A Socially Equitable Energy Transition in Indonesia: Challenges and Opportunities

Maria Lauranti and Eka Afrina Djamhari

FRIEDRICH EBERT STIFTUNG

Contents

List of Figures

List of Tables

Abbreviations

ASEAN	Association of Southeast Asian Nations
BKPM	Badan Koordinasi Penanaman Modal (Capital Investment Coordinating Board)
CO_2	carbon dioxide
COD	commercial operation date
FES	Friedrich-Ebert-Stiftung
GDP	gross domestic product
GW	gigawatt
HIVOS	Humanist Organization for Development Cooperation (the Netherlands)
KWh	kilowatt hour
KWP	kilowatt peak
MEMR	Ministry of Energy and Mineral Resources
Mtoe	Metric tonne of oil equivalent
MoU	Memorandum of Understanding
MW	megawatt
NDC	Nationally Determined Contribution
PLTSa	Pembangkit Listrik Tenaga Sampah
PT PLN	PT Perusahaan Listrik Negara
REDD	Reducing Emission from Deforestation and Degradation
SLA	Subsidiary Loan Agreement
TWh	Terawatt hours

Foreword

Tackling climate change will not be possible without a significant contribution from Asia. Although most Asian countries have relatively low levels of per capita greenhouse gas emissions and historically Asia's contribution to global climate change has been limited, Asia now contributes substantially to global greenhouse gas emissions. This is both because of the region's large population and its relatively robust economic growth. According to economic forecasts, Asia's share of global greenhouse gas emissions will grow dramatically in the coming decades. At the same time, millions of people in the region will be affected by climate change. Serious environmental pollution has resulted from the burning of fossil fuels. Health risks due to air pollution already affect millions of Asians.

There are signs of growing interest in renewable energy in many parts of Asia due to energy security and environmental concerns and the need to provide electricity to energy-poor regions. With dropping renewable energy prices, there is growing investment in the sector in Asia. This makes it increasingly possible to promote energy transitions, which are occurring within the region. Greater use of renewable energy may lead to more socially and environmentally just energy structures. We still know, however, little about the actual social and political contributions, costs and implications of renewable energy expansion.

Friedrich-Ebert-Stiftung examined these questions with a series of country studies in Asia. The studies address the political and social factors that drive—and hamper—socially just energy transitions. Authors from China, India, Indonesia, Japan, the Philippines, the Republic of Korea, Thailand and Vietnam worked with Miranda Schreurs, Professor of Environmental and Climate Policy in the Bavarian School of Public Policy, Technical University of Munich, to provide an in-depth analysis of the situation in their respective country. The preparation of the country studies and their review was supported by Julia Balanowski.

The studies provide insights into the status of climate and energy policies, their socioeconomic implications and the actors involved in developing and implementing those policies. Two of the important questions that motivated this comparative study were whether renewable energy development was contributing to a more socially just energy structure and which factors foster or impede political acceptance of renewable energy development.

We hope that this study provides a starting point for further analysis to foster a learning process on a transition towards renewable energy in Indonesia and that its useful information will help policymakers, academics and civil society to work together towards low-carbon development in Indonesia and beyond.

Yvonne Blos
Regional Coordinator for Climate and Energy in Asia
Friedrich-Ebert-Stiftung Vietnam

Sergio Grassi
Country Director
Friedrich-Ebert-Stiftung Indonesia

Introduction

This study was conducted to observe how an energy transition towards greater use of renewable energy could be socially and politically accepted in Indonesia and to provide recommendations to the government for more progressively pursuing that energy transformation path. The study identified important stakeholders for possible partnership with Friedrich-Ebert-Stiftung to support such a transformation. Despite the huge potential of various renewable energy sources across the country, the government still focuses heavily on exploring and exploiting its fossil fuel resources (oil and gas in particular). This is not unique to Indonesia. Having considerable fossil fuel resources has been a barrier to exploring renewable energy in many countries.

The Ministry of Energy and Mineral Resources (MEMR) categorizes "new and renewable energy" as a distinct energy group. Based on Law No. 30/2007, "new energy" is defined as energy generation from both renewable and non-renewable sources of energy, including nuclear, hydrogen, coalbed methane, liquified coal and gasified coal. In contrast, "renewable energy" derives from renewable sources, such as geothermal, wind, bioenergy, sunlight and hydropower, as well as the movement and differences in ocean temperature.

The study's analysis reflects information from a literature review, including policy documents, media information, and primary and secondary documents, and in-depth interviews with officials, experts and civil society organization staff.

1.1 Indonesia and climate change

Indonesia is an archipelago of many thousands of islands and lush tropical rain forests. Climate change is a growing concern, not only because of the increasing greenhouse gas emissions that contribute to global warming but also because the country is already heavily affected by extreme weather events. In 2016, the number of disasters caused by extreme weather increased by 35 per cent from the previous year. There 2,342 events in total was the largest number recorded since 2002. Of them, 92 per cent were hydro-meteorological disasters, with a dominance of floods, landslides and tornadoes. In, 2016, the impacts resulted in 522 casualties, more than 3 million people needing evacuation and 69,287 housing units and 2,311 public facilities damaged.[1]

Climate change also threatens Indonesia's efforts to combat poverty. The impacts of climate-related extreme weather events can heighten the risks to and vulnerabilities of impoverished households and add to their already difficult burdens.[2] Climate change can increase the potential for habitat vulnerability in Indonesian society. About 65 per cent of the population lives on the coast. Sea level rise will cause direct impacts in the form of reduced territory due to saline seawater intrusion and the destruction of coastal ecosystems due to tidal waves. It will also have indirect impacts in the form of livelihood loss or people being forced to change the way they live. People who live close to the coastline will have to cope with reduced areas for lowland paddy field. A rise in the sea level also will affect food security, cause interisland transport interruptions and result in the damage or loss of island and coastal tourist attractions (Law No. 16/2016).

To achieve a reduction in greenhouse gas emissions, the government has enacted laws that provide a legal basis for action. By far, the larger sources of greenhouse gas emissions are land use and peat and forest fires, amounting to more than 80 per cent of the country's emissions in 2010. Only about 19 per cent of the country's greenhouse gas emissions are tied to fossil fuel burning. The challenge facing Indonesia is thus complex. It means efforts must be made to change agricultural and forestry practices while steps are taken to check the growth in energy-based emissions as the economy and population expand and energy consumption increases. Although fossil fuel use is a relatively small share of the country's total emissions, it is the primary focus of this study.

In 2011, the National Action Plan for Reducing Greenhouse Gas Emissions 2010–2020 and the plan for the Implementation of a National Greenhouse Gas Inventory were enacted. The greenhouse gas inventory involves monitoring and data collection of emission sources as well as greenhouse gas sinks, including carbon storage.

The country's first biennial update report for the United Nations Framework Convention on Climate Change states that a targeted 26 per cent reduction in carbon dioxide (CO_2) from the business-as-usual trend is to be achieved by 2020 (table 1).

Indonesia filed its Intended Nationally Determined Contribution in September 2015 and reaffirmed during the Conference of Parties 21 in Paris its commitment to reduce emissions. Indonesia's Nationally Determined Contribution (NDC) sets an unconditional reduction target for greenhouse gas emissions of 29 per cent by 2030 over the business-as-usual trajectory and based on domestic efforts alone. The 29 per cent by 2030 target would mean a reduction of 314 million tonnes of CO_2 in the energy sector when compared with a scenario of no enhanced policy measures. The government will raise that target as high as 41 per cent with sufficient international assistance. This would amount to 398 million tonnes of reduced CO_2, or 14 per cent of the business-as-usual scenario.[3]

The business-as-usual trajectory starts in 2010 and is based on the historical trajectory from 2000 to 2010. The targets also draw on the National Action Plan for Reducing Greenhouse Gas Emissions and the National Mid-term Development Plan 2015–2019.

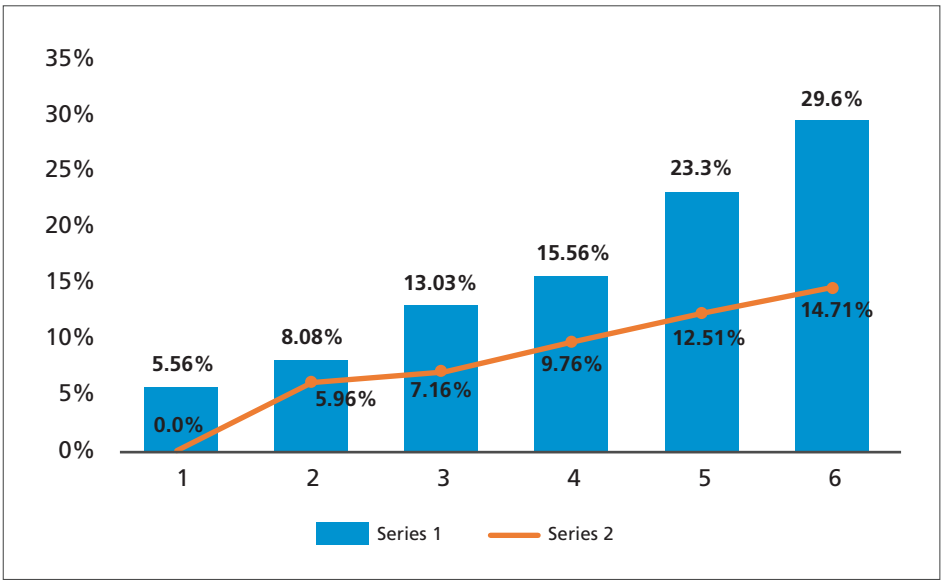
Table 1. Greenhouse gas emission reduction targets

Sector	GHG emissions 2010 (million tonne CO_2e)	GHG emission reduction targets for 2030, compared with business as usual (million tonne CO_2e)			GHG emission reduction target for 2030, compared with business as usual (million tonne CO_2e)			
		Business as usual	Mitigation 29%	Mitigation 41%	Mitigation 29%	% difference from total business	Mitigation 41%	% difference from total business as usual
Energy	453.2	1.669	1.355	1.271	314	11%	398	14%
Waste	88	296	285	270	11	0.38%	26	1%
Independent power producers (industrial process and product used)	36	69.6	66.85	66.35	2.75	0.10%	3.25	0.11%
Agriculture	110.5	119.66	110.39	115.86	9	0.32%	4	0.13%
Forestry	647	714	217	64	497	17,2%	650	23%
Total	**1.334**	**2.869**	**2.034**	**1.787**	**834**	**29%**	**1.081**	**38%**

Note: GHG=greenhouse gas.
Source: Ministry of Environment and Forestry, Nationally Determined Contribution (Jakarta: MEF, 2016).

