which employed 600,000 workers. The coal industry together with the steel industry in the Ruhr area became the backbone of West Germany's economy in that period.

While the steel industry helped reduce the unemployment rate resulting from the coal decline in the region by absorbing most of the coal workers who lost their jobs, the oil and steel crises in the 1970s had soared the unemployment rate both at the regional and national levels. The number of employees in the hard coal industry in the Ruhr area dropped to 290,000 in 1967 and further declined to 190,000 in 1977 and 4,500 in 2017 before vanishing in 2018 due to permanent closures of hard coal mines in 2018. The mine closures were mainly due to the stipulation of the 2007 law concerning the cessation of subsidies provision for hard coal production in Germany.

Since 1968, the German government together with the regional government in the Ruhr area has created structural policies aimed at reorienting and diversifying economies in the region. From 1968 to 1973, , the government of the Ruhr area initiated an €8.7 billion structural policy program dubbed as the 'Development Program Ruhr' directed to attract new businesses from other sectors to the region. In its implementation,

the mining companies were reluctant to sell their land to new businesses (ground lock). Consequently, the economic reorientation efforts failed with only few new companies established in the region within this period (Oei, Brauers, Herpich, 2018).

The program, however, was instrumental in the improvement of transportation infrastructure and the establishment of new educational institutions in the Ruhr area. The new transportation infrastructure would improve the connectedness of mining areas with surrounding areas which later helped local workers find new opportunities in other areas without having to leave the Ruhr area. Meanwhile, the formation of new universities was crucial in helping coal workers and the local workforce acquire skills required by new businesses in the region. In addition, education and research institutions would also help attract new companies and people from other regions to settle in the Ruhr area as well as equip the region for the transition towards a high-value adding, knowledge-based economy (Herpich, Brauers, Oei, 2018).

With the failure to attract new businesses, the number of unemployment in the Ruhr area had increased from 12,000 in 1970 to around 100,000 in 1976. In response to this, in 1974, the government put in a €1.3 billion-program aimed to modernize the existing industries (including steel, coal mining, and energy). Despite the hope to revive the coal industry, the program proved ineffective and thus was abandoned in 1984.

The structural policy programs such as the 'Action Program Ruhr' and 'IBA Emscher Park' came in 1980 and 1989 respectively to help the Ruhr area improve its image through measures such as the establishment of new research and technology centers, improvement in water quality, as well as increase in cultural activities in the region (soft location factors). Turning old coal and steel sites into tourist landmarks has successfully increased the cultural and touristic attractiveness as well as changed perceptions of the region (Herpich, Brauers, Oei, 2018).

Since 1980, the government has put more focus on economic reorientation (neo-industrialization) for the Ruhr area. Programs and initiatives established were directed towards technology, innovation, education, and infrastructure improvement as well as increased capacity which later helped the region diversify its economy. The proactive industrial policy imposed to develop energy efficiency, renewable energy, recycling, and waste combustion technologies has transformed the region into one of the main hubs of environmental research & development and industry in Germany (Campbell & Coenen, 2017).

The gradual economic diversification in the Ruhr area cannot be separated from the multi-level, polycentric governance and planning used by the German government to stimulate participation and dialogue between all stakeholders in structural policymaking. The participatory approach was first introduced in the 'Action Program Ruhr' with the federal government, state, and cities coordinated together in the policymaking process. Later, more freedom has been given to cities in the Ruhr area to create their own development strategies which take into account each city's strengths and weaknesses. One of the successful diversification stories is from the city of Dortmund which emerged as a city known for its specialization in microsystem technologies (Brauers et al., 2018).

The hard coal transition in Germany has hardly been deemed as a smooth transition. The missteps in the early phase of transition have increased overall transition costs and slowed down the economic diversification in coal-producing areas such as the Ruhr area. However, efforts to improve infrastructure and a strong emphasis on education and technology development as well as better coordination and involvement of regional stakeholders in the later stage of transition proved effective in helping the region transition towards a more diversified, sustainable economy.

3.2. South Africa

Compared to international standards, the South African economy is vastly energy-intensive and has low industrial energy efficiency. Most of South Africa's energy source comes from coal, which contributes to 73% of its total primary energy supply. The coal power plants currently are responsible for 91% of total electricity generation and coal-to-liquid plants represent 25-30% of total liquid fuel consumption in the country (IDDRI, 2018). Due to this fact, South Africa is considered as the most coal-dependent country among all G20 countries (Climate Transparency, 2019).

Around 80% of total emissions in the nation come from the energy sector, particularly from coal-related processes (CT, 2019). Thus, the mitigation challenge for the country will revolve around replacing coal as the primary energy source. The Department of Energy, National Treasury, and the Development Bank of South Africa (DBSA) are among the key players in South Africa to promote the transition. Together, they established the Renewable Energy Independent Power Producer Procurement Program (REIPPPP) in 2010 as a way to procure renewable energy from Independent Power Producers (IPPs). As a result, around 6,422 MW of power has been procured from 112 renewable energy IPPs and 40,134 jobs have been created for South Africans (Project 90 by 30, 2019).

Furthermore, in addition to Paris Agreement, the country also tries to reduce the share of coal power in the electricity mix from 82% in 2016 to 31% in 2050 as stated in its 2016 Integrated Resource Plan (IRP). South Africa also included the term "just transition" in its NDC, signaling the importance of "justice" when conducting the transition. It also formed the Just Transition Transaction proposal which comprises a blended finance vehicle and a just transition fund. This should serve as the source of funds for just transition in South Africa.

However, with the dominant role of coal in South Africa's economy and the fragile condition of employment in the country, the implementation of the transition policies may be challenging. In 2019, the government still plans to build several additional coal power plants despite the decline in renewable costs and increased costs of coal-based electricity due to contract and investment problems that Eskom, the electricity public utility, has been experiencing in the past years as well as corruption scandals within the company (AFP, 2019; Reuters, 2019).

Eskom's financial problem has prompted the Minister of Finance to make a statement that a vertically integrated utility structure is out of date. This signals an opportunity for renewable energy to enter the market as the topic of decentralization of the power system has now been brought up. Eskom had announced in March 2017 that it would shut down five power plants due to the increasing pressure to comply with environmental standards and more renewable projects coming online (IDDRI, 2018).

However, the closures of coal-fired power plants are met with public outcry, particularly from those linked with the coal industry. In response to the public pressure around shutting excess stations, Eskom commissioned several socio-economic impact studies examining the importance of coal stations to local economies. Eskom's position seems clear; they will use the threat of job losses and economic impacts to advocate for the purpose of retaining their dominance in the power sector. This action was commenced without regard to Eskom's financial issue, which would not allow the company to pay for the coal power plants as well as the fact that the stations planned for closure are surplus to requirements and approaching the end of their technical lives (IDDRI, 2018).

Since then, the deployment of renewable power plants has been protested by unions. They blame renewable energy for the closures of Eskom's older power plants, which caused considerable job losses. These challenges stem from inadequate planning and thought process behind the energy transition. With regard to Eskom,

it has failed to engage relevant stakeholders and plan ahead before announcing the massive closures of coal power plants. Therefore, unions that previously were behind climate change mitigation are now opposing the closures of coal power plants and the deployment of renewable power (IDDRI, 2018).

With Eskom's monopoly in South Africa's electricity sector, it is difficult to transition to a more decentralized market that fits for renewable energy deployment. In conjunction with that, several challenges remain in South Africa. Feed-in-Tariff is currently illegal in treasury regulations. Thus, it hinders renewable energy development since there are not enough incentives available. At the same time, the public does not have sufficient capability to develop and own renewable electricity generators. All these factors obstruct the just energy transition as it does not support public participation in renewable energy development in South Africa (Power Futures, 2019).

In terms of the "just transition" aspect, South Africa has not made significant progress. Social dialogues have been conducted by the National Planning Commission (NPC) through their workshops and stakeholder summits, which they claimed were designed to form the basis for "social compact" to allow just transition. This effort was done in May 2018, after several actors such as unions, civil society organizations, and business interests echoed the needs for a just transition in South Africa (IDDRI, 2018).

The dialogues seek to build a shared vision and agenda between four social partners: government, labor unions, civil society organizations, and businesses. This initiative represents a starting point in South Africa's effort for the energy transition. They noted that they should address the economic diversification, workers training, infrastructure repurposing, and other aspects to ensure a just transition. However, these meetings were eventually seen as failures as they failed to involve the communities living near coal mines (Project 90 by 30, 2019).

On a broader scale, coordination between governments at different levels, local communities, mining companies, and unions have also been found to be lacking in South Africa. Several surveys conclude that local governments are unaware of the upcoming challenges associated with shifting away from coal. They are unprepared largely in terms of financial capabilities needed for the transition. Mining municipalities have already struggled with providing infrastructure and services (Marais et al., 2018). State fragmentation, lack of transparency, and central authorities' disregard for subnational government priorities were also mentioned as barriers in designing and implementing policies for energy transition (SEI, 2019).

Currently, there is still no real implementation of a just transition plan in Mpumalanga, South Africa's largest coal-producing region, and other coal-dependent regions. The development of new industries is paramount in South Africa since structural unemployment and poverty are major problems in the country (CT, 2019). In South African coal-dependent regions, job opportunities are deficient for both unskilled and skilled workers.

To solve employment issues, in November 2011, the South African government along with representatives from industry, labor unions, and communities signed the Green Economy Accord, which primarily focuses on green jobs. With this accord in place, local governments were able to develop their own Green Economy Plans and hoped to create 5 million green jobs by 2020 nationally. While well-intentioned, the implementation of these plans is still limited (IDDRI, 2018).

3.3. Australia

As one of the top coal-producing and exporting countries in the world, it is natural to expect Australia to utilize coal to meet its domestic electricity demand. Currently, coal dominates the country's primary energy consumption by accounting for 40% of the total primary energy consumption. In the power sector, coal looms over other types of energy by supplying 60% of

Australia's power demand in 2018 (Department of Industry, Science, Energy and Resources, n.d.).

Despite its utter reliance on coal, Australia has closed more than ten coal power plants in the past decade and will increase to 20 coal closure by 2020 (Court, 2017). Most of these plants are coal-fired power plants reaching the end of their operating lives. At the same time, the Australian government has planned to source 33,000 GWh national electricity supply from renewables by 2020 and set up incentives through the Large-scale Renewable Energy Target (LRET) and Small-scale Renewable Energy Scheme (SRES) (Clean Energy Council, 2018).

In addition to LRET and SRES, the Australian government has also used the strategic public procurement of renewable energy, in particular the FiT and Renewable Energy Certificate (REC) schemes, and provided public funds for pilot projects through the Australian Renewable Energy Agency (ARENA) to help create new demand for renewable energy (Parliament of Australia, n,d.; ARENA, n.d.).

Through these incentives, the renewable share in the electricity mix reached 19% in 2018 and would potentially continue to increase to 35% by 2021 (Morton, 2019). In addition, the government of Australia has set a renewable power percentage, which mandates electricity retailers to meet their LRET obligation, by 19.31% in 2020 (Australia Clean Energy Regulator, 2020). This development further threatens the coal industry.

However, not everyone is happy with the transition plan, especially those who are impacted by the plant closures. According to Burke, Jotzo, and Best (2018), the closure of a coal-fired power station can create economic challenges, including a higher unemployment rate. One particular case is the closure of a coal power plant and mine in the Latrobe Valley, Victoria. The state had previously privatized the State-owned Electricity Commission (SEC) including the Hazelwood mine and power station, which was bought by Engie, Mitsui, and other Japanese investment corporations. However, in 2016, Engie planned to close Hazelwood as a part of the company's plan to divest from fossil fuels (Engie, n.d.; Government of Victoria, 2019). This decision was met with resistance, particularly from coal workers, unions, and communities.

The government of Victoria responded to this by establishing the Latrobe Valley Authority (LVA) that is responsible for assisting workers and communities impacted by the closure. There were four initiatives:

- A provision of one-on-one transition services and advice related to skills, training, financial services, and employment assistance;
- Retraining funds from the company and subsidized retraining funds from the government;
- Worker Transfer Scheme providing job opportunities for Hazelwood workers who wished to stay in the industry, and;
- Job stimulation and regional revitalization through Latrobe Valley 'special economic zone' (Snell, 2018).