As indicated in figure 1, which shows the greenhouse gas reductions Indonesia achieved from 2010 through 2015 and what it would have reduced had it stayed to the business-as-usual trajectory, the country has surpassed the initial targets.

Figure 1. Greenhouse gas emissions reductions, compared with the business-as-usual trajectory, 2010–2015



Source: Ministry of Energy and Mineral Resources and Directorate General of New and Renewable Energy and Energy Conservation, Performance Report 2015 Ministry of Energy and Mineral Resources (Jakarta: MEMR, 2016).

An inventory of greenhouse gas emissions in the energy sector in 2015 indicated an emission level of 261.89 million tonnes of CO_2, which translates to an average increase of 2.43 per cent per year from 2010 through 2015. This increase is smaller than it would have been in the business-as-usual trend. The largest source of non-greenhouse gas emissions is the combustion of fuel (at 64 per cent), followed by coal (at 16 per cent), gas (at 12 per cent) and liquefied petroleum gas (8 per cent). In relation to energy consumption (not including power generation), emissions are produced by transportation (at 53 per cent), industry (at 35 per cent), residential (at 8 per cent), others (at 3 per cent) and commercial purposes (at 1 per cent).[4]

Civil society organizations criticize the NDC targets as too weak and lacking detail. And the steps to reduce emissions by 2030 have not been spelled out at more than a general level. Indonesia has not defined a method to calculate emissions, and both baseline and projection data are lacking. The Ministry of National Development Planning noted that the absence of an integrated database system is a major challenge for government at all levels in preparing their NDCs. The establishment of a method to calculate emissions agreed by all actors in Indonesia, including the support of all ministries and agencies, is still a challenge.

1.2 Renewable energy in Indonesia

Indonesia is a major producer and exporter of oil and natural gas. The reserves are beginning to decrease, however. The declining fossil fuel-based energy sources, especially oil and natural gas, has prompted the government to make renewable energy a top priority for achieving energy sustainability and independence. The country's potential for renewable energy is large, but it has yet to be widely tapped. Hydropower, wind, solar and ocean currents could be used for electricity, but this potential is just beginning to be recognized. Biofuels, biogas and biomass are used by households (for cooking) and for some commercial and industrial purposes. Expanding their use could reduce future fossil energy demand.

Various government ministries and agencies have responsibilities for renewable energy and climate policy (table 2). The MEMR is the primary actor in developing renewable energy policies and overseeing the renewable energy sector. The Ministry of Environment and Forestry has primary responsibility for climate mitigation and adaptation policy development. The Ministry of National Development Planning is responsible for ensuring the achievements of the president's overall vision for energy intensity reductions, a decline in greenhouse gas emissions and expanded renewable energy use. The National Energy Council oversees the implementation of national energy policies that are cross-sectoral.

Table 2. Mapping of Indonesian energy sector institutions

	Renewable energy	Electricity	Climate mitigation
Policymaking	1. Coordinating Minister for Economy 2. Ministry of National Development Planning 3. Ministry of Foreign Affairs 4. Ministry of Environment and Forestry 5. Ministry of Industry 6. Ministry of Public Works and Housing 7. National Energy Council	1. Coordinating Minister for Economy 2. Ministry of National Development Planning 3. Ministry of Foreign Affairs 4. Ministry of Environment and Forestry 5. Ministry of Industry 6. Ministry of Trade 7. Ministry of State-Owned Enterprises 8. National Energy Council	1. Ministry of Finance 2. Ministry of National Development Planning 3. Ministry of Environment and Forestry 4. Climate Change Council
Granting permission	1. Local government	1. Directorate General of Electricity 2. Local government	1. Ministry of Environment and Forestry 2. Local government
Regulator	1. Directorate General of New and Renewable Energy and Energy Conservation 2. Directorate General of Electricity 3. Directorate General of Oil and Gas	1. Directorate General of Electricity	1. Directorate General of Climate Change Control 2. Directorate of Climate Change Adaptation 3. Directorate of Climate Change Mitigation
Operation (State-owned enterprises)	1. Company (Wijaya Karya Intrade Energi: solar energy) 2. Union (Sumba Iconic Island) 3. Community/society	1. State-owned PT Perusahaan Listrik Negara (PT PLN) 2. Captive power 3. Union 4. Community/society	

Source: Asian Development Bank, Energy White Paper (Manila: ADB, 2014).

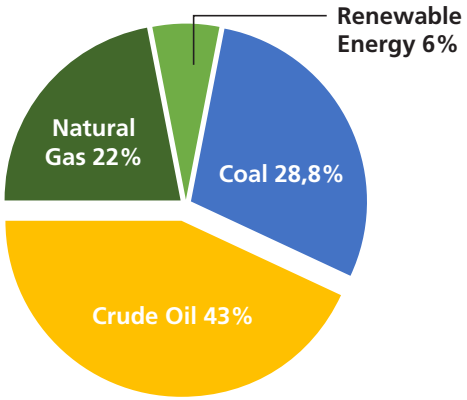
State-owned enterprises are critical in the energy sector. They function as corporations but are simultaneously mandated to work towards the goals and needs of the State. The Ministry of State-Owned Enterprises seeks to ensure that companies are efficient, well managed and profitable. Compliance with sector-based laws and policies is regulated by the relevant ministries and agencies. The Ministry of Finance must agree on matters concerning tariffs, budget allocations, public service obligations and subsidies, while the Ministry of National Development Planning oversees central planning. State-owned enterprises have access to diverse sources of financing, including multilateral institutions, bilateral financing and government-only grant facilities.

PT Perusahaan Listrik Negara (PT PLN) is the only State-owned utility in Indonesia and largely manages the country's energy supply at the centralized level. As the main provider of electricity and electricity infrastructure, PT PLN covers the business of power generation, transmission, distribution and retail. PT PLN has primary responsibility for achieving the government's accelerated target through fast-track projects. The government relies on the private sector to realize the fast-track programmes, which are mostly hydro and geothermal power plants. Electricity Law No. 30/2009 ended PT PLN's legal monopoly on power generation, transmission and distribution and created a legal basis for the private sector to enter every phase of the electricity sector.

PT Pertamina, the State-owned oil and gas company, is Indonesia's second-largest crude oil and liquefied natural gas producer. PT Perusahaan Gas Negara, also State-owned, is the country's largest natural gas transport and distribution company, with business operations also expanding into liquefied natural gas, compressed natural gas and coalbed methane. PT Pertamina Geothermal Energy is a subsidiary of PT Pertamina and has concessions throughout Indonesia. PT Geo Dipa Energi is a State-owned geothermal electricity company with concessions in Dieng (West Java) and Patuha (Central Java).

The National Energy Policy (Government Regulation No. 79/2014) centres on a strategy to ensure sustainability, security of supply and efficient energy utilization as well as the realization of an optimum energy mix as of 2050. The policy spells out goals for the country, such as achieving a final energy intensity reduction of 1 per cent per year up to 2025 and increasing the share of new and renewable energy in the energy mix by at least 23 per cent as of 2025 and by at least 31 per cent as of 2050. The share of petroleum in the energy mix should shrink to less than 25 per cent by 2025 and to less than 20 per cent by 2050, and the reduction goal for coal is to drop to 30 per cent or smaller of the energy mix by 2025 and to 25 per cent or smaller as of 2050. A target of 22 per cent natural gas in the energy mix by 2025 and 24 per cent in 2050 is also envisioned. Based on data provided by the MEMR, figure 2 shows the primary energy mix in 2015.

Figure 2. Primary energy mix, 2015



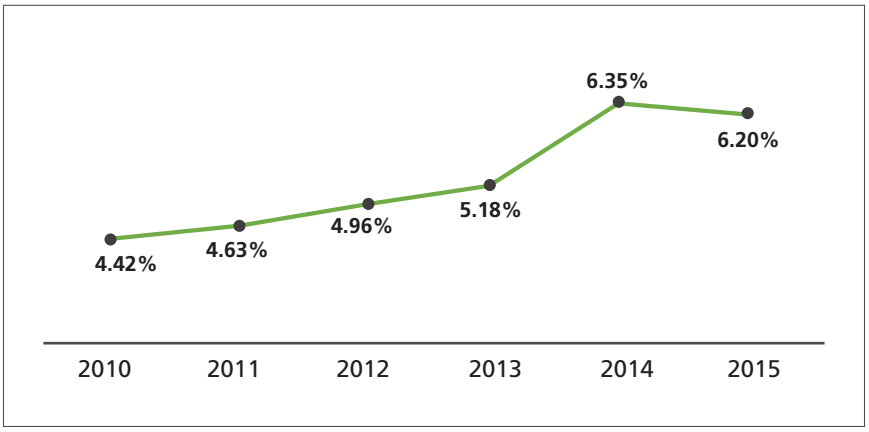
Source: Ministry of Energy and Mineral Resources, MEMR Strategic Plan 2015–2019 Energy Sector Program (Jakarta: MEMR, 2016).

As shown in figure 3, renewable energy increased within the primary energy mix by 0.36 per cent per year on average from 2010 through 2015. To reach a renewable energy share of 23 per cent by 2025, however, various obstacles need to be overcome. The challenges include: (i) Unbalanced subsidies or unfair subsidies: Renewable energy is subsidized at a much lower rate than the subsidies for fossil energy. As

a result of this unfair pricing, renewable energy is not affordable for most people (and industry). (ii) Limited investment: The government and industry have invested little into research and development of renewable energy technologies, which negatively impacts the chances for upstream and downstream opportunities. (iii) Renewable energy technologies are mostly imported: Too little has been done to foster a domestic industry. (iv) Most renewable resources are small-scale and scattered: Renewable energy is still treated as a niche technology rather than as a major contribution to energy stability and energy access.

As long as the price of fossil energy is lower than the price for renewable energy, increasing the contribution made by renewable energy in the electricity mix in the near future will be difficult.

Figure 3. Increase in the share of renewable energy in the primary energy mix, 2010–2015



Source: Ministry of Energy and Mineral Resources, MEMR Strategic Plan 2015–2019 Energy Sector Program (Jakarta: MEMR, 2016).

Civil society organizations are advocating for policies that are supportive of renewable energy and clean energy in the country. But participation in that development is still limited to a relatively small group of individuals and groups. Change in energy use is a major social challenge due to the lack of practical skills and capacities to develop and maintain renewable energy technologies. Many people are still not aware of the benefits of renewable energy and of the negative impact that fossil energy generation has on greenhouse gas emissions and the world's climate. There has been little energy efficiency education, and thus significant behavioural changes have not evolved. Energy-efficiency initiatives are mostly limited to small-scale household stoves. The media have done little to help broaden the awareness that could contribute towards changing peoples' perceptions. Media coverage of renewable energy, energy efficiency and climate change tends to be low.

1.3 Energy production and consumption

Indonesia's economy and population are expected to grow significantly over the next four decades. Based on an assumption of an annual gross domestic product (GDP) growth rate of 5.6 per cent from 2015 to 2050 and an average population growth rate of 0.8 per cent per year (2015–2050), the national final energy demand is expected to reach 238.8 million tonnes of oil equivalent (Mtoe) in 2025 under the business-as-usual scenario. The estimated demand for 2025 reflects an increase of 1.8-fold from the final energy consumption level for 2015, equating to an average annual growth rate of 6.4 per cent, or 128.8 Mtoe.[5]

Table 3. Growth indicators and energy service demand drivers, 2010–2016

Information	2010	2011	2012	2013	2014	2015	2016
Population (million)	234	241	245	248	252	255	257
GDP per capita (US dollars per capita)	3.167	3.688	3,741	3.528	3.442	3.329	3.603
Electrification ratio (%)	70	72.95	76.56	80.51	84.35	90.65	93.41
Poverty level (%)	12	12.4	11.7	11.5	11	11.2	10.8

Source: Ministry of Energy and Mineral Resources, MEMR Strategic Plan 2015–2019 Energy Sector Program (Jakarta: MEMR, 2016).

The government has targeted four renewable energy sources to develop: geothermal, hydropower (mini and micro hydro), bioenergy and solar photovoltaic. The potential of hydropower is spread across Indonesia, with an estimated total capacity of 75,000 megawatts (MW). Wind energy has especially large potential in the islands of Java and Sulawesi, where an estimated 950 MW could be produced. Currently, 4.8 kilowatt hour (KWh) per square meter of solar energy is produced each day. As noted earlier on, only a small percentage of this huge potential has been tapped (table 4).

Table 4. Potential source of renewable energy

Type of Energy	Resource	Installed Capacity	Utilization
Hydro	94,476 MW	5,024 MW	5.3%
Geothermal	29,544 MW	1,403.5 MW	4.8%
Bioenergy	32,000 MW and 200,000 bpd BBN	1,740.4 MW	5.4%
Sunlight	4.80 kWh/m/day ~ 207.9 GW	78.5 MW	11.7
Wind and hybrid	3-6 m/s ~ 60 GW	3.1 MW	
Sea energy	61 GW2) Wave: 1,995 MW Ocean thermal (OTEC): 41,001 MW Ocean currents: 17,989 MW	0.01 MW	

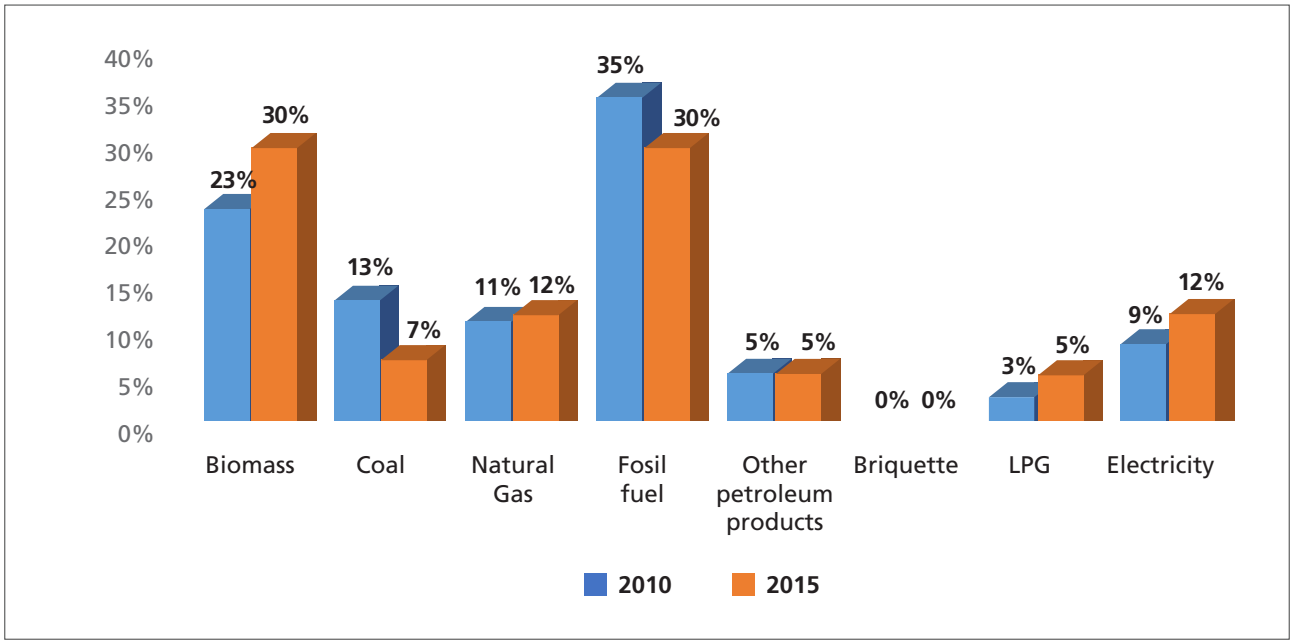
Note: bpd = barrels per day; BBN = bahan bakar nabati (biofuel); OTEC = ocean thermal energy conversion.
Source: National Energy Council, Indonesia Energy Outlook 2015 (Jakarta: National Energy Board, 2016.)

In line with the increases in the country's population and its GDP, energy consumption is increasing. Indonesia has one of the highest growth rates in energy consumption in the world, at about 7 per cent per year. Total final energy demand in 2015 was 876,594 barrels of oil equivalent (excluding traditional biomass). The transportation sector consumes the largest share, followed by industry, households, the commercial sector and other sectors.[6]

As shown in figure 4, total primary energy consumption reached 1,033.24 million barrels of oil equivalent in 2015. Fossil fuels and biomass provided the main sources of energy, with a combined share of 30 per cent, followed by electricity (at 12 per cent), natural gas (at 12 per cent), coal (at 7 per cent) and liquefied petroleum gas (at 5 per cent). Final energy consumption in 2015 was dominated by the household sector, which reached 373.79 million barrels of oil equivalent and held a share of about 36 per cent. This was a decrease from 2000, when

the household sector accounted for 40 per cent of primary energy consumption. The transport sector ranked second with a share of almost 32 per cent, followed by the industry sector (at nearly 27 per cent), the commercial sector (at 3.7 per cent) and others (at 1.6 per cent). The share of final energy consumption for industry, households and other sectors in 2015 decreased from their levels in 2000. In contrast, the commercial and transportation sectors each increased their share.

Figure 4. Primary energy consumption, by type, 2010–2015

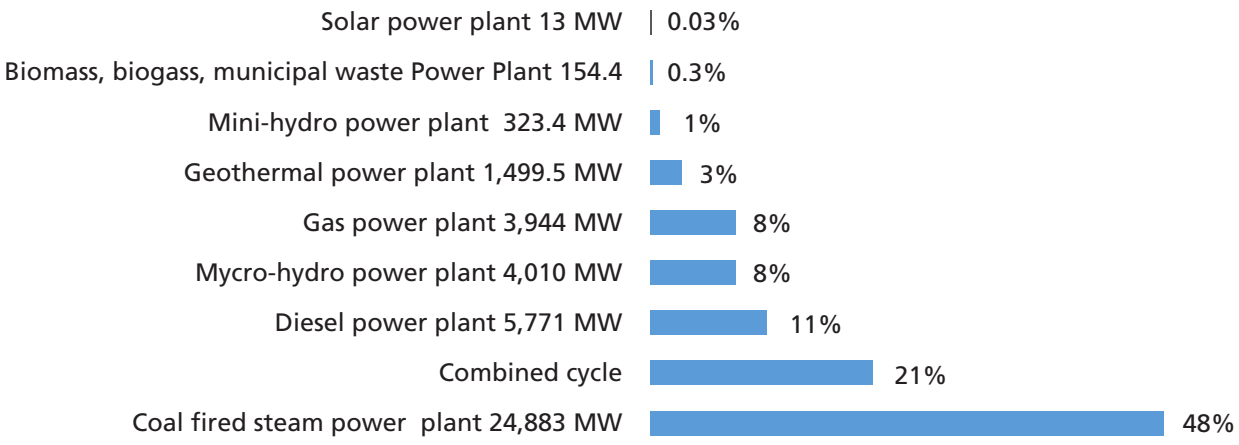


Note: LPG = Liquefied Petroleum Gas.