As the results of the initiatives, 136 community projects were funded to upgrade facilities and hold events, 962 jobs created in 29 businesses through the facilitation fund, 852 people employed through worker transfer scheme, 1,430 workers and families supported through transition services and advice, and 86 business projects reimbursed government fees and charges (Latrobe Valley Authority, 2019).

3.4. Canada

In 2018, Canada announced its commitment to phasing out coal-based electricity by 2030. The closures of coal-fired power plants in the country will help reduce 5 Mt of GHG emissions, accounting for 10% of Canada's total CO2 emissions (Independent, 2016). The plan was fully supported by both conservative and liberal parties as they realized the impacts

of coal on the environment and health and since the coal-based power generation was already in decline (IISD, 2018).

In the same year, the Canadian government established a Task Force for Just Transition for Canadian Coal Power Workers and Communities to help understand the possible impacts of coal transition and provide recommendations to support coal workers and communities affected negatively by the transition. The Task Force consisted of representatives from labor, business, local governments, academics, and NGOs which together conducted dialogues with the relevant stakeholders to gather perspectives and aspirations from stakeholders they talked with. Employment support as well as diversification of local economics were some of the findings commonly stated by communities across provinces (Government of Canada, 2019).

In their final report released in 2019, the Task Force stated that in order to ensure a smooth transition for the workers, the government should connect job seekers with employers. Furthermore, the establishment of training support and skills enhancement programs are needed to help workers move on to the next jobs. As for the older workers, the government should also allow early retirements. Additionally, the communities wish that the government increases economic development opportunities within their regions and provides loan access as well as entrepreneurship support for those wanting to start a new business.

Aligned with the Task Force's recommendations, the federal government has set up CA$ 35 million Canada Coal Transition Initiative (CCTI) from the 2018 federal budget. The initiative is a five-year strategic fund that will support skills development and economic diversification to assist workers and communities in adapting to clean energy and green economy (WD Canada, 2019). The CCTI is implemented by Western Economic Diversification Canada (WD) and the Atlantic Canada Opportunities Agency (ACOA). WD is a federal department that supports community economic development and is in charge of assisting the transitions in Alberta and Saskatchewan. These two provinces are heavily reliant on the coal industry–both mining and power plants–thus transitions will surely have serious impacts on them. By using the grant from CCTI, the government will support planning, skills training, and research that are needed to diversify the local economy.

Two towns in Alberta, Castor and Forestburg, were chosen as the hosts of CCTI-funded innovation centers. The city of Forestburg lies 20 km north of Battle River generating station, a coal-based power plant with a capacity of 689 MW, and is serviced by the nearby Paintearth coal mine (ECA Review, 2018). The innovation centers were set to support entrepreneurship, training programs, and employment services for about 200 former coal mine and power plant workers as well as the community members in the area (WD Canada, 2018).

Canada plans to fund its transition to a clean economy by using federal revenues collected from investments, taxes, and sales of oil and gas of the Trans Mountain Expansion Project (Department of Finance Canada, 2019). The money generated from the project, which is estimated to reach $500 million per year, will be invested to create jobs, diversify the market, and accelerate Canada's clean energy transition (Trudeau, 2019). To accelerate the transition, the Canadian government has also set fiscal incentives in a form of subsidies and tax exemptions/reductions for renewable energy under the Emerging Renewable Power Program (ERPP) (Government of Canada, 2020; Willuhn, 2018).

In addition to the national initiative, local governments have also been proactive in seeking ways to assist workers and communities affected by the coal phase-out. For instance, the government of Alberta had set up a $40 million Coal Workforce Transition Program, in which the government provides financial, employment, and retraining information for workers in the coal industry (CBC News, 2017).

3.5. Lessons Learned: Elements of a Just Energy Transition

While the pace of energy transition in the aforementioned countries varies from one to another, there are common aspects of transition that can be extracted and used as insights to ensure a just energy transition:

Impose good governance in planning the energy transition pathway

The energy transition is a highly complex process that involves many actors with different interests and perspectives relevant to the way the transition should unfold. Due to the uncertainties and impacts the transitions bring to the economies, governments in the case studies tried to commence good governance and transition management to help ensure the equal share of costs and benefits associated with the energy transition.

Borrowing the transition management concept developed by Loorbach in 2007, countries in the case studies have at least three levels of planning in their efforts to transform their energy system. The first level is strategic planning, which comprises vision development and long-term goal formulation. The second level is tactical planning, which includes agenda and coalition building, negotiation, and establishment of policies, strategies, and medium-term goals of transition. The third level is operational planning, which includes short-term goals and the implementation of day-to-day transition processes and activities.

The announcement of the coal phase-out made by the Canadian government, for instance, is a part of strategic planning that shows the long-term commitment to energy transition in the country. Meanwhile, the establishment of a special task force in Australia and Canada to bring together all stakeholders in dialogues and build consensus on transition pathways that the countries should take is a form of the tactical plan required in transition management. The use of the task force has proven effective in providing policy recommendations reflecting local circumstances and needs of coal regions in the respective countries. Lastly, the assignment of a federal department by the Canadian government to assist the transition process in Alberta and Saskatchewan is part of an operational plan necessary to manage the implementation of short-term measures.

The transition plan should comprise clear imperatives, goals, and specific milestones to establish the required enablers to realize an effective energy transition (World Economic Forum, 2018). In addition, the governments should perform comprehensive analyses on technical, economic, and social aspects of the transition and take the leadership and decision making role to help manage the possible implications and outcomes of the transition (Miller & Richter, 2014).

Coordination across all government levels is also needed. The Canadian federal government managed to work together with the government of Alberta to identify the needs of affected communities and utilize the transition fund to provide appropriate assistance. The coordination has also been effective to prevent local communities and governments from rejecting the idea of transition.

More importantly, planning should be well-executed. Otherwise, any plans will become futile in realizing the transition target.

Poor planning in South Africa–with the absence of a comprehensive economic development plan for coal-reliant regions, lack of social dialogue between the government and other local communities, lack of incentives to develop new industries such as renewable energy industry, and lack of coordination between central and local governments–is a perfect example of how a mere vision is inadequate to ensure a just energy transition.

High-level support from the central government is also crucial in realizing the transition. However, any political changes due to the general election pose a notable challenge since the measures for energy transition might change (European Commission, 2019). Transition policies,

therefore, must be seen as a longer-term political commitment in order to reach a successful, just transition.

Creating enabling conditions for investment in renewable energy

Meeting energy demand is important. The key in the energy transition is large scale deployment of renewable energy and energy storage to meet the increasing demand and to substitute thermal power plants. These require large-scale investment particularly at the beginning of the transition phase. The ability to attract investment in clean power sources is considered as one of the main measures of a country's transition readiness. For most countries in the world, increasing the proportion of renewables in the energy mix would meet both energy security and climate objectives. Therefore, as potential power sources, renewables create investment opportunities and demonstrate a country's preparedness for the energy transition.

Due to the significantly large investments required to develop renewables, the government cannot solely rely on its budget to fund the development. The participation of private sectors to invest in the sector is needed, but most of the time, private investments must deal with barriers that prevent them from accessing investment opportunities. These barriers also increase the investment risks and project capital costs which discourage the private sector, despite their interest in investing in renewable energy. In their study, IRENA identified some of the barriers of renewable investment namely the front-loaded cost structure of renewable projects, lack of experience and capacity of local policymakers and financial sector, lack of investment-ready projects with sufficient size, and financial regulations restraining illiquid and riskier investments (IRENA, 2016)

There are several areas that the government can address to support the mobilization of renewable energy investments. In order to relieve the heavy burden of initial capital costs, , the government can use public finance to create derisking instruments, crowd in private capital, and provide efficient means to overcome the existing challenges. Examples from Canada and Australia show that the transition funds set up by the government may very well be used to address this barrier and attract renewable investors to take on projects that can also accelerate the transition.

The lack of mature projects is arguably caused by two things: lack of information regarding opportunities in the renewable energy market and/or lack of capacity to prepare project proposals and financial documents covering all stages of the project. Therefore, project development and facilitation should be included in the government's energy transition planning. A high-quality and rigorous technical analysis will help in assessing resource potential and eliminate inadequacies at least in the initiation phase of renewable energy projects.

In addition, financial regulation constraints might hinder the implementation of high-risk renewable projects, despite the interest of financial institutions to finance renewable energy projects. While this might not be a big issue in Canada, Australia, or Germany due to better credit ratings and better financial regulation for renewable projects, this is a relevant issue for developing countries like South Africa and Indonesia. Most developing countries do not have high credit ratings nor accommodating financial regulation that can support the development of renewable energy projects. These elements are important to increase the confidence of financial institutions in financing renewables.

Typically, to improve access to affordable capital, investors in developing countries can access concessional loans provided by public finance institutions or development banks. However, the loans have many prerequisites including the capacity building of local lending institutions to assess and mitigate risks related to the project. In addition, small-scale private projects are rarely granted the loan due to the narrow outreach. International organizations began proposing blended concessional

finance for small-scale projects only recently, therefore, the effectiveness thereof is still unknown (ADB et al., 2019; OECD/UNCDF, 2019). Alternatively, the government can provide a guarantee that will increase the confidence of renewable energy investors to take on more illiquid and riskier investments, which in turn will help accelerate the energy transition (IRENA, 2020).

Public Consultation and Social Dialogue

An energy transition will hugely impact those directly working in the industry as many jobs will be lost due to the closure or termination of mines and power plants. Their communities will be indirectly affected as many of their business activities revolve around the coal sector. These people are more likely to reject and resist energy transition with concerns about their sources of income.

To anticipate the negative responses, countries like Australia and Canada conducted social dialogue to hear the community's aspirations and concerns before executing the transition plan. Social dialogue comprises "all types of negotiation, consultation, and exchange of information between or among representatives of governments, employers, and workers on the issues of common interest relating to economic and social policy" (ILO, 2018). In the context of energy transition, social dialogue will help build consensus on pathways a country should take to meet the climate target.

With social dialogue, workers and the community will be better prepared to anticipate the changes through retraining programs or new business development. In contrast, ignoring social dialogue at the early stage of the transition will cause social resistance as experienced by South Africa. The country only conducted social dialogue after the abrupt transition was announced, thus provoking the workers. A late dialogue to gain support from the people is precarious and can even turn them against the transition

By having a preliminary dialogue, the government can set up appropriate responses and identify policy frameworks to guide and facilitate the transition. This includes a mechanism for predictable and orderly power plants' closure, as well as market and regulatory frameworks to facilitate investments in renewables to replace coal (Jotzo, Mazouz and Wiseman, 2018). An important element to realize successful outcomes from the dialogue is clear coordination among the stakeholders. This can be done by organizing a specialized task force comprising experts including from the affected regions. Canadian Just Transition Task Force is an exemplary group on facilitating stakeholder discussions. By doing so, stakeholders will be able to identify the needs and aspirations, unify their agendas, and determine the actions to take.

Social protection and skill development policies

During the transition, facilitating coal workers should become a priority. The affected workers should not be worse off in order to minimize the negative multiplier effect on the economy. Therefore, an important task for the government is to identify the structure of the labor to determine proper assistance. Once they are identified, there are several options that the government can provide to the workers.

The displaced workers should be offered employment, especially in new jobs. The government of the state of Victoria in Australia encouraged this through the Workers Transfer Scheme for those who wished to stay in the power industry. For those who are willing to change their line of work can take on a retraining program sponsored by the government similar to the Canadian experience. In Germany, the government went further by establishing universities in coal-producing areas to increase the quality of workers. The government can also provide early retirement incentives directed to people nearing retirement age. This last option will also reduce the burden on the labor market.

These policies are effective in smoothing the transition and ensuring the employment of

the affected workers. The ex-coal workers were willing to move away from their former jobs because they were included in the discussion and the government took their inputs into account when making policies. In South Africa, the workers managed to push the government to conduct dialogue for a just transition, however, without proper adjustment support for them, workers are still refusing to go through transition.