Source: Ministry of Energy and Mineral Resources, Statistics EBTKE 2016
(Jakarta: Directorate General of New and Renewable Energy and Energy Conservation, 2016).

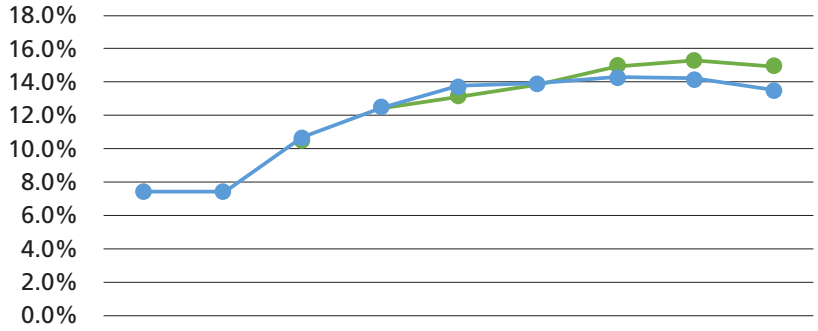
By the end of 2016, total energy electricity capacity had reached 51 gigawatts (GW), of which renewable energy accounted for only 6 GW, equating to a 12 per cent share (figure 5).

Figure 5. New and renewable energy generation composition as of December 2016



Source: PT Perusahaan Listrik Negara, Electricity Supply Business Plan 2016–2025 (Jakarta: PT PLN, 2017).

Figure 6. Contribution ratio of renewable energy to electricity generation, 2014–2050



		2014	2015	2020	2025	2030	2035	2040	2045	2050
●	Contribution ration renewable energy (base scenario)	7.6%	7.5%	10.6%	12.5%	13.3%	14.0%	14.9%	15,3%	14,9%
●	Contribution ration renewable energy (high scenario)	7.6%	7.5%	10.7%	12.5%	13.7%	14.0%	14.4%	14,3%	13,7%

Source: Agency for the Assessment and Application of Technology (BPPT),
Indonesia Energy Outlook 2016: Energy Development to Support Green Energy (Jakarta: BPPT, 2016).

Nuclear energy is a debated issue in Indonesia. The government aims to develop nuclear power, but the industry has yet to show it can meet the necessary safety standards specified in Government Regulation 79/2014. To date, there are no conventional nuclear power plants, but there are three nuclear research reactors, which are used for medical and health care innovations. The first two research reactors were built in Yogyakarta (1979) and Bandung (1965). The third reactor was built in Serpong (1987). A major share of the population is reluctant to accept nuclear power as an energy source. Yet, the National Energy Policy regards nuclear power as an option among new energy sources and as an alternative option among renewable energy. The National Energy Council is aware that the choice of nuclear energy as a source of electricity is still controversial due to the risks of accidents and the lack of a solution for nuclear waste storage. For these two reasons, it is focusing on other renewable energy alternatives.

1.4 Energy markets

The National Energy Policy has four major targets for 2025–2050 in primary energy. These targets aim to expand energy availability to the population and thus expand economic opportunities and the quality of life:

- increase the supply of primary energy to 400 Mtoe by 2025 and 1,000 Mtoe by 2050;
- expand primary energy utilization per capita to about 1.4 tonnes of oil equivalent by 2025 and 3.2 tonnes of oil equivalent by 2050;
- achieve a generation capacity of 115 GW by 2025 and 430 GW by 2050; and
- reach electricity utilization per capita of 2,500 KWh by 2025 and 7,000 KWh by 2050.

MEMR Regulation No. 12/2017 on the Utilization of Renewable Energy Sources for the Provision of Electric Power obliges PT PLN to buy the electricity generated from photovoltaic plants, biomass and waste plants, hydropower plants and geothermal plants. The purchase price for electricity from renewable power plants based on the technology involved in the generation.

The efficiency of renewable energy technologies varies. In the case of solar photovoltaic, for example, efficiency is highly dependent on the level of solar radiation and weather conditions in a region. PT PLN uses tenders when purchasing renewable energy and sets capacity quotas. Its pricing of renewable energy is determined by benchmarking the regional cost of production. In the case of hydropower, *pembangkit listrik tenaga biomasa* (a biomass power plant), *pembangkit listrik tenaga biogas* (biogas power plant), *pembangkit listrik tenaga sampah* (PLTSa, a waste power plant) and *pembangkit listrik tenaga panas bumi* (a geothermal power plant) uses a mechanism. For the photovoltaic plants, PT PLN publishes the capacity of the local power grid when they open for tenders. Independent power producers can access the cost of production information of the former year. The respective values are used as a reference to benchmark the minimum electricity price that can be expected to be paid by PT PLN.

PT PLN manages 76 per cent of electricity production, while the private sector (independent power producers) manages the remaining share, the private power utility and the oil operation permit schemes. MEMR Regulation No. 12 of 2017 regulates the base generation supply cost in terms of the local cost of production, which is above the average national cost of production. If the local cost of production is equal to or below the national average, then the purchase price of by PLTSa and geothermal power plants are set by agreement of the parties.

MEMR Regulation No. 3/2015 encompasses three procurement mechanisms: (i) direct designation, (ii) direct selection and (iii) open tender. The business process for direct appointment procurement is 30 days, while it is 45 days for direct selection procurement and within 321 days using open tender. Independent power producers must pass several stages in the business process, from pre-qualification to finalization of a contract (figure 7).

Figure 7. PT PLN business process for independent power producers

Prequalification	• Criteria: Financial strength: assets, net profit Technical strength: ecperience in independent power production, engineering, procurement, construction and operation and maintenance.
Request for proposal	• Contains: (i) information for bidder, (ii) project description, (iii) model power purchase agreement, (iv) instructions to bidders, (v) proposal requirements and (vi) evaluation procedure
Letter of intent	• Contains: (i) agreed major terms and conditions and (ii) agreed electricity tariff and basic formula
Power purchase agreement signing	• Requirements: performance security stage 1, PT PLN's corporate approval, MEMR tariff approval
Financial closure	• Requirements: copies of documents • The legal opinion issued for PT PLN and seller • Performance security stage II
Commercial operation date	• Requirements: Net dependable capacity test procedures completed
End of contract	• Transfer procedure to PT PLN

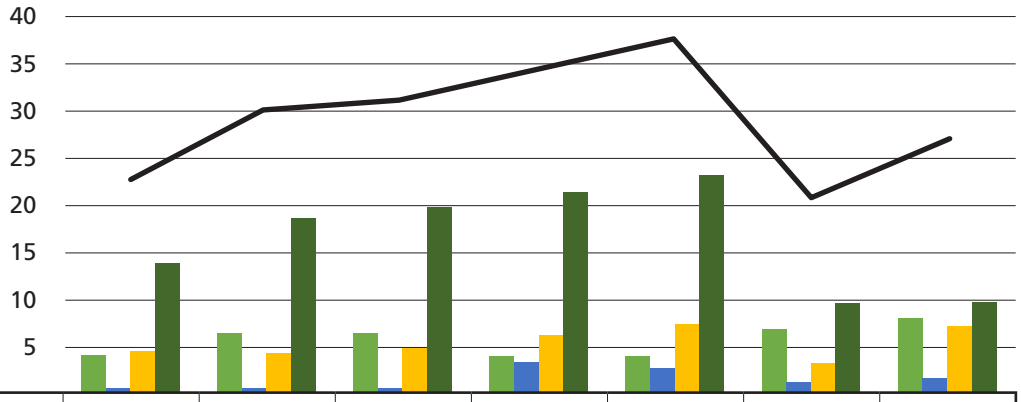
Source: PT Perusahaan Listrik Negara, Electricity Supply Business Plan 2016–2025 (Jakarta: PT PLN, 2017).

To accelerate the achievement of the renewable energy target for the electricity sector, it is important to simplify the private power utility permit process and land acquisition. It is still important to do environmental assessments and to make sure that the land is not being taken away from other important purposes, like agriculture. As of 2017, the previous 31 licensing and non-licensing mechanisms were simplified to 14 licensing and non-licensing mechanisms. Several policies have been developed to ease investments in renewable energy:

1. Simplification of permissions.
2. Delegation of licensing authority to the Investment Coordinating Board for one-stop service.
3. Giving the function of setting the purchase price for renewable energy and direct designation authority to PT PLN to:
   - accelerate price negotiations with a benchmark price;
   - accelerate approval procedures between PT PLN and independent power producers;
   - provide assurances for PT PLN in the implementation of power purchases; and
   - build a more conducive investment climate.

PT PLN focuses on the development of generators, transmission infrastructure (power plants, substations, transmission lines), substations for distribution and the distribution network as well as supporting the power business.