Economic transition and diversification

Many places that rely heavily on coal are reluctant to move away from the sector as it generates a significant amount of money for the economy. In addition, the economy is trapped under the resource curse where they fail to develop other sectors. Therefore, in anticipating transition, the government must intervene by expanding other sectors in the economy. Initial structural policies must be established to encourage development.

The government of Ruhr provided several incentives to assist the structural adjustment for the community like early retirement and retraining programs (Oei, Brauers, Herpich, 2018). Following this, Germany established research institutions and universities in former coal regions and improved infrastructure to help attract private investments (Wettengel, 2019; Oei, Brauers, Herpich, 2018). New universities and R&D institutions build the knowledge capacity which helped Ruhr to diversify its economy towards technology and health industries. These industries absorb significant labor including the displaced workers, thus the unemployment level caused by energy transition can be kept at a relatively low level.

A similar experience is currently happening in Australia. The LaTrobe Valley area managed to entice an electric commercial vehicle company, SEA electric, to open a factory and establish a large assembly facility by 2021 (Latrobe Valley Authority, 2019; Whittaker, 2019). The agreement came as the local government aimed to become the national capital for electric vehicles and committed an undisclosed amount of support package to underpin the facility construction (Vorrath, 2018). The area also implements a retrofit program that provides energy efficiency and renewable energy upgrades in houses and commercial buildings in the area, which also supports hundreds of local jobs and businesses (Martinelli et al., 2016; Sustainability Victoria, n.d.). By diversifying the economy through alternatives like these, the economy can bounce back quickly after the transition.

Establish funding mechanisms to support just transition

To ease the effect of the energy shift, many countries have established a fund to support local development in areas heavily dependent on coal. In Australia, the fund is used to help workers and communities respond to the unavoidable closures of old power plants. Through this fund, people can get themselves retrained before entering new jobs. By doing so, the government successfully reduces the structural unemployment caused by the transition.

The transition fund can also be used to invest in new businesses. The Canadian government, both at the federal and provincial levels, has transferred funds to innovation centers to encourage the development of entrepreneurship in coal-oriented regions. These funds are sourced from the federal tax revenues generated through fossil-fuels production like the CCTI. It is important to highlight that the funding for transition is not cultivated by the regional government only; The central government has to take a role in the funding provided as it has a larger capacity and also enjoys the benefits from fossil fuels.

Meanwhile, the case study of South Africa shows that developing countries that have limited fiscal capability do not have the same degree of flexibility to fund their energy transition. Therefore, for developing countries, the challenge is to come up with other ways to fund the transition. Imposing taxes on fossil fuels, channeling fossil-fuel revenues for the energy transition, or establishing green bonds could become sources of funding for the energy transition.

STUDY REPORT

4 Energy Transition in Indonesia

Fossil fuels have long dominated the Indonesian energy sector. In 2018, fossil fuels made up 91.45% of the primary energy supply in the country, a slight decrease from 95.63% in 2008. Meanwhile, the share of renewables has only increased by 4.18% over the past decade, trivial progress compared to the huge renewables potential that Indonesia has. Oil has remained the largest energy source of energy supply in Indonesia. Meanwhile, coal surpassed natural gas in 2010 and became the second-largest source of energy supply ever since.

In terms of final energy consumption, petroleum products by far dominated the consumption by accounting for 41.3% in 2018 followed by coal with a share of 36.7%. Coal was predominantly used to generate electricity. In the power sector, coal contributed to 60% of power generation, followed by natural gas (22.3%), renewable energy (11.9%), and oil (6%) in 2018. With the large use of fossil fuels, the power sector contributed to 43% of GHG emissions in the energy sector (including transportation, manufacturing, oil & gas, coal mining, commercial, and household sectors) in 2017. The emission from the energy sector is projected to continue increasing in the coming years.

Globally, Indonesia is the fifth largest fossil GHG emitter in the world, with 2.27 tonnes of CO2 per capita being emitted in 2018 (Global Carbon Project, 2019). While this number is only less than half of Indonesian's total emissions per capita –due to LULUCF contribution– there is a possibility that fossil emissions will surpass the LULUCF sector in the future (Climate Transparency, 2019; IESR, 2019).

Apart from GHG emissions, there are other factors that make the case for the energy transition in Indonesia. Data from Carbon Trackers show that by 2021, it might become more costly to construct new coal-fired power plants than new solar PV in Indonesia, and by 2028, building solar PV will even be cheaper than running coal-fired power plants (Carbon Tracker Initiative, 2018). In the same study, it is also revealed that the owners of coal-fired power plants in the country will be put at risk of stranded assets which cost them USD 34.7 billion if coal phase-out comes to fruition to meet the climate target.

The lack of planning to manage the changing market will also risk the economy as coal demand will inevitably drop to an unprecedented level due to increased international pressure to meet climate target, declining renewable energy costs, divestment of financial institutions from coal, and increased concern over air pollution which will lead to lower coal demand from coal export destinations such as China (Atteridge, Aung and Nugroho, 2018). In contrast, Indonesia will potentially save USD 10 billion in the next ten years if PLN abandons its coal investment plan laid out in 2018 RUPTL and opts for increasing renewable share to 43% (IESR, 2019).

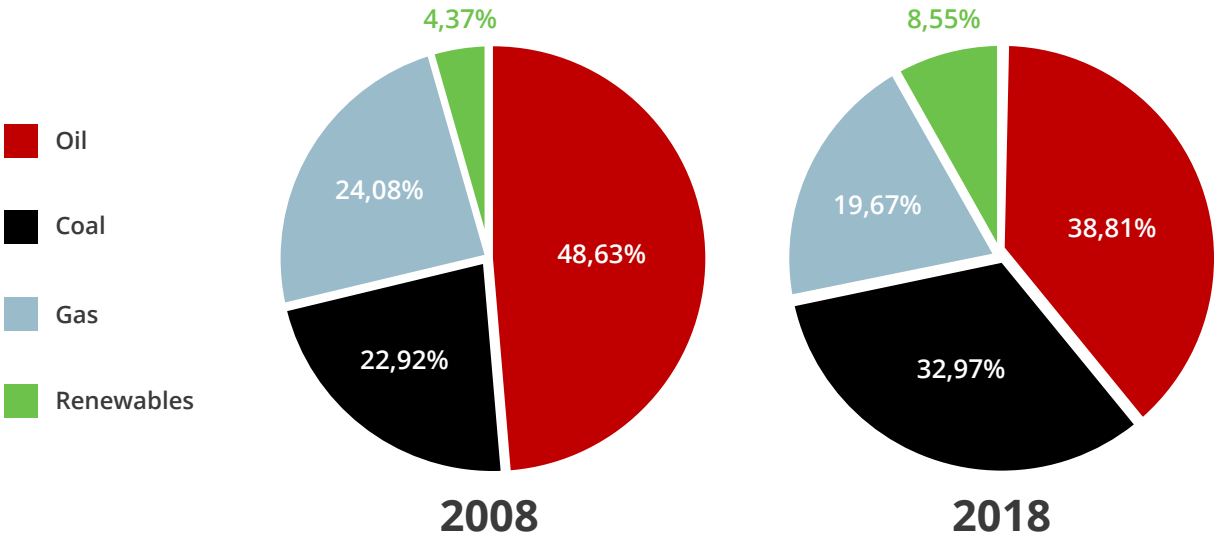

Figure 5. Primary energy supply in Indonesia (source: MEMR, 2019)

4.1. The Indonesian Power Sector

Indonesia had actually gone through an energy transition in the power sector in the past. In the 1970s, oil dominated power generation in the country by contributing to 56 - 77% of the total generation before peaking at 87% in 1982. Since then, diesel power generation has continued to decline and been gradually replaced by coal and natural gas. Coal power itself was introduced in Indonesia back in 1985 as an effort endorsed by the World Bank to help the country reduce its reliance on oil after the oil crisis in the 1970s (Seymour and Sari, 2002).

Coal generation significantly increased in the early 2000s when the government started to kick off the Fast Track Program (FTP) I in 2006 which aimed to build 10 GW of coal-fired power plants. The government then introduced FTP II in 2010 with a goal to construct 10 GW of power plants with 30% of them coming from coal power (PWC, 2013). While the FTP I and II were aimed to help address the electricity supply crisis which happened after the Asian financial crisis in 1997/1998 (Sambodo & Oyama, 2010), many projects in both programs faced severe delays due to cash shortage as well as delays in permits, land acquisition, and loan disbursement (Deloitte, 2016; Sambodo & Oyama, 2010)

Despite this issue, the Indonesian government set a new goal in 2014 to build 35,000 MW of power plants in the archipelago. With this program, the government wished to add 19,600 MW of coal-fired power plants in the country, accounting for 56% of total additions (ADB, 2017). All of these programs have increased the dominance of coal in the Indonesian power sector. Although much focus has been put on coal power development, the development of renewable energy has seen a declining trend. Renewable energy started off strong by contributing to 44 - 43% of total generation (mostly hydropower) in 1971–1976 before plummeting to 11% in 2015.

Aligned with the upward trend in coal generation, coal-fired power plants dominate the power sector in Indonesia. By 2018, the technology made up 50% of total installed capacity in the country, followed by gas, renewables, and diesel which contributed to 29%, 14%, and 7% of total capacity respectively (DEN, 2019). In the last decade, Indonesia has seen a substantial increase in generation capacity from around 31 GW in 2008 to 65 GW in 2018 (MEMR, 2014; MEMR, 2019). With PLN plans to build new coal-fired power plants under its 2019 RUPTL, PLN's coal consumption will continue to increase from 97 million tonnes in 2019 to 153 million tonnes in 2028. The rapid development of power infrastructure has been attributed to the growing electricity demand which comes along with Indonesia's economic growth and efforts to increase the electrification ratio.

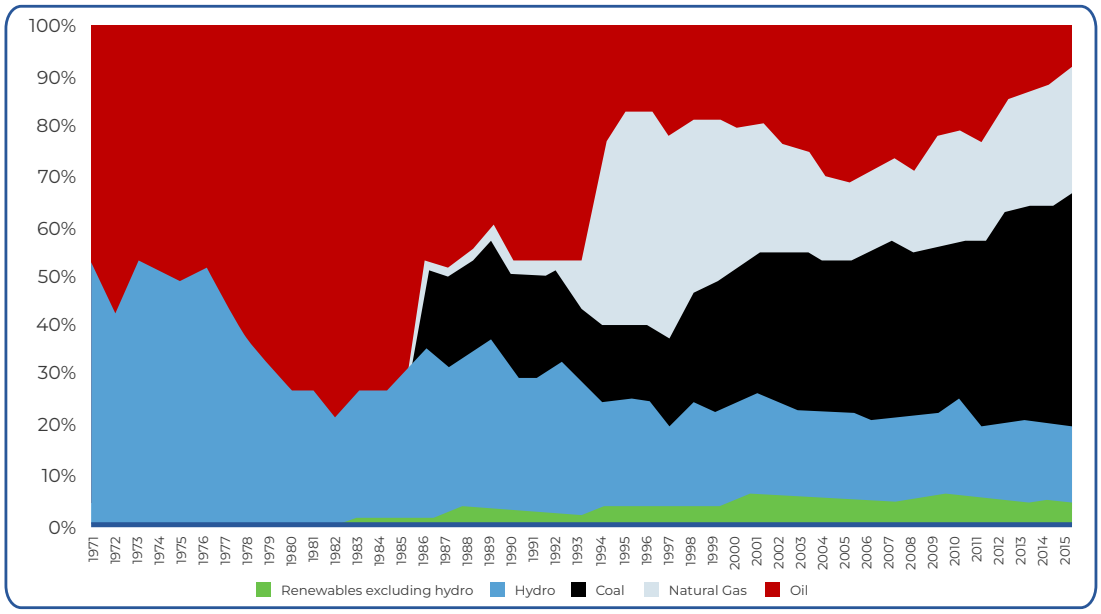

Figure 6. Electricity generation mix in Indonesia. Data source: World Bank Indicator

While electricity consumption has augmented from 149 TWh in 2008 to 267 TWh in 2018, some parts of Indonesia still lack access to electricity. Data from the MEMR show that by 2018, the universal electricity access has yet to be attained in the country. East Nusa Tenggara and Papua suffer the most as only around 57% and 43% of households in these regions had access to PLN's grids respectively in 2018 (MEMR, 2019). The rest of the populations in these regions were served either with communal power plants built by other entities such as ministries, local governments, and NGOs or with less reliable electricity coming from the energy-saving solar-powered lights (LTSHE) (Carbon Trust, 2017).