Figure 8. Sector investment, 2010–2016 (billion US dollars)



		2010	2011	2012	2013	2014	2015	2016
	Electrication	4.28	6.42	6.38	3.93	3.91	6.8	8.1
	Renewable energy	0.28	0.1	0.31	3.34	2.64	1.2	1.6
	Coal and oil	4.37	4.46	4.8	6.13	7.4	3.3	7.2
	Gas	13.66	18.72	19.63	21.34	23.09	9.6	9.8
	Total	22.59	29.70	31.12	44.74	37.04	20.9	26.7

Source: Ministry of Energy and Mineral Resources (Jakarta: MEMR, 2017); PT Perusahaan Listrik Negara, Electricity Supply Business Plan 2016–2025 (Jakarta: PT PLN, 2017).

Investment in renewable energy began in 2013. Foreign investor interest is growing in Indonesia's renewable energy potential. In March 2017, Engie (a French multinational electric utility company) revealed plans to invest up to 1 billion US dollars to develop photovoltaic and biomass power plants, with a total power generation capacity of 500 MW, in Sumatra and eastern Indonesia, in partnership with PT Sugar Group over a period of five years. The French contractor DCNS Energies (with a company in Singapore) and

PT Autochem Industry recently signed a letter of intent to deliver a road map for the engineering, industrial development and commercial ramp-up of a tidal energy (hydropower) industry in Indonesia. The United Kingdom-based Atlantis signed an agreement with Superior Brokerage Services (SBS) International for the supply of turbines, engineering services and equipment for a 150 MW tidal power stream in Lombok, Nusa Tenggara Barat. SBS International has been awarded exclusive development rights to three offshore sites around Lombok and Bali, which will have an ocean energy capacity of 450 MW. The Japanese Toshiba Corporation and the United States-based Ormat Technologies launched commercial operations of the first unit of the Sarulla geothermal power plant in North Sumatra, with 110 MW capacity.

Despite the positive signs of growing investment interest, the renewable energy sector still lags far behind the oil and gas sectors in terms of actual investment. From 2010 to 2014, investment in the energy sector increased by 64 per cent, from around 23 billion US dollars to 37 billion US dollars. The biggest amount of investment went to oil and gas development. There was relatively little investment in renewable energy. In 2016, total investment in energy development was around 27 billion US dollars, of which oil and gas accounted for 9.8 billion US dollars, while electricity attracted 8.1 billion US dollars, minerals and coal took 7.2 billion US dollars and renewable energy garnered only 1.6 billion US dollars.

Law 21/2014 states that geothermal energy is a valuable renewable natural resource that can have an important role in supporting national sustainable development and improving the welfare of Indonesians. Geothermal energy could potentially supply large amounts of environment-friendly energy, but its utilization has not been optimized. Geothermal sources should be targeted in energy planning and integrated into relevant policies to reduce the country's dependence on fossil fuels.

1.5 Energy policy

The National Energy Management Plan is the implementation strategy for the cross-sector General Plan of National Energy, which outlines the country's energy targets up to 2050. The plan was endorsed by Presidential Regulation 22/2017, article 1.

Implementation of the General Plan of National Energy is relegated to the National Energy Council and the MEMR, which are expected to disseminate the details to relevant agencies, both at the central and regional levels. The National Energy Council supervises the plan's implementation and coordinates policies in the energy sector that are cross-sectoral. Supervision is to be carried out in a coordinated manner with relevant agencies at the central or regional level, as appropriate. Monitoring results are to be discussed in member sessions and reported to the chairman of the National Energy Council or they can be discussed in the plenary session of the National Energy Council. And the National Energy Council is to monitor follow-up recommendations.

Table 5. Energy policies in Indonesia

National energy policy directions, according to Regulation No. 79/2014	Supporting policies at the technical level
• Availability of energy for national needs • Priorities of energy development • Utilization of national energy resources • National energy reserves	• Energy conservation • Energy diversification • Environment and safety • Price of energy subsidies and incentives • Infrastructure • Access to public • Energy technologies • Institutional and funding

The commitment to start a transition towards renewable energy is found in several policies:

1. Law 30/2007 on Energy (article 20 (3)), which mandates an increase in the provision of new and renewable energy, both at the national and subnational levels.
2. Government Regulation 79/2014, which mandates that the use of renewable energy should reach at least 23 per cent by 2025 and 31 per cent by 2050 in the energy mix.
3. Government Regulation 7/2017, which promotes utilization of geothermal energy.
4. Presidential Regulation 4/2016 on the acceleration of electricity infrastructure development, mandates in article 14 an acceleration in priority electricity infrastructure development and renewable energy utilization. In addition, national and subnational governments should provide assistance through fiscal incentives, ease licensing procedures and other mechanisms, determine the purchase price for electric power for each type of renewable energy source and support the formation and work of independent power producers so that they can provide renewable energy-based electric power to PT PLN.
5. Regulations issued by the Ministry of Finance address fiscal and non-fiscal incentives for renewable energy development.
6. MEMR Regulation 12/2017 promotes utilization of renewable energy sources in the electricity supply.

Social aspects of an energy transition

2.1 Access to energy

The National Medium-Term Development Plan targets 35,000 MW of electricity development until 2019. The demand for electricity is expected to increase from 216.8 terawatt hours (TWh) in 2016 to 457 TWh in 2025, which represents an average growth rate of 8.6 per cent per year (table 6). The average per capita consumption in 2015 amounted to 791.4 kWh and is forecasted to increase to 1,616.5 kWh in 2025. This shows that the growth of the demand for electricity is coupled to the growth of the population and the economy.

New and renewable energy power plant development in 2016 was able to provide additional electrification for 15,796 households in remote areas.[7] The electrification ratio was obtained by comparing the number of households that had received electricity from PT PLN and from other sources (non-PT PLN). MEMR data for 2015 includes reference to12,669 villages that had no access to electricity, .

Table 6. Forecast of electricity needs, 2016–2025

Year	2016	2018	2020	2022	2024	2025
Energy demand (TWh)	216.8	267.9	315.3	366	424.9	457
Growth (%)	8.2	9.9	8.1	7.7	7.7	7.6
Costumer (million)	64.1	69.9	74.7	78	81.1	82.6
Consumption per capita (kWh/capita)	845.6	1,020.00	1,173.00	1,333.30	1,517.10	1,616.50
Economic growth (%)	5.2	5.5	6.5	6.46	6.42	6.4
Electrification ratio (%)	90.65	95.89	98.8	99.81	99.99	99.99

Source: Ministry of Energy and Mineral Resources, Socialization National Energy Plan in the Framework of the Preparation of the General Plan of the Energy Area (Jakarta: MEMR, 2016); PT Perusahaan Listrik Negara, Electricity Supply Business Plan 2016–2025 (Jakarta: PT PLN, 2017).

The number of electricity customers increased from 42.2 million in 2010 to 57.2 million in 2014 (table 7). This means an average increase of 3.5 million customers each year, of which 3.2 million were in the residential sector, 140,000 in the business sector, 82,000 in the public sector and 2,000 in the industrial sector.[8]

Table 7. Electricity customers, 2010–2015 (thousands)

Type customer	2010	2011	2012	2013	2014	2015
Household	39,111	42,348	45,991	49,887	53,078	56,311
Commercial	1.877	2.019	2.175	2,359	2.549	2.815
Public	1.146	1.214	1,300	1.402	1.497	1.682
Industry	48	50	52	55	58	61
Total	42,183	45,631	49,519	53,703	57,183	60,869

Source: PT Perusahaan Listrik Negara, Electricity Supply Business Plan 2016–2025 (Jakarta: PT PLN, 2017).

PT PLN and other providers must overcome the geographical challenges created by the country's scattered, secluded and, in some cases, small islands. Some areas have a less developed or even no power grid. Hence, each region's contribution to increasing the national electrification ratio has been different (table 8).

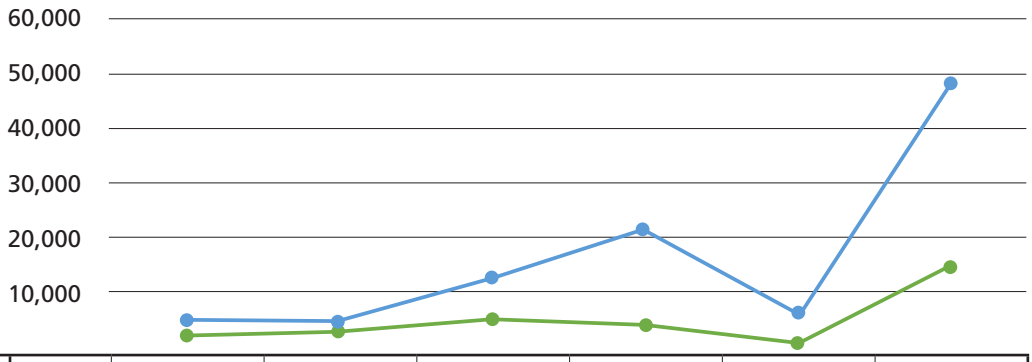
Table 8. Number of households with electricity access, by region, 2010–2015 (thousands)

Territory	2010	2011	2012	2013	2014	2015
Indonesia	39,111	42,348	45,991	49,887	53,078	56,331
Java-Bali	26,586	28,066	30,204	32,512	34,468	36,643
Sumatra	7,294	8,211	8,958	9,724	10,361	10,972
Borneo	1,862	2,081	2,323	5,581	2,774	2,944
Sulawesi and Nusa Tenggara	2,873	3,422	3,878	4,337	4,669	4,888
Maluku and Papua	497	568	628	733	806	865

Source: PT Perusahaan Listrik Negara, Electricity Supply Business Plan 2016–2025 (Jakarta: PT PLN, 2017).