In Indonesia, PLN is in charge of the provision of electricity throughout the country, unless otherwise decided by the MEMR. As a single off-taker, PLN may develop and operate its own power plants or procure power from the Independent Power Producers (IPPs). The IPPs sell electricity to PLN through a contract called Power Purchase Agreement (PPA) which usually lasts for two to three decades. The contract adopts the take or pay scheme where PLN is required to absorb power generated by IPPs or pay penalties if it fails to do so. The scheme has created a financial burden for PLN with payments to IPPs projected to reach USD 7.8 billion in 2020 and continue to increase to USD 10.7 billion in 2021 (Brown, 2020).

The take or pay contracts may put Indonesia at risk of coal lock-in as PLN is required to pay for coal power in the long term. This will push PLN to maintain its status quo and slow down the integration of renewable energy that may lead to coal-fired power plants to become stranded. The energy transition from coal to renewable energy, therefore, will be more challenging if there is no significant regulatory change in the sector, regardless of the plummeting costs of renewables in recent years.

4.2. State of Coal Industry in Indonesia

Coal is one of the primary mining commodities in Indonesia. Each year the government increases the coal production target in the country from 419 million tonnes in 2016 to 489.7 million tonnes in 2019. In fact, the production realization oftentimes surpassed the target set by the government. In 2019, for instance, the production realization surpasses the production target by 26% (MODI KESDM, 2020).

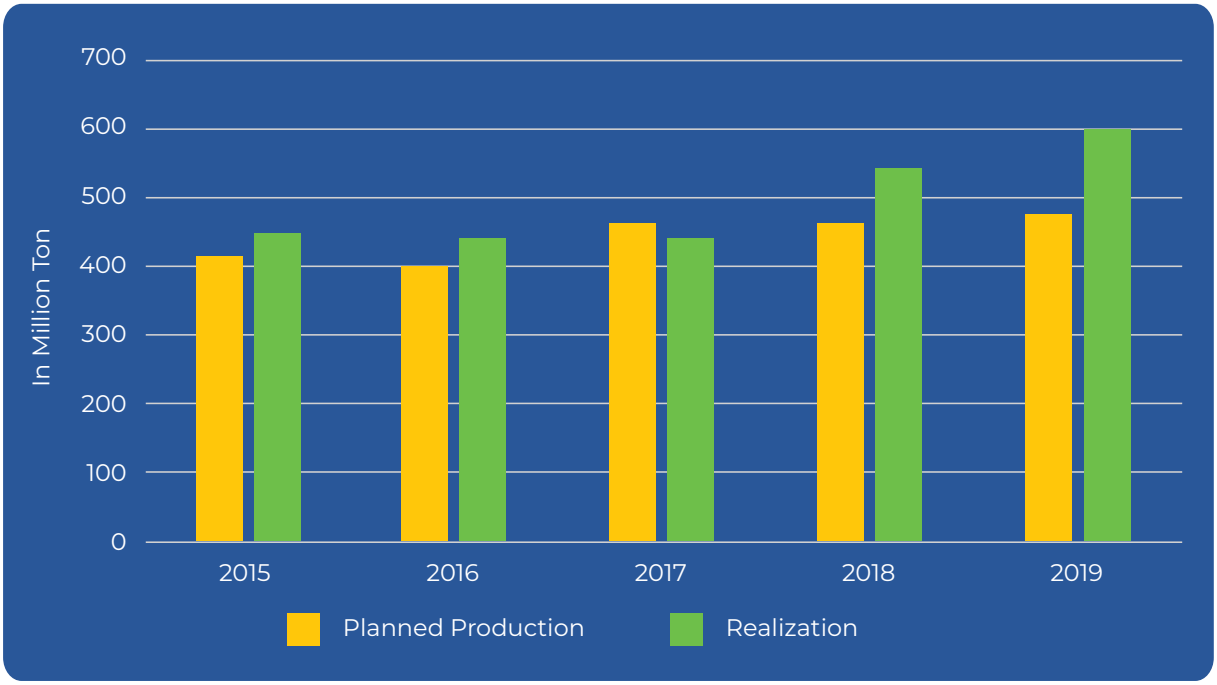

Figure 7. Planned coal production and realization in Indonesia

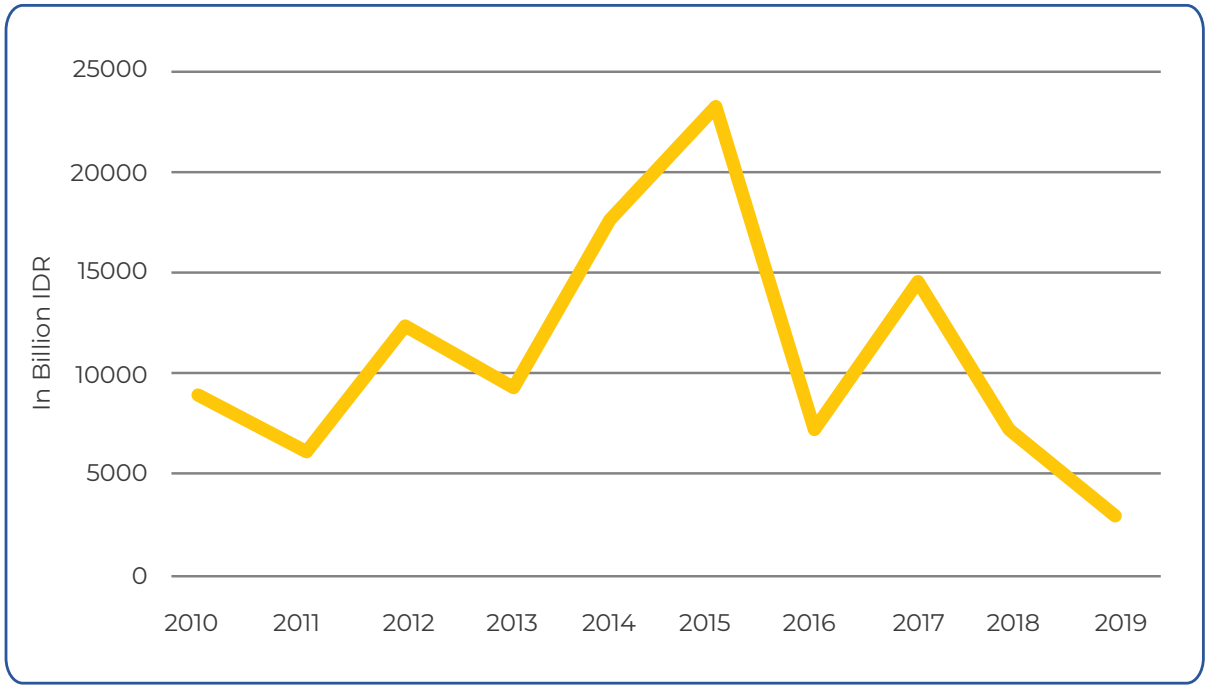

Figure 8. Investment realization in the Indonesian coal sector (source: Indonesian Investment Coordinating Board (BKPM), 2019 (*as of semester 1, 2019)

Coal had contributed to state revenue through land rent, royalty/tax as well as sales of exported mining products in Indonesia. The availability of low-cost coal matches the government's purpose of expanding the capacity to provide cheap electricity to its people (Oxford Business Group, n.d.). Domestically, Indonesia used 138 million tonnes of coal in 2019 and is expected to use up to 155 million tonnes in 2020 (Mariska, 2020). This is a sharp increase in consumption considering that it was estimated that the consumption will only reach 157 million tonnes in 2027 (Arinaldo and Adiatma, 2019).

The increase in domestic consumption might be a response to the decreased global demand for coal. Previously, when the price of coal was relatively high and many countries imported Indonesian coal, the government relied on coal to balance its trade to increase government revenue and to reduce its trade deficit (Arinaldo and Adiatma, 2019). However, this is not the case anymore. Since 2011 until recently (2018) above 50% of Indonesian coal has been exported to India and China, but markets in both countries have been fluctuating. In China's case, coal imports are subject to government policy changes as the country uses imported coal as a price balancing tool for its domestic coal market and to protect the domestic market. Therefore, a sharp change is possible in the future (Arinaldo and Adiatma, 2019; Indonesia Investments, n.d.). In addition, a growing number of countries and financial institutions have started to reduce their investment for companies that are involved in the coal industry as they began to realize the harm caused by coal combustion and the fact that renewables are getting more competitive (Hill, 2019; Carrington, 2018; Kollewe, 2018).

In fact, foreign investment realization for coal has been declining in recent years. The investment had fallen from around IDR 24 trillion in 2015 to only IDR 6.7 trillion in 2016. The investment increased briefly in 2017 but has been decreasing to a level lower than the investment at the beginning of the decade (see Figure 2 below). This trend may indicate a shrinking appetite among investors for coal investments in Indonesia, especially since the exports to India, China, Japan, and South Korea are declining (Reuters, 2020).

Table 2. Profit-sharing scheme for coal mining

Type of revenue	Central government	Province	Coal-producing regency/city	Other regencies/ cities in the province
Land rent	20%	16%	64%	-
Royalties	20%	16%	32%	32%

Through the Government Regulation No. 75/2011, the central government gave licensing authority and mechanism to local governments. As a result, the number of licensed producers rose greatly which explains the increase in productions that went beyond the national targets (Umah, 2020). However, under the new Coal and Mineral Law No. 3/2020, both regulations and licenses are now given by the central government. In addition, under this law, coal companies that have had licenses are guaranteed to have a contract extension for up to 20 years. The guaranteed extension will potentially make the coal transition slower in Indonesia due to a strong push from these companies to maintain the status quo with no specific articles in the law mentioning transition strategies for this sector.

Royalties and land rent from coal production will be distributed to the central government (20%) and the provincial government (80%). The provincial government will then distribute 32% of the royalties and fees to the coal-producing regency, the other 32% to other regencies, and keep the remaining 16% for the provincial budget. With this scheme, coal production benefits not only coal-producing regencies but also the surrounding regencies within the province. Energy transition, therefore, will negatively affect not only the coal-producing regencies but also others.

In addition to the royalty and rent regulation, there is also an incentive for coal miners to produce more coal in Indonesia. In 2009, the government introduced MEMR Regulation No .34/2009 on prioritization of coal and mineral supply for the public interest or known as Domestic Market Obligation (DMO). According to the regulation, the producers of coal are required to set aside a minimum percentage of their coal production for the domestic market. The percentage value is determined by the MEMR every June and made available to the coal producers effectively the year after.

As of 2020, the DMO rate is set at 25 percent with a selling price of $70 per ton of power production (Harsono, 2020). This rate was announced through the Ministerial Decree No 261/2019, which was a continuation from the previous rate and selling price.