To address electricity shortages, the government developed a series of fast-tracking projects for power production. This fast-tracking mandate derives from Presidential Decision 71/2006, amended by Decision 59/2009, according to which PT PLN was to develop an electricity power supply business plan for 2009–2018. During its first phase, the fast-tracking project focused on coal-based power plants. Of the 9.975 MW to be achieved by 2016, only 5.707 MW was produced. During the second phase, the fast-tracking project planned to increase electricity produced from geothermal mines (4 MW), hydropower (1.753 MW), coal gasification (64 MW) and gas (280 MW). The projects in this second phase have not been fully realized either. With the 2015–2024 electricity supply business plan, the government entered the third phase of the fast-tracking project with an energy supply target of 35 GW. The plan still foresees mainly coal (56 per cent) and gas (36 per cent), along with hydropower (4 per cent), geothermal (2 per cent) and other various energy sources (2 per cent).

Figure 9. Electric power production expansion plan, 2016–2020 (MW)



		2016	2017	2018	2019	2010	Total
●	IPP	1,896	1,649	7,579	17,646	5,038	33,808
●	PT. PLN	2,244	2,838	4,858	3,737	760	14,437

Source: PT Perusahaan Listrik Negara, Electricity Supply Business Plan 2016–2025 (Jakarta: PT PLN, 2017).

As much as 10 MW of electricity from new and renewable energy production must be connected to the power grid and its distribution network. The Smart Grid Implementation Plan aims to address the intermittency challenge of renewable energy plants with smart grid solutions. At the moment, the grid can only absorb 12.5 per cent of intermittent renewable energy. Smart grids are power network systems based on advanced information and communication technologies that optimize the efficiency and reliability of the power supply so that large amounts of new and renewable energy sources can be injected into the grid.

PT PLN manages and operates eight transmission networks in Indonesia. They are connected to at least 600 isolated grids. Its length covers 39,900 circuit-kilometres and it has a capacity of 86,500 megavolt-amperes. Because economic development is centred in Java, the network in Java has become the backbone of all transmission interconnection. It is predicted that Java's network will no longer be able to meet the increasing demand for electricity from its surrounding islands.[9] At the end of 2015, the provinces of Central Kalimantan, South-East Sulawesi, East Nusa Tenggara and Papua had electrification ratios below 70 per cent.

Table 9. Development plan for renewable energy generation, 2016–2025 (MW)

New and renewable energy capacity (MW)	2016	2018	2020	2022	2024	2025
Geothermal	1,654	1,909	2,133	2,520	3,109	7,241
Hydro	5,124	4,929	5,103	5,468	5,615	17,987
Micro-hydro	162	314	520	815	1,000	3,000
Biomass	1787.9	1,881	2,030	2,200	2,500	5,500
Solar photovoltaic	85	225	375	550	900	6,500
Wind	1	74	204	399	600	1,800
Other new and renewable (ocean currents and new energy)	0	1,232	1,675	2,059	2,433	3,125
TOTAL	8,804	10,563	12,041	14,012	16,157	45,153

Source: Presidential Decree 22/2017.

In 2017, MEMR allocated a budget of more than 75 billion US dollars for solar power, micro-hydropower, geothermal power, bioenergy (waste) power and other renewable energy development. In 2016, the government developed a programme to electrify the rural population, which began with funding obtained from the national budget and the PT PLN budget. The programme focuses on provinces in which the electrification ratio is low. Rural electricity development is based on studies undertaken by the local power business units. of, The Regional Development Division of PT PLN will take on a larger role in coordination of rural electricity development, alongside the PT PLN business units.

Rural electrification includes infrastructure projects that can be done through a public–private partnership scheme. The provisions in Presidential Decrees 56/2012 and 38/2015 state that the government can provide incentives for infrastructure provision. One form of incentive is supported by PMK223 and PMK.011/2012 (Minister of Finance Regulations), which serves as the legal basis for instruments of the Viability Gap Fund, the gap between budget revenue and state expenditures, with the aim of improving the financial viability of infrastructure projects that attract private sector participation public–private partnership projects.

The provincial Road Map to Village Electrification (Proyek Listrik Pedesaan) 2013–2017 and the revised Provincial Road Map 2015–2019 set out plans to increase the electrification ratio. The Directorate General of Electricity and PT PLN are involved in various efforts to support the construction of rural electrification:

- development of a network to support the distribution of power from the project grid infrastructure project to build new transformers and grid extension;
- fossil fuel plant development for outlying or isolated areas where renewable energy generation has been blocked by lack of infrastructure;
- development of a network to support the distribution of power from small-scale plants using new renewable energy and other types of energy;
- open the possibility to integrate hybrid solar power into the PT PLN network; and
- carry out electrical connections and installation programmes without introducing electricity charges in poor and disadvantaged areas.

2.2 Energy price and affordability

The legal basis for energy development is mandated in article 33, paragraph (3) of the Constitutional Law of 1945, according to which soil, water and all other natural resources are controlled by the State and are to be utilized for the welfare of the people. Energy development priority is to be based on:

1. Economics (cost-competitiveness) of energy, as stipulated by Law 30/2007, article 7 and Law 30/2009, article 4, which mandate that local governments provide subsidies to community groups that cannot afford energy.
2. Security of energy supply as well as its environmental sustainability.
3. Prioritization of energy supplies for people who have not had access to electricity, household gas and energy for transportation, industry and agriculture. Law 30/2009, article 2 describes the aim of electricity development as ensuring the availability of power in sufficient quantity, good quality and reasonable price to increase the prosperity of the people in a fair and sustainable manner.
4. Development of energy resources to fulfil domestic energy needs.
5. Development of industries with high need for energy in regions that are rich with energy resources.
6. Development of solar photovoltaic use in households, as supported by Presidential Decree 47/2017 and the MEMR Regulation 33/2017.

The government set a feed-in tariff for electricity generation from geothermal energy, hydropower, bioenergy and solar energy sources based on their production costs (table 10). The government further provides incentive for renewable energy development through an Energy Security Fund.[10] There is, however, no mechanism to guarantee that PT PLN will purchase the energy.

Table 10. Feed-in tariffs for various renewable energy technologies

Renewable energy technologies	Rates	Regulation	Information
Geothermal	11.8–29.6 US dollars/kWh	MEMR 17/2014	Prices are based on commercial operation date (COD) and the region
Mini and small hydropower (up to 10 MW)	MV (up to 10 MW): 80 US cents/kWh x F LV (up to 250 kW): 97 US cents/kWh x F F = 1.1–1.6	MEMR 17/2014	Price based on connection grid voltage (medium or low)
Water (sanitary landfill)	MV (up to 10 MW): 1.25 US dollars/kWh LV (up to 10 MW): 1,598 US dollars/kWh	MEMR 19/2013	COD maximum of 36 months after the purchase power agreement is signed
Waste (zero waste)	MV (up to 10 MW): 1.4 US dollars/kWh x F LV (up to 10 MW): 1.7 US dollars/kWh x F	MEMR 19/2013	COD maximum of 36 months after the purchase power agreement is signed
Biomass and biogas	MV (up to 10 MW): 90 US cents/kWh x F LV (up to 10 MW): 1.3 US dollars/kWh x F	MEMR 4/2012	Price based on connection grid voltage (medium or low)
Solar photovoltaic	25–30 US cents US/kWh	MEMR 17/2013	Price based on allocation of quotas in certain regions
Other renewable energy with a capacity of 10 MW or more	MV: 60 US cents/kWh x F	MEMR 4/2012	Price based on connection grid voltage (medium or low)

Note: MV=medium voltage; LV-low voltage; F=regional index (differs province to province).
Source: World Wildlife Fund, Sustainable Energy Finance (Jakarta: WWF, 2014).

Masyarakat Energi Terbarukan Indonesia (Indonesian Renewable Energy Society) and renewable energy entrepreneurs urged the MEMR over the past year to review the policy on guidelines for calculating the price regarding the feed-in tariff to attract more initiatives, both from PT PLN and the private sector, and to encourage investment. Having learned lessons from the feed-in tariff scheme, the MEMR issued Regulation 12/2017 to support the optimization of renewable energy sources. It calls for cultivating new technologies for the processing of renewable energy sources by private developers. The regulation addresses the unfair competition situation between new and renewable energy and fossil energy, as the former has received far more limited incentives to attract investors than the latter. The regulation also encourages PT PLN and independent power producers to improve generation cost efficiency to produce electricity at a lower price. MEMR Regulation 12/2017, article 11 sets a purchase price for renewable electricity in accordance with the highest benchmark price for local production costs or by agreement. In addition, it regulates purchases with a minimum of 15 MW from photovoltaic and wind energy generation and a minimum of 10 MW for other forms of energy. This regulation was reaffirmed by MEMR Regulation 33/2017 on new and renewable energy sources and energy conservation. Figure 10 shows the rate of electricity purchase by PT PLN.

Figure 10. PT PLN purchase price of electricity, 2017 (selling price US dollars per kWh)

Source: MEMR Regulation 33/2017.

Most subsidies have been channelled to the most advanced regions of Indonesia. High costs for grid infrastructure development have led to a slow expansion of electrification in remote areas. The Jokowi administration implemented Law 30/2009, obliging the government to subsidize electricity supplies only to poor and remote areas.[11] Electricity subsidies thus will slowly begin to decrease; but to achieve the target to electrify all households in the poorest areas in Indonesia by 2018, the subsidy adjustments will be made according to the consumer group.