4.3. Possible Impacts of Energy Transition

Transition to renewable energy will bring consequences to the fossil fuel industry, particularly the coal industry. Nevertheless, the transition can introduce opportunities to the economy if managed properly or it can endanger the economy if the government is not ready to respond to the transformational change in the energy sector. Some of the possible impacts of the energy transition in Indonesia will be explained as the followings:

Lower Gross Regional Domestic Product (GRDP)

As one of the main industries in Indonesia, the coal industry provided IDR 35.9 trillion to the government by September 2018 through

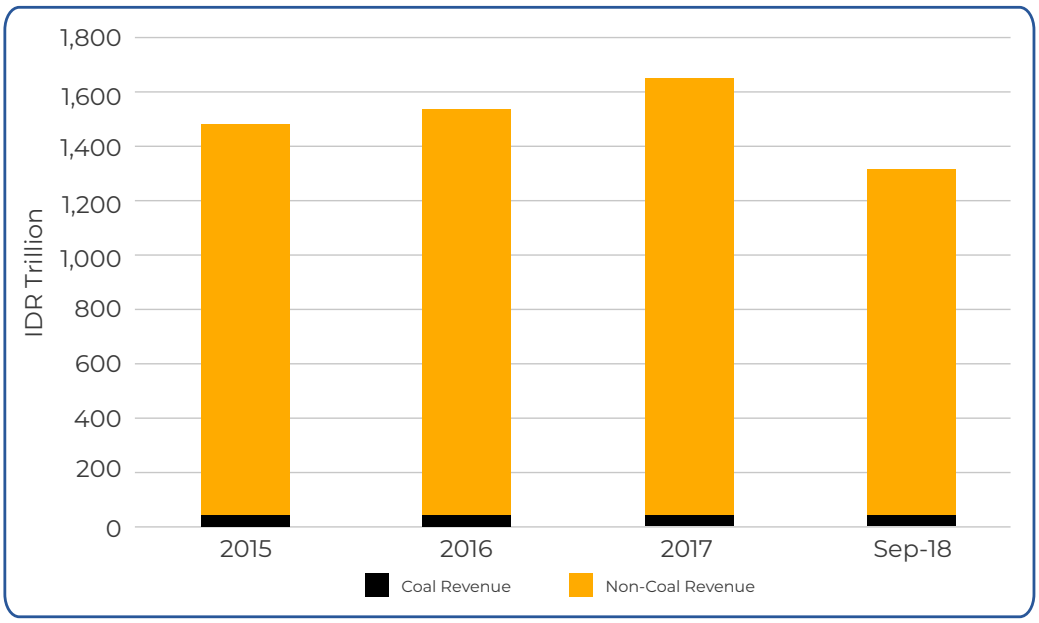

Figure 9. Coal contribution to state revenue

the royalty and sales of mining products, contributing to 2.7% of the state budget in that period. On average, the industry contributes to 1.5-2% of total national revenue annually (Arinaldo and Adiatma, 2019). Nationally, this contribution is not significant as the national economy is more diversified compared to local economies where coal is dominant. Nevertheless, coal is a part of the mining and quarrying sector, which is the fifth-largest contributor to the national GDP (BPS, 2020)..

In terms of GDP, coal contribution to national GDP in 2019 was relatively decent at 2.33% (BPS, 2020). However,coalplaysakeyroleincoal-producing provinces by contributing to 7-34% of provincial GDPs in 2018. Coal contribution, however, has been slowly decreasing in the past 5 years.

Coal production is concentrated in the three largest coal-producing provinces (East Kalimantan, South Kalimantan, and South Sumatra) which together make up for more than 90% production in the country. For these coal-rich provinces, the coal industry brings a significant amount of revenues and jobs into the local economies.

Within each of these provinces, much of the coal production is concentrated in several regencies such as Kutai Kartanegara,

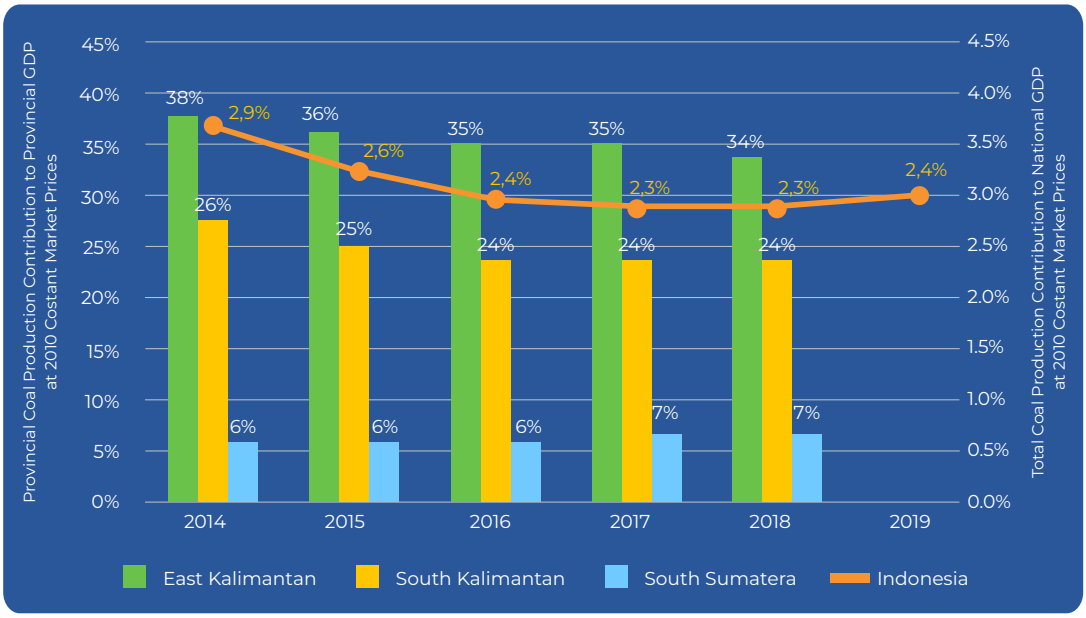

Figure 10. Coal contribution to provincial and national GDPs

Kutai Timur, and Paser in East Kalimantan, Balangan in South Kalimantan, and Muara Enim in South Sumatra. The contribution of the mining and quarrying sector to 2018 GRDPs in these regencies ranged from 55% to 81%, with Kutai Timur had the highest reliance on this sector to generate GRDP. Meanwhile, the contribution of the coal sector to Paser's GRDP was strikingly high, reaching 70% in 2018.

Almost all of these coal-rich regencies have a higher GRDP per capita than their provincial GRDP. Kutai Timur's GRDP per capita, for instance, was twice the GRDP per capita of East Kalimantan in 2018. Similar trends also occur in coal-oriented regencies in other provinces. This has created inter-regional inequality between districts/regencies within a province (Maulana, 2019). However, this does not necessarily translate to the prosperity of the area. Many of the coal-producing regencies have higher poverty rates and unemployment relative to the average in the province as many coal companies tend to recruit employees from other places (Jatam, 2019).

Due to the global decline of coal demand, these regencies and provinces may face the risk of declining coal production over time that could lead to a further increase in unemployment and slow down their economic growth. The negative impacts of the energy transition, however, would be relatively small at the national level as the contribution of coal to state revenue is limited due to the more-diversified economic activities.

Table 3. Coal contribution to the GRDP of the top five coal-producing regencies (all prices are current prices). Sources: BPS Balangan (2019), BPS Kutai Kartanegara (2019), BPS Kutai Timur (2019), BPS Muara Enim (2019), BPS Paser (2019)).*Data in 2017

Regency	Coal Production in 2018 (metric tons)	Mining and quarrying contribution to regency GRDP in 2018	Coal contribution to regency GRDP in 2018	Regency GRDP in 2018 (billion IDR)	The ratio of regency GRDP per capita to provincial GRDP per capita in 2018
Kutai Kartanegara	86,989,488	65%	32%	160,596	1.19
Kutai Timur	82,530,414*	81%	No Data	125,512	1.98
Paser	34,001,363	75%	70%	48,264	0.99
Balangan	28,520,356	62%	No Data	10,751	2.02
Muara Enim	19,455,781	55%	No Data	52,727	1.67

Box 1 Preparing for transition is crucial for regencies that heavily rely on coal - the case of Paser

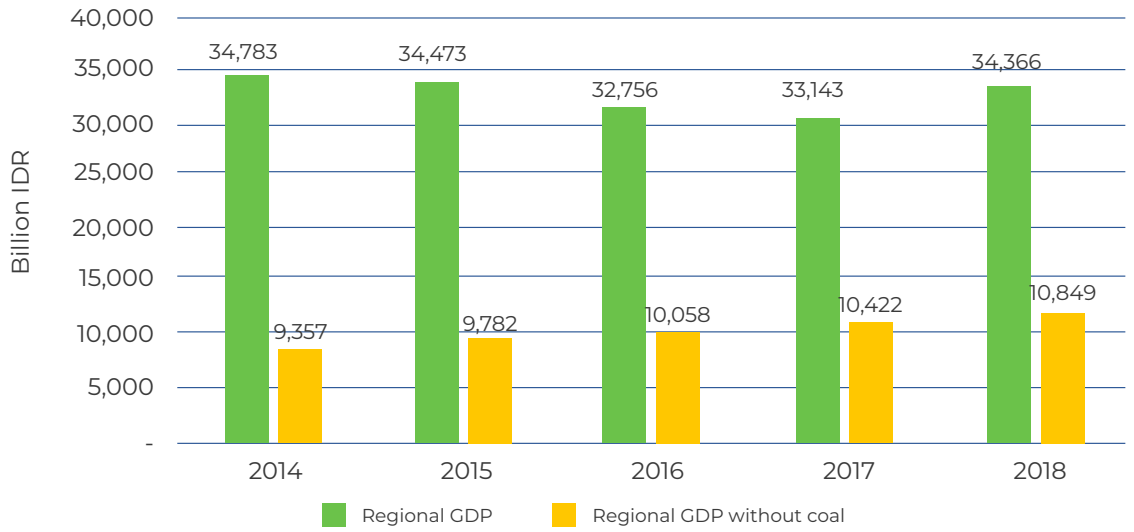

Figure 11. Paser's GRDP from 2014 to 2018 (constant price 2010)

In 2014, Paser Regency had a GRDP of IDR 34,783 billion with 73% of it coming from the coal sector. While the share of coal in Paser's GRDP slightly decreased in 2018, coal was still the main GRDP source in the regency. Other industries such as agriculture, forestry, and fishery only made up less than 10% of Paser's GRDP in 2018 (BPS, 2019). Coal phase-out will likely hit Paser hard if no measures are taken by the local government to facilitate the energy transition process in the regency.

Trade Deficit

One of the reasons that is often used by the government to keep on supporting the coal industry is that the industry has long helped decrease the trade deficit. In 2018, the deficit reached USD 8.7 billion, a new record low for the country. While declining, the deficit was still high in the following year at USD 3.2 billion. Fuel imports have been the main cause of this deficit, followed by the weakening industrialization and slowing oil and gas exports. In 2018, fuel imports reached 27.9 million kL, costing the country around USD 29 billion (SEKI Bank Indonesia, 2019).

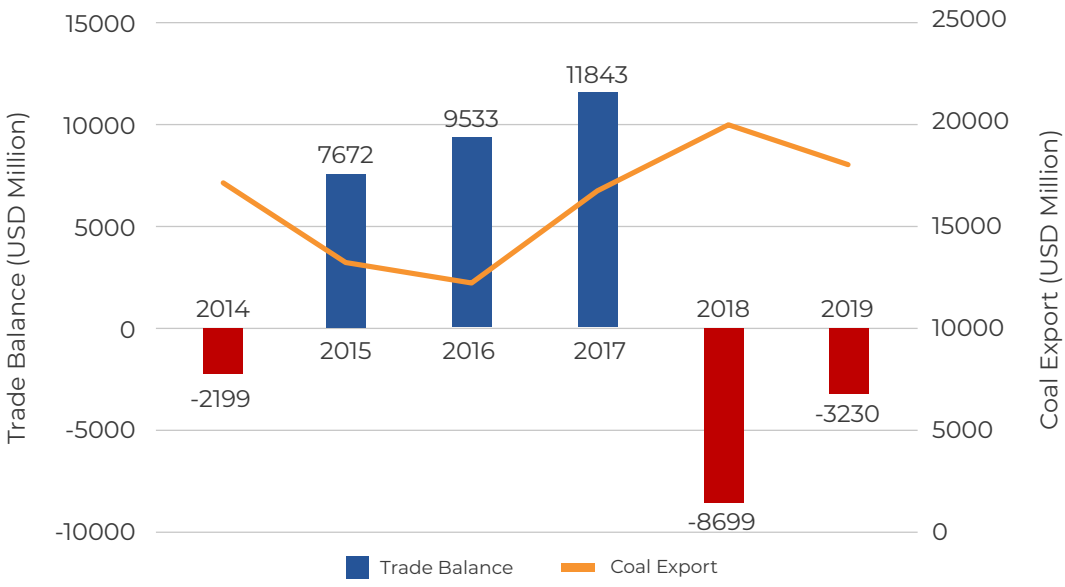

Figure 12. Indonesia Balance of Trade. (Source: SEKI, 2019)

Meanwhile, coal exports have helped ease the deficit. The value of coal exports peaked at USD 23.9 billion in 2018, before slightly declining to USD 21.7 billion in 2019 (SEKI, 2019). On average, coal has contributed to around 12% of total exports in the past six years.

Despite its notable contribution to trade, reliance on coal will likely put the country at risk of higher trade deficit due to the changinglandscape of global energy investments. Many countries around the world, including China, India, Japan, and South Korea – the main export destinations of Indonesian coal– are currently undergoing energy transitions. The coal consumption in these countries will likely decrease in the coming years due to their emission reduction commitments, increasing renewable capacity and declining renewable costs, and stricter environmental standards put on power plants.

A higher trade deficit will contribute to the current account deficit, which will put Indonesia in a disadvantageous position. Indonesia is a price taker in the international market, thus when there is a commodity price shock such as an increase in oil price or a decrease in coal price, the implicationswill be strong for the economy. Therefore, the country should reduce its reliance on natural resource-based export and diversify its economy instead.

Unemployment

The energy transitions at the national and global levels will likely reduce coal demand in both Indonesian and global markets. The lower coal demand will inevitably force coal companies to cut jobs in the industry. The coal industry itself has long provided a high number of jobs in the country. While data on employment in the industry is patchy, some historical data might show the scale of the industry in Indonesia.

As seen in Figure 13, the number of direct employment in the coal mining sector had soared from around 33,000 in the late 90s and early 2000s to more than 153,000 in 2012. This increase was caused by rising coal production in the country from 62 million tonnes in 1998 to 412 million tonnes in 2012, a six-fold increase in 14 years. From 1998 to 2003, the labor intensity in the sector had declined by an average of 12% per year due to improved productivity and increased automation in the sector. In 2013, it was estimated that the Indonesian coal sector employed 1.1 million people (including direct, indirect, and induced jobs) (Arif, 2014).

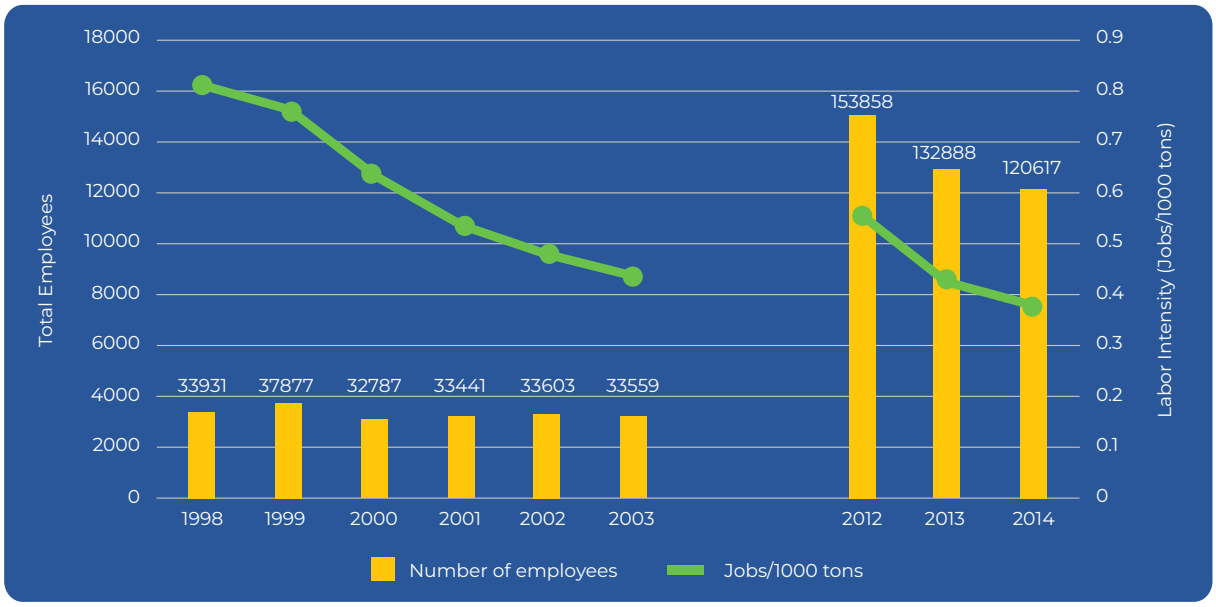

Figure 13. Direct employment of coal mining (No data on 2004–2011) (source: MEMR, 2015 and Singawinata, 2007)

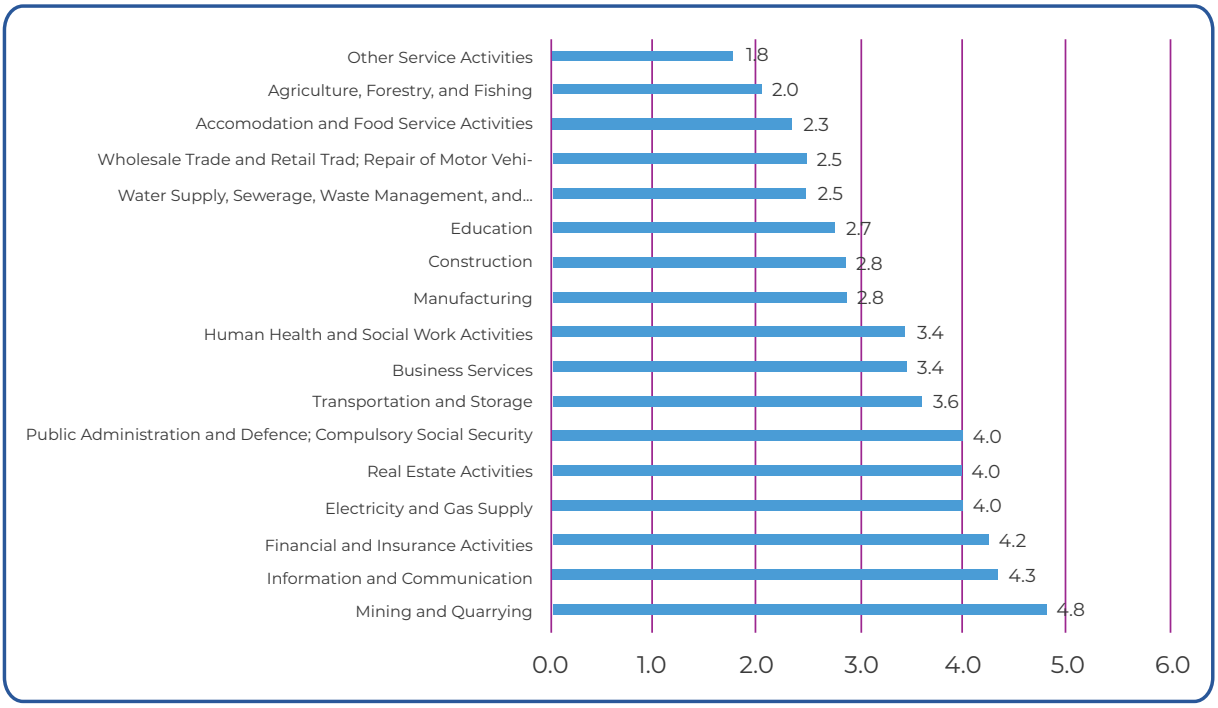

Figure 14. The average net wage in Indonesia by sector in 2019 (source: Statistics Indonesia, 2020)

With this scale of employment, the energy transition will likely bring massive unemployment in Indonesia. Many workers will not be able to find jobs easily as they only possess specific skills that might not be applicable in other sectors. The transition will be even more difficult for older workers when the job market prefers young workers, thus, risking vulnerable people to be left behind. Moreover, indirect and induced workers (e.g., workers in coal-transporting companies) will also be affected by the transition. This will further drive up unemployment.

While there is no specific data available on wages in the coal mining industry, data on average monthly wage in the mining and quarrying sector reflects that the coal mining sector provides relatively high paying jobs compared to other sectors (see Figure 14). Furthermore, many of the coal areas in Indonesia provide various facilities such as airports, seaports, housing for employees, schools, sports facilities, and small coal power plants available for the mining community (Daniel, 2019). The better living conditions enjoyed by coal workers contrast the high poverty rates in coal-producing regencies, presenting economic inequality in these regions.

The fact that the industry has provided such decent jobs with the level of salaries and benefits also implies that transition will likely lower the living standards of the workers if they fail to find other jobs that can provide similar or higher levels of wages. Therefore, any changes from the current condition (energy transition) might trigger resistance from coal workers as their standards of living are likely to drop significantly.

Affordable System Costs

Contrary to conventional wisdom, power systems with a high renewables penetration will actually result in relatively low system costs. IESR's study in 2019 shows that a power system with high renewable penetration making up 43% of total generation would bring lower ten-year operating and annualized investment (system) costs than the high fossil fuel-based system laid out in the 2018 RUPTL. High renewable penetration (43%) by 2027 will lower the system costs by 5%. Furthermore, as Indonesia integrates more renewables into the grids, the investment risks in renewables will significantly decrease, helping lower the WACC from 10–12% to date to around 8%. At this WACC level, the system costs will further go down by 12% (IESR, 2019).

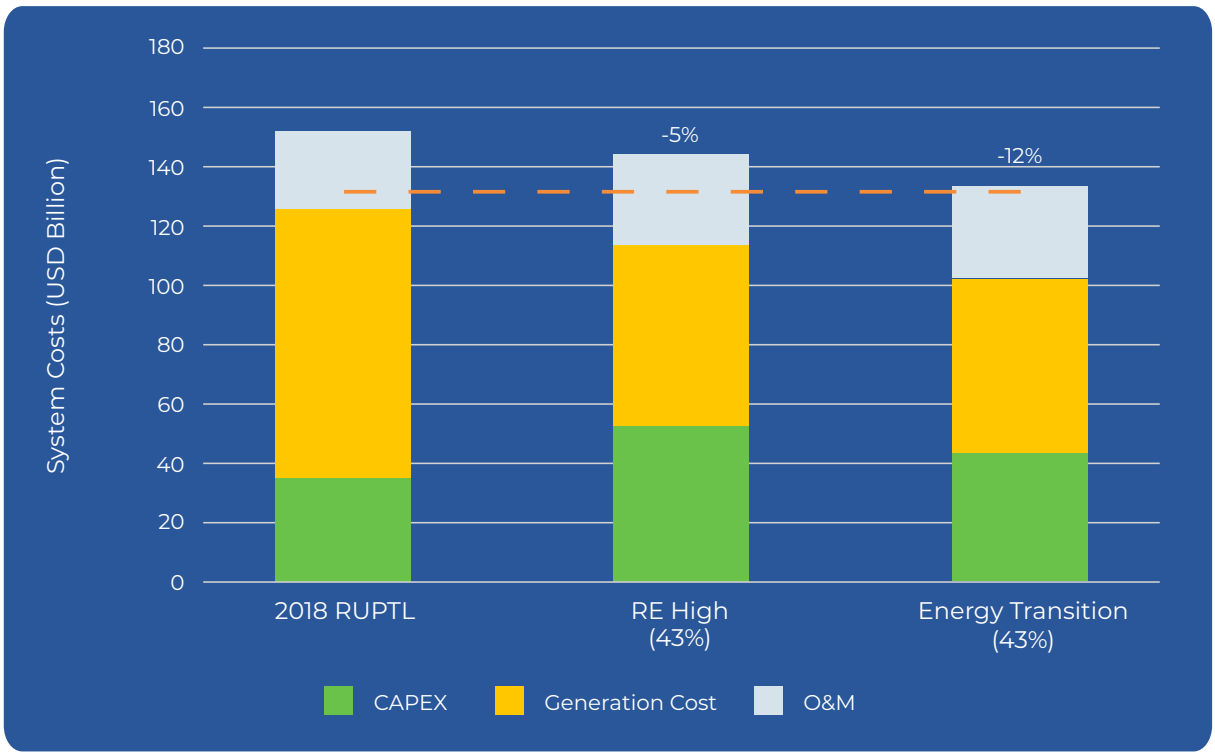

Figure 15. Total operating and investment costs for Java-Bali-Sumatra systems 2018–2027

Observation on overall system costs is important as a mere focus on the Levelized Cost of Electricity (LCOE) might lead to a misleading conclusion. While it might be true that the average LCOE of some renewable technologies today is still higher than coal technologies, long-term investments in renewable energy will bring more affordable system costs to Indonesia.