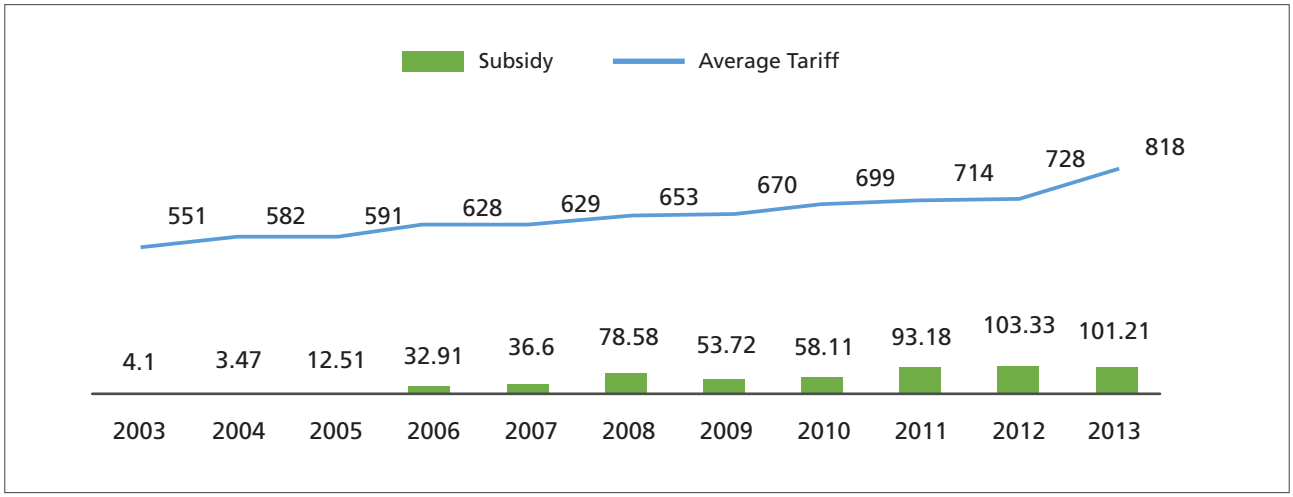
Table 11. Subsidies based on Regulation 31/2014, 2013–2018

Tariff category	2013	2014	2015	2016	2017	2018
R-3 6.600 VA & above B-2 6.600 to 200 kVA B-3> 200 kVA P-1 6.600 to 200 kVA	Subsidy reduction through gradual tariff increases	Automatic tariff adjustment mechanism (ATAM)	ATAM Simplification of tariff category	ATAM	ATAM	ATAM
1-3 > 200 kVA go public 1-4 30.000 kVA & above		Subsidy reduction through gradual tariff increases	ATAM Simplification of tariff category	ATAM	ATAM	ATAM
1-3>200 kVA non-go public R-2/>3.500 to 5.500 VA P-2/>200 kVA R-1 2.200 VA P-3 R-1 1.300 VA		Subsidy reduction through gradual tariff increases	ATAM Simplification of tariff category	ATAM	ATAM	ATAM
S-2 2.200 VA S-2 3.500 VA S-3 > 200 kVA B-1 2.200 to 5.500 VA 1-1 2.200 VA 1-1 3.500 to 14 kVA 1-2/> 14 kVA to 200 kVA P-1 2.200 to 5.500 VA			Simplification of tariff category	Subsidy reduction through gradual tariff increases– 4% per quarter	Subsidy reduction through gradual tariff increases	ATAM
S-2 1.300 VA B-1 1.300 VA 1-1 1.300 VA P-1 1.300 VA			Simplification of tariff category	Subsidy reduction through gradual tariff increases– 4% per quarter	Subsidy reduction through gradual tariff increases	ATAM
S-2/ 450 to 00 VA R-1/450 to 900 VA B-1/450 to 900 VA P-1/450 to 900 VA			Simplification of tariff category	Application of progressive tariff	Application of progressive tariff	Application of progressive tariff
				Block 1 (up to 60 kWh): subsidized tariff	Block 1 (up to 60 kWh): subsidized tariff	Block 1 (up to 60 kWh): subsidized tariff
				Block II for more than 60 kWh: subsidy reduction through gradual tariff increases– 4% per quarter	Block II for more than 60 kWh: subsidy reduction through gradual tariff increases– 4% per quarter	Block II for more than 60 kWh: subsidy reduction through gradual tariff increases– 4% per quarter

Source: P. Tharakan, Summary of Indonesian Energy Sector Assessment. ADB Papers on Indonesia (Manila: ADB, 2015).

PT PLN cannot meet the economic value (marginal costs) of the electricity tariff, thus the government continues to cover the cost difference (figure 11). PT PLN's effort to expand its services to remote areas led to losses of up to 6 US cents per kWh due to high production costs. The electricity subsidy covers the discrepancy between the average electricity tariff from each tariff group minus the basic production cost on voltage in each tariff group, plus the margin (a percentage of the basic production cost) times sales volume (kWh) for each tariff group. Figure 10.

Figure 11. Electricity subsidies and tariffs versus production costs, 2003–2013 (kWh tariff in Indonesian rupiah)



Source: Authors' compilation

The subsidy scheme does not incentivize PT PLN to reduce electricity prices or increase efficiency. Critics argue PT PLN is spending inefficiently. Electricity subsidies may ease the household burden for power, but the domino effect is large: The subsidy scheme encourages wasteful electricity consumption rather than contributing to raising energy efficiency awareness among the population. Given that electricity generation mainly relies on fossil fuel in Indonesia, it also impacts the environment negatively.

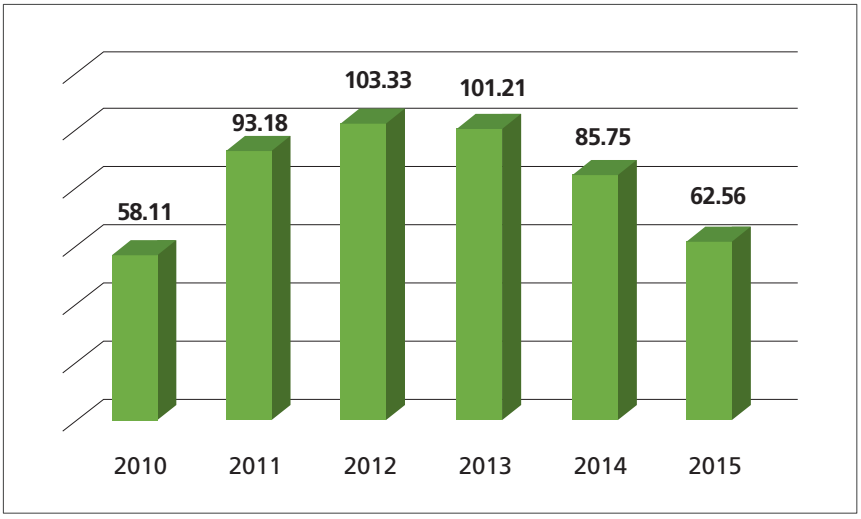
Table 12. Subsidies in their respective energy use, 2016

Performance indicator	Unit (IDR)	Realization
Fuel subsidy	Billion	34,886.44
Liquefied petroleum gas subsidy	Billion	27,050.240
Electricity subsidy	Trillion	48.33

Source: Ministry of Energy and Mineral Resources, Statistics EBTKE 2016
(Jakarta: Directorate General of New and Renewable Energy and Energy Conservation, 2016).

In 2014, the energy subsidies absorbed 24,891 billion US dollars, or around 18 per cent of the total amount of national spending of 140,725 billion US dollars (figure 12). The subsidies still sow heated debate. Although the government has conducted myriad studies and analyses that explicate that energy subsidy allocation (especially for fuel) should be reduced and used for other productive spending, each national budget includes subsidies (figure 12). Fuel subsidies reached 89.9 per cent of primary energy and liquefied petroleum gas subsidies were 104.6 per cent of the reserved target (primary energy) in the 2015 national budget.

Figure 12. Electricity subsidy, 2010–2015 (in trillions of Indonesian rupiah)



Source: Ministry of Energy and Mineral Resources, Statistics EBTKE 2016 (Jakarta: Directorate General of New and Renewable Energy and Energy Conservation, 2016).

Electricity subsidies are forecasted to increase to 6.7 billion US dollars by 2019. Electricity subsidy reduction could be achieved by ensuring that the electricity tariff is at a suitable level for each consumer group. MEMR Regulation 31/2014 on electric power tariffs charged by PT PLN entails 12 non-subsidy tariff customer classifications for which adjustments apply (effective January 1, 2015). The classifications are based on the following power consumption levels:

1. R-1/low voltage households, power 1.300 volt-amepere (VA)
2. R-1/low voltage households, power 2.200 VA
3. R-2/low voltage household, power 3.500 VA to 5.000 VA
4. R-3/low voltage households, power 6.600 VA and above
5. B-2/low voltage business, power 6.600 VA to 200 kVA
6. B-3/medium voltage business, power more than 200 kVA
7. I-3/medium voltage industry, power more than 200 kVA
8. I-4/high voltage industry, power more than 30.000 kVA
9. P-1/low voltage government office, power 6.600 VA to 200 kVA
10. P-2/medium voltage government office, power more than 200 kVA
11. P-3/ low voltage public road lighting
12. Low voltage, medium voltage and high voltage special services.

Electricity sales in 2010–2015 grew by 8.1 per cent per year on average. For the Java–Bali region, the average growth rate for that same period was 7.5 per cent.

2.3 Energy and employment

The National Energy Plan (Government Regulation 79/2014) aims to create energy-related jobs while improving the efficiency of energy utilization and improving people's welfare. Foreign investment in 54 projects in the energy sector planned for 2015 were expected to create more than 40,000 jobs and thousands of MW of electricity.[12]

MEMR initiated an energy management and energy auditor skill certification programme. In 2015, MEMR reported that the Energy Conservation Expert Association had awarded energy manager competence certificates to 75 people and energy

auditor certificates to 48 people. According to the Energy Conservation Directorate, as of October 2015, there were 197 energy managers (distributed across 185 industries and 10 buildings) and 115 energy auditors in industry.