In fact, solar energy recently reached a new record low at USDc 5.8/kWh in the 145 MW Cirata floating solar PV project (Afriyadi, 2020), on par or lower than typical coal power at USDc 5.6–8.1/kWh (USC technology). If more large-scale renewable projects are developed, the generation costs of renewable energy will likely become more competitive. As a result, Indonesia will likely see low system costs in the near future.

Economic Diversification

The shifting from fossil fuels to renewable energy potentially drives economic diversification away from fossil fuels both in coal-producing areas and the whole country. As previously discussed in the trade deficit section, economic diversification will be helpful for Indonesia in avoiding severe impacts of commodity price shocks. In addition, considering the fact that renewable energy costs have become more competitive, the use of renewable technologies is expected to increase in the coming years. The declining costs paired with the government's commitment to developing renewable energy will attract investors to invest in the renewable energy industry in the country, helping create a new tax base and a more diversified economy.

Looking at the renewable energy potential in the three highest coal-producing regions in Indonesia, there is a prospect to start developing the renewable sector in these regions. If provided with the necessary training, ex-coal workers may also be employed in the new industry. At the same time, the renewable energy sector will also bring more job opportunities in other supporting sectors since the renewable energy sector has potential multiplier effects.

Table 4. Renewable energy potential and installed capacity (2017) in coal-producing regions. Source: MEMR's Statistik Ketenagalistrikan, 2018

Region	Total Installed Capacity (MW)	Renewable Installed Capacity (MW)	Renewable Energy Potential (MW)
East Kalimantan	1321	0.43	23,841
South Sumatra	729	30	14,103
South Sumatra	2330	11.85	21,866
Indonesia	60,788	7323	431,745

Apart from the renewable energy sector, the energy transition also brings the opportunity to boost the existing industries which have been contributing to local economies. Local governments, however, have to ensure that the industries they opt to expand are sustainable in the long term. For instance, East Kalimantan is rich in both coal and oil and gas. The province also has a sizable manufacturing industry. To shift away from a resource-based economy, the government might focus on increasing the local manufacturing capacity. As seen in the table below, East Kalimantan has existing industries such as food, beverage, chemical, and rubber which together make up for 30.12% of total manufacturing outputs in the province. While this seems sizable, more comprehensive studies need to be conducted to identify industries that are suitable to replace the fossil fuel industry. The effort to find the right industries to develop might not be straightforward as there is no "one size fits all" recipe that can be used for economic development. Economic development is innately local and

Table 5. Manufacturing industry in East Kalimantan. Source: BPS E. Kalimantan, 2019

Type of Manufacturing industry	GDP in Billion Rupiah (constant 2010)
Food, beverage, and tobacco	10,218.44
Textile, leather goods, and footwear	85.99
Wood and other forest products	2,940.64
Paper and printing	2,677.93
Chemical, pharmaceutical, botanical products, and rubber	12,539.95
Transportation equipment, machinery, and equipment	906.82
Total Manufacturing (incl. mining and others)	**97,499.09**
Share of non-mining manufacturing	**30.12%**

therefore, any attempts to ensure its success should involve local stakeholders (IISD, 2017).

However, it is generally well-understood that overreliance on a single sector to generate revenues and employment is a huge risk for the economy, particularly if the sector is natural resource-based. Energy transition, therefore, should be used as an opportunity to establish a new economy that can withstand the commodity price volatility and supply diverse sources of employment.

Potential Sectors in South and East Kalimantan

In the case of South Kalimantan and East Kalimantan, the local governments have realized that they should start lessening their reliance on the coal sector. However, the current growth of the other sectors is insufficient to replace coal contribution to the economy. In both provinces, the mining and quarrying industry has been a dominant sector in local economic composition. As for the second and third dominating sectors, Indonesian Statistics of East Kalimantan has noted Manufacturing (18.3%) and Construction (8.5%) and South Kalimantan has Agriculture, Forestry & Fishing (14.4%) and Manufacturing (14%) (BPS E. Kalimantan, 2019; BPS S. Kalimantan, 2019). Governments of both provinces have also included the development of the non-coal sectors as the focus of their Local Government Work Plan (Rencana Pembangunan Jangka Menengah Daerah/RPJMD). Both provinces are considering to promote agriculture, forestry & fishing sector by encouraging shrimp farming, tourism, and agroindustry (combined with manufacturing) while also boosting accommodation & food service activities in which tourism is a part of (Dwinanto & Pratama, 2019; Dwinanto & Sumarsono, 2019; Diananta, 2018; Fadhilah, 2018).

Growing Green Jobs

Even though the transition will take away some jobs linked to coal and other fossil fuel industries, it will also open the opportunity to set up industries that create green jobs. Green jobs are defined as any decent jobs from any sectors that can "reduce consumption of energy and raw materials, limit greenhouse gas emissions, minimize waste and pollution, as well as protect and restore the ecosystem" (UNEP et al., 2008). A study has shown that if 100% renewable energy utilization in power systems is to be realized, globally there will be around 34 million direct energy jobs created by 2030 (Ram, Aghahosseini, & Breyer, 2019). Meanwhile, the fossil fuel sector is projected to provide only 2% of the total global jobs in 2050 (Ram et al., 2019).

Through transitioning towards renewable energy, the current number for green employment is likely to increase as the renewable energy sector alone is predicted to create 1.3 million jobs by 2030 in Indonesia (IRENA, 2017). The renewable employment projection is also aligned with the global trend where the renewable jobs have increased from 7.3 million jobs in 2012 to 11 million (direct and indirect) jobs in 2018, giving a 50% increase in six years (IRENA, 2019). This increase will be a significant contribution to the Indonesian job market, especially since Bappenas projects there will be around 15.4 million additional green jobs under a high LCDI scenario by 2045 (Bappenas, 2019). Job creation from renewable energy development might be higher than the projection if the multiplier effects are also included. Further studies are needed to measure the overall impact of renewable energy development on the Indonesian job market.

Additionally, the renewable energy sector brings safer and healthier working conditions than the coal sector, increasing the overall job quality. While there is no data available on wages in the Indonesian renewable sector, global data shows that the renewable sector provides well-paid jobs. It is also revealed that renewable projects have a higher number of employment per unit of energy produced than conventional power generation projects (Bacon & Kojima, 2011).

It is worth noting that the new jobs created by the energy transition are not limited to jobs in the renewable energy sector. Other "green industries" such as the electric vehicle industry will also bring new green jobs into the country. Considering the trends,

the energy transition might, in turn, bring a net employment gain for Indonesia in the long term.

Better Air, Water, and Soil Quality

As one of the biggest coal producers in the world, Indonesia contributed greatly to the increase of pollutants in the ecosystem and was responsible for the emissions in the atmosphere. Various studies have found negative effects of coal activities on air, soil, and water quality. However, there is limited study of the negative externalities from coal-related activities on the air, water, and soil quality in Indonesia.

A study on 15 existing and proposed coal-fired power plants located within 100 km of central Jakarta estimated that altogether, they emit 227,410 tonnes of SO2 and 261,403 tonnes of NOx annually (Myllyvirta and Chuwah, 2017). These gases increase air pollution that causes respiratory illnesses. Coal combustion also releases ashes and particulate matter (PM) that contribute to smog and haze on top of respiratory problems (EIA, 2020). According to Walhi, coal power plants around Jakarta contribute to 20-30% percent of haze that happened throughout 2019 (CNN Indonesia, 2019). However, this report has not calculated the damages as a value of money loss.

In terms of coal mines, many are open-pit mines that remove the soil and rock above coal deposits, thus changing the surrounding landscape. Dust and depositions caused by dangerous chemicals might damage the quality of land (Myllyvirta and Chuwah, 2017). The soil will lose organic materials, nutrients, and microorganisms needed to support biodiversity even after mining activities are over (Hardjanto, 2015). As a result, land from post-coal exploitation becomes barren. In addition, a study by Jatam and Waterkeeper Alliance found that by using mine pit water, farmers may lose 50% of rice yields and 80% of fish production (Waterkeeper Alliance and Jatam, 2018).

Considering all of the impacts, reduction of coal use through energy transition will certainly help improve air, water, and soil quality in Indonesia. More comprehensive studies, however, are needed to calculate the monetized value of environmental damage caused by the coal sector in Indonesia to help communicate the urgency of this issue to policymakers.

Reduced Health Costs

It is clear that the use of fossil fuels has negative impacts on health caused by increased air pollution. Some major cities in Indonesia have seen worsening air quality mostly due to fossil fuel combustion in vehicles and power plants. Jakarta, for instance, often ranked as the city with the worst air quality in the world. This led to the public outcry demanding the government to take action to improve the air quality.

Air pollution from coal combustion itself is one of the main causes of Non-Communicable Diseases (NCDs). In the three biggest coal-producing countries, namely India, China, and Indonesia the air pollution-related NCDs had caused the death of 1.2 million in 2017, 1.1 million in 2016, and 1.3 million in 2015 respectively (Pompeu, 2019). Another study estimated that respiratory and cardiovascular diseases will cost Indonesia US$ 822.48 billion to US$ 1,770.12 billion of GDP output loss respectively between 2012 to 2030, much higher than the total expenditure for health at 2.9% of GDP or US$ 26.62 billion in 2012 (Bloom et al., 2015).

The studies of air pollution impacts in Indonesia have been carried out by several institutions as seen in Table 7 below. While the figures seem varied, the number of fatalities caused by fossil fuel use in Indonesia is conceivably high. With 7,480 deaths per year, Bappenas estimated that the mortality caused by coal-related air pollution will cost Indonesia approximately USD 2.9 billion (Bappenas, 2019).

While there is no data available on the number of people suffering from air pollution-related NCDs, the medical treatment for people with these conditions would likely cost a significant amount of money. On average, NCDs

Table 6. Health costs of fossil fuels in Indonesia

Institution	Study result (Indonesian case)
WHO (2015)	62,000 air pollution-caused NCDs-related deaths in 2012
Koplitz et al. (2017)	7480 coal-related deaths per year
Greenpeace - Harvard University (2015)	6500 coal-related premature deaths per year and will increase to 28,300 deaths per year if all planned coal power plants are built.

treatment can cost USD 648–1,125 per person per year (Bappenas, 2019). As most people in Indonesia use subsidized universal health care called BPJS, any improvement in air quality due to the shift from fossil fuels to clean energy will free up some state budget to be used for other important causes.

4.4. Key Stakeholders in the Indonesian Energy Transition

As many will get affected by the energy transition process, it is imperative to start identifying stakeholders needed to involve in the dialogues on just transition in Indonesia. At a minimum, the consultation process must include the government, employers, and workers (tripartism) and should also involve the local communities impacted by the transition. The following list may not be all-encompassing and therefore, necessitates further analysis.

Recognizing various perspectives from different stakeholders will help formulate equitable policies that ensure equity in cost and benefit-sharing among stakeholders. Considering the importance of the dialogues and the number of stakeholders involved in the dialogues, the government may establish a dedicated committee assigned to bring all stakeholders together to produce actionable recommendations.

Table 7. Key stakeholders to ensure a just energy transition in Indonesia

Stakeholder Group	Detail
Central Government	Ministry of Finance, Ministry of Energy and Mineral Resources, Ministry of Trade, Ministry of State-Owned Enterprises, Ministry of Environment and Forestry, Bappenas, National Energy Council (DEN), Parliament
Local Government	Governors, regents, mayors, local government bodies
Companies	PLN, coal companies, coal contractors, coal transport companies, equipment supply chain companies, IPP, financial institutions, development banks
Workers	Coal workers, impacted workers, health workers
Community	Local communities, impacted communities, vulnerable and disadvantaged groups
CSO	Labor unions, NGOs, associations, academia, political parties

STUDY REPORT

5 Managing Just Energy Transition in Indonesia

A just transition is all about managing impacts (IISD, 2018). In order to maximize the positive impacts while mitigating the potential risks that the transition brings into the economy and society, the government should prepare measures to help manage the transition. As the transition will negatively affect coal-producing regions and the workers, it is important for the government to create policies and measures that will help those affected by the transition go through difficult times and ensure that nobody will be left behind. These policies have to be shaped with the involvement of local stakeholders through intensive dialogues and set as early as possible to give those impacted time to adjust to changes.

While the risks are real, there are no in-depth studies and analysis ever been done by the government to help prepare Indonesia to face the worst possible outcomes of transition. The lack of planning will unequivocally lead to an unjust energy transition in the country, further increasing inequality in society. To prevent this from happening, at minimum, the government has to act on the following measures. In addition, to understand the impacts better, the government needs to obtain both quantitative and qualitative information on aspects of the transition, which can be used to help set strategies for managing the impacts.

Understand the whole spectrum of energy transition impacts on the overall economy and coal industry by conducting research or studies

The energy transition is a long, multifaceted, and complex process that brings uncertainties and risks, not only to the sector but also to the economy at large. Energy transition, for example, will affect the job market not only in the coal sector but also in other sectors related to the coal industry and power sector. Therefore, a successful and just transition requires an understanding of the impacts of the energy transition on both the coal sector and the overall economy.

This report demonstrates that Indonesia can learn from the experiences of other countries that have already gone through energy transitions. While the severity of the impacts might vary, the affected sectors are similar. Indonesia can learn from various policies implemented in these countries that are effective to ensure a successful transition and avoid making the same policies that are ineffective.

To carry out the study, the government can collaborate with academics, research institutions, and other related entities that have the expertise and experience to identify and investigate energy transition impacts. The collaboration will also be helpful in providing justification regarding the urgency of the energy transition. While this report provides a brief explanation of how some countries have gone through energy transitions, further studies should be conducted to seek more detailed information on aspects influencing the outcome of transition and suitable policies to maximize benefits and minimize risks that the energy transition potentially brings to the economy.

Furthermore, this report showcases how energy transition affects GDP, trade, employment, power system, health costs, the environment, and national as well as local economies. However, it should be taken as an initial study that covers only the outer layer of the problem. More comprehensive and in-depth studies on this topic should be carried out to give more context regarding what Indonesia will go through during the energy transition.

Embed good governance in the energy transition process

Good governance is a prerequisite for a just transition. Lessons learned from the international case studies show that there are at least three plans that should be in place to help a country govern and manage the transition. The development of these plans should be carried out in a transparent process and include participation or consultation with relevant stakeholders. ***The first plan*** is a strategic plan which includes vision development and long-term goal formulation. The vision and long-term goals should gain public acceptance to ensure a successful transition.

Indonesia should learn from Canada that has shown its commitment to climate change by setting up a long-term goal to phase out coal power plants.

A mere vision, however, is insufficient to make the transition just. The strategic plan should be followed by the development of a *tactical plan* necessary for agenda and coalition building, networking, and negotiating with stakeholders. Indonesia may learn from Australia and Canada which assigned a dedicated body (task force) to conduct social dialogue between the government, employers, and workers (tripartism) as well as local communities and NGOs on transition issues. The case study of Germany also shows that the *multi-level, polycentric governance and planning*, where stakeholders participate in policymaking, is key in helping coal regions diversify local economies. Social dialogue is an integral part of the negotiation process paramount to build consensus on future plans or actions and a tool to help ensure that no one is left behind in the transition process, which is an essential part of a just transition.

Task forces have effectively helped governments in the respective countries in setting up regulations, strategies, medium-term goals, and pathways of transition which mirror local circumstances and needs of coal-reliant regions. The pronouncement of long-term goals together with specific plans and strategies to meet the goals will be effective in lowering market risks and enabling markets to respond and adjust in time.

The third plan that should be in place is an operational plan used to mobilize projects and implement strategies and policies set to achieve transition agendas. The plan should clearly articulate the short-term targets required to help achieve the long-term transition goals. In this plan, the role of PLN as a single off-taker in the Indonesian power market becomes more central to execute the phase-out of coal-fired power plants and the integration of more renewable energy into the grid.

Lastly, the *monitoring and evaluation* process should be continuously performed to examine the effectiveness of the plans. The setting up of regulations and strategies should be seen as an evolving and continuous process as they will change following the new objectives, instruments, and stakeholder engagement in each stage of transition (Könnölä, Carrillo-Hermosilla & van der Have, 2008). Therefore, it is imperative for the government to make necessary adjustments to reflect the transition development and involve stakeholders in every adjustment it makes.

Build economic resilience through economic diversification and green job creation

To minimize the risk of weakening economic resilience as a result of changes in the energy sector, the government needs to start focusing on climate-resilient development by diversifying the economy towards sustainable economic growth. Lessons learned from Germany show how the government strategically set policies aimed to transform the local economies which used to rely on a single sector as a source of income to a more diverse and sustainable economy. Policies such as *infrastructure improvement as well as education and technology development* proved effective for this objective. However, it is only with the *coordination and involvement of local stakeholders*, cities in the coal region could maximize their potential and diversify their economies.

Economic diversification is crucial in minimizing the economic shocks that may happen due to the contraction of the coal industry. Therefore, as a preliminary step, the Indonesian government needs to identify and incentivize potential industries to be developed in coal-producing areas as an effort to diversify local economies. Through these new industries, the government may see the creation of green jobs both for workers displaced by the coal phase-out and other workers.

The economic changes should then be a long-term development plan that avoids resource curse due to dependency on coal and other natural resources. Instead, it should be

shifted towards a more sustainable industry that can also provide decent work for all and promote equality among the people. Sustainable development and a just transition, therefore, should be at the heart of macroeconomic policies in Indonesia.

As coal has been a dominant industry in East and South Kalimantan, the lack of alternative industries multiplies the possible damages that the energy transition would cause to these provinces. To mitigate this, both the provincial and central governments must work together on supporting new and/or emerging industries to become the replacement for coal and diversify the economy.

A few sustainable industries such as the renewable energy industry can potentially replace the fossil fuel industry, bring new decent jobs to the economy, and become new tax bases for local governments. Other than the renewable industry, local governments may expand the existing industries that can bring similar benefits to the economy.

While industries such as palm oil and fisheries may become options for economic diversification, it has to be taken with precaution as the two industries have the potential of damaging the environment. Sustainable operation of palm oil and fisheries should be able to help support the economies but the governments have to make sure that the economies do not depend on these industries and other similar industries in the longer term.

As this study is not aimed at providing rigorous analysis on potential industries to develop in transition-affected regions, the government has to conduct comprehensive quantitative and qualitative studies to help identify new industries that are aligned with their sustainable economic development goals.

To develop renewable energy, the government needs to actively create demand for renewable energy to help stimulate and develop the market in the country. Lessons learned from Australia show how the Feed-in-Tariffs (FIT), Renewable Energy Certificate (REC), and pilot projects can help create new demand for renewable energy. This has helped the country to both create new demand for renewables and share the responsibility to develop the local market.

Similar to other technologies in their early adoption, green technologies also need fiscal and financial support from the government. Subsidies and tax exemptions or reductions for renewable energy, for instance, have proven effective in supporting renewable energy development in Canada. Economic instruments are necessary to help influence the market, change both short and long-term preferences of market players, and establish new renewable industries locally.

In addition, it is also clear that the government support on educational as well as research and development programs are substantial in helping increase the competitiveness of new green industries and assist local talents to gain necessary skills that match with the new industries' needs. Germany has showcased this through its financing of R&D activities in local universities which later helps the country maintain its status as the front runner in renewable technologies. While it might be true that Indonesia lacks focus on R&D programs, the government should integrate the programs if it wishes to see local green industries flourish.

Set up an active labor market, skills development programs, and social protection policies

Energy transition will have a significant impact on the labor market. Therefore, the labor market policies should actively help the individuals affected by the change in labor market demand due to energy transition. The policies should focus on providing access to jobs and increasing employability and training (ILO, 2015). Employment services should be set to provide information on available jobs, matching services, as well as training for displaced workers.

The policies are crucial in anticipating job losses caused by the energy transition. Huge unemployment may be unavoidable,

but the length of unemployment can be shortened through several incentives that are targeted according to the structure of the labor market. Therefore, it is important to align the active labor market policies with energy transition goals.

Previous experiences from other countries have highlighted several government incentives that are effective in reducing the unemployment period for displaced workers. Among them, early retirement and retraining programs are successful in relieving the labor market's burden. Workers who are nearing retirement age should receive an early retirement offer. This will encourage them to voluntarily leave the workforce, thus limiting the labor dispute and at the same time help older workers who are less likely to find reemployment.

As for younger workers, they should go through retraining programs. For retraining programs to be successful, the government needs to support the growth of new and emerging industries in the local areas so that these alternatives can absorb the displaced workers. The governments of East and South Kalimantan, for instance, have recognized several sectors that can be developed to replace coal dominance in their economies. The local governments, therefore, can assist displaced workers by providing training programs to develop skills needed by these sectors. In addition, to secure a just transition for impacted workers and their families, the government should strengthen social security systems through the provision of unemployment benefits and other social safety net measures for low-income households affected by the transition.

Establish the energy transition fund

Seeing the importance of coal, both as a commodity and a source of energy, coal phase-out will have major impacts on the economy. Development in coal-dependent provinces relies on the income from the coal sector. These provinces will suffer the most as coal has become the main income generator for them while the growth of other sectors is slow. At the same time, if governments refuse to go through the energy transition, they will inevitably suffer in the future when coal starts losing its market values as a commodity and energy source. Therefore, provincial governments need to find a solution to find alternatives while pushing for the growth of other sectors. Obviously, the process of shifting from coal to its alternatives will require a significant amount of funding. Thus, as an anticipative action, the central and/or provincial governments may establish a dedicated fund used to transition the coal-reliant regions.

In Germany, both the federal and state governments have set aside a transition budget to assist coal-reliant regions to phase out and close coal facilities. These funds were given in aggregate over a time period and were used to set up new programs to support new industries and displaced workers. Similarly, Canada has designated a portion of their budget for coal transition. The government goes even further by utilizing revenues from oil and gas projects to fund a clean energy transition.

Indonesia has had the experience of setting up a similar fund from oil and gas revenues at the sub-national level called the Bojonegoro fund. It is a fund specifically allocated from Bojonegoro regency's budget as a long-term investment to prepare the region for the condition where the oil and gas industry no longer provides revenues for Bojonegoro. Through this fund, some of the revenues from oil and gas will be saved and redistributed equally to future generations (NRGI, 2018). The fund is set for a 50-year term as an endowment fund investment. The fund is sourced partially from the central government's oil and gas revenue shares (Dana Bagi Hasil) and also from BUMD's dividends from the Cepu block (Participating Interest). It is also set to use term deposit and Central Bank Certificates (SBI) as their investment instruments. The earnings from these investments will be allocated to the education and health budget.

Similarly, the energy transition fund should be set up as an endowment fund with several sources of capital. The government can also impose a carbon tax on power plants to add to the revenues from fossil fuels. Earnings from the investment should be used to support the growth of new industries and provide incentives for displaced workers. In order to do so, it is important that the government set the fund earlier than the planned transition.

Financial instruments such as green bonds can also be used to complement the energy transition funds. Although the Indonesian government has not had many experiences with green bonds, it should start taking "just transition" projects as a part of the project portfolio. In doing so, the government can attract more investments in green projects in Indonesia.

Alternatively, there is also potential to utilize the newly established ecological fiscal transfer mechanism namely Provincial Ecological Fiscal Transfer (TAPE) and District Ecological Fiscal Transfer (TAKE) to incentivize coal-dependent provinces and/or regencies to go through energy transitions. Coal-reliant provinces and/or regencies could set a parameter to measure their efforts to reduce their reliance on coal and demand an additional budget to be transferred from the central government once the reduction target is reached. The payments can serve as funds for the energy transition process.

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