There are no accurate data on green job opportunities. Support for the education sector and for skill development is lacking, both on the operational and strategic levels. No policies have been introduced by the Ministry of Manpower and Transmigration or the Ministry of Education to promote green jobs. This is in part because of a belief that greening the economy needs high levels of investment.[13]

2.4 Public perceptions of energy

There is a growing trend towards adopting environment-friendly lifestyles across Indonesia—and not only by environmentalists. People are increasingly becoming aware of the impacts of global warming. For example, there is growing interest in solar panel installation for household electricity generation (table 13).

Table 13. Development of solar power, by source of financing, 2015

Sources of financing	Capacity (kilowatt peak)
Independent power producers	13,000
State budget	21,548
Total	34,548

Source: Authors' compilation.

The National Energy Strategic Plan 2015–2019 calls for the creation of an energy-saving culture. Three relevant regulations are the President's Instruction 13/2011 on Energy and Water Efficiency, MEMR Regulation 13/2012 on Electric Power Efficient Use and MEMR Regulation 14/2012 on Energy Management. MEMR has developed an online reporting system for energy and water efficiency.

Government Regulation 79/2014, article 17 describes various ways to promote energy efficiency and energy savings, including:

- standardizing requirements for and labelling of all energy consuming equipment.
- introducing energy management systems, including energy audits for energy users;
- obligating the use of power plant technologies and efficient energy conversion equipment;
- promoting a culture of energy saving;
- realizing a business-friendly climate for investors and providers of efficient energy sources;
- accelerating mass transportation systems for urban and intercity transport efficiency;
- accelerating the implementation of a road pay system (electronic road pricing) to reduce congestion caused by private vehicles; and
- target setting for phased in improvements in fuel efficiency in the transportation sector.

High-income households are encouraged to use at least 25 per cent of their roof space for generating solar power, and the commercial sector is required to use products efficiently. Solar panels and wind turbines are to be more widely used.[14]

In May 2017, MEMR launched a "Cutting 10 Per Cent Movement" in several big cities to reduce energy use. The campaign aims to increase people's awareness on the importance of energy efficiency. The Industry and Trade Working Unit also conducts workshops at the subnational government level to promote the efficient use of oil and gas. The biggest energy efficiency potential is in the transportation sector, with expansion of the public transport system, road pricing (non-toll charges) and fuel efficiency targets. The government's efforts to cut subsidies for

oil and gas discussed previously should enable new and renewable energy development to become cost-competitive.

Several application-based innovations have been developed by the MEMR to make it easier for people to manage and save energy. For example, its energy calculator application can be used to calculate a household's energy costs and to determine how energy efficiency could be improved in homes. Yet, many people do not know about these innovations because they are not widely promoted by MEMR.

Energy intensity, the amount of energy used to produce a unit of GDP, serves as an indicator of an economy's energy efficiency. In 2015, the government reported success in decreasing the country's energy intensity by 37,111 barrels of oil equivalent per million US dollars, which was equal to a 3.89 per cent decline from the business-as-usual trend. Intensity reduction efforts in 2015 were supported by the Energy Conservation Directorate through the following programmes:

- energy audits in 10 government buildings;
- energy management implementation in 70 companies;
- manager and energy auditor skill certifications;
- energy efficiency labelling;
- energy and water efficiency in government institutions based on the President's Instruction 13/2012, implemented by 38 government institutions;
- energy-efficient lamp pilot projects in Semarang City and Batang District;
- increasing capacity in the energy conservation sector;
- energy conservation socialization in the national media; and
- National Energy Efficiency Award.[15]

Political feasibility of an energy transition

3.1 Barriers to a renewable energy transition

Tharakan cites three main factors that limit energy infrastructure investment: a shortage of funding, uncoordinated planning and chronic implementation problems.[16] The following sections investigate each of those factors.

Funding limitations

A large amount of investment is needed to develop new and renewable energy and to diversify the economy away from fossil fuel. Currently, capital spending by State-owned enterprises is low because they are subject to price control and they conduct their business inefficiently. This is attributed to price decisions made in the past that did not fulfil economic value.

Bureaucratic problems and a culture of corruption, collusion and nepotism at the central and subnational levels often hinder the achievement of projects, especially those carried out using the national budget. Tender processes tend to be time-consuming and, as a result, project implementation can be delayed. This complicates financial and achievement reports as well as budget planning. When a government agency fails to spend its budget accordingly, the following year budget will be reduced. Indonesia has trouble sustaining a favourable investment climate for the energy sector due to regulatory uncertainty, particularly with the feed-in tariff scheme. MEMR Regulation 12/2017 on the supply of electricity addresses such implementation problems. But more time is needed to see if the regulation will be effective.

There is also a problem with loan disbursements from bilateral and multilateral agencies. The subsidiary loan agreement (SLA) and the government disbursement agreement (known as DIPA-SLA) both have significant impacts on the progress of ongoing energy projects. SLA and DIPA-SLA involve complex layers of agreements between implementing agencies (usually State-owned companies), the Ministry of Finance, the Board of Directors and the State-owned company's Board of Commissary. The agreements need to be conducted in a certain order before the Ministry of Finance will sign a loan agreement with the bilateral or multilateral financing development agency. Even if this process is successfully conducted by the State-owned companies, SLA liquidation approval depends on the government's national budget negotiations, which could run for months. The problem of SLA and DIPA-SLA has significantly influenced how implementing agencies fund their projects. PT Pertamina, for example, prefers not to use sovereign financing from bilateral or multilateral bodies that require an SLA because they cannot take the risk of suspending their payments to a contractor or slowing a project's progress.[17]

Most of PT PLN's long-term financial needs in the past were covered by the Indonesian government or through funds supported by the Asian Development Bank, the World Bank and bilateral donors, such as the Japan International Cooperation Agency and KfW Development Bank (Germany) and that allow the Ministry of Finance to borrow on behalf of PT PLN ("two-step fund"). PT PLN projects that need financing are included in the government's "blue book", which is a formal list of projects that fulfil the requirement for international development support and particular readiness criteria. Then they are registered in the "green book", and the borrower can associate its loan with a loan giver. Delay in adding the project to the blue or green book, increasing procedural requirements by the government to approve loan negotiations and the next annual liquidation from that fund causes a general delay in processing sovereign loans to PT PLN. Nonetheless, PT PLN has been able to access the capital market directly and issue bonds in US dollars and euros. In 2014, PT PLN received long-term financing from a European export credit organization and from both the French and German government development organizations.

Presidential Decision 82/2015 made it possible for international multilateral and bilateral financial agencies to provide direct loans with the government's collateral to State-owned companies for infrastructure activities. This has become an alternative to the traditional two-step regulation that includes the funds to the Ministry of Finance, which are then loaned to the State-owned companies.

Given that regulations and laws change frequently, it is a serious challenge to provide funding to invest in the new and renewable energy sector. The government does not provide any financing assistance to the private sector to start renewable power plant development. This is one of the reasons why the new and renewable energy development industry in Indonesia is hampered.

In 2016, the Financial Services Authority and MEMR cooperated in the accelerated development of renewable energy and energy conservation through an increased role for financial institutions. The Financial Services Authority encourages the financial services industry to increase financing in the energy sector, knowing that its potential is very large. It also encourages the government's priority development sectors to accelerate the development of new and renewable energy and energy conservation. The Financial Services Authority issued Regulation 51/POJK.03/2017 on the Implementation of Sustainable Finance by Financial Institutions to realize cooperation and coordination in support of accelerated development of sustainable development through an increased role by financial institutions.

Uncoordinated planning and implementation between agencies

Bad coordination between ministries and agencies means that the Infrastructure Development Plan throughout sectors is inconsistent. One example is published data. Data that are issued by the MEMR and by the Directorate General of New and Renewable Energy and Energy Conservation are different, even though the latter is a unit that works under the MEMR. When data are inaccurate, then plans will be poorly developed and outcomes will be limited.

There has also be a failure in holistic planning at the national level. When the MEMR aims to have fossil fuel as the main energy source and, at the same time, claims to have more new and renewable energy power plants developed, the national budget is not being used optimally. More support is provided to the production and consumption of fossil energy than the other sources.

Implementation

Political decentralization shifts authority to local governments but also creates more scope for project implementation. But local governments often do not have the capacity to implement policies and programmes, particularly in managing their natural resources. Delay in land acquisition and permits can hamper projects and increase risk perceptions for future investors. In Indonesian villages, implementing agencies have encountered cases in which many groups of people claimed land ownership. PT PLN is then asked to provide compensation. If a planned energy transmission route runs through a plantation, PT PLN is obligated to compensate for each tree. In several areas, costs have become too high to continue transmission line development. Project implementation throughout different sectors would benefit from role delegation within the various government levels, together with local government capacity improvement to aid in the fulfilment of tasks.

Energy is vital for industry to process raw materials in production processes and requires an uninterrupted energy supply. However, Indonesia has focused too little on domestic needs and too much on exporting a huge share of its energy. This is especially true for mineral energy sources. Based on November 2016 data from the Directorate General of Mineral and Coal, total production of mineral energy reached 253 million tonnes.[18] The export portion dominated, at 184 million tonnes. The remaining 69 million tonnes were marketed to meet domestic obligations. Indonesia remains tied in to long-term export agreements of gas and coal, including to Japan.

Regarding its policies to reduce carbon emissions, the government faces a dilemma—bound between the

need to respond to an increasing energy demand that is widely believed to be achievable only by means of conventional energy sources and raising awareness for the need to reduce emissions. Energy is an important element in encouraging national economic growth, and coal is a cheap energy source. If Indonesia wants to expand its renewable energy use, it will need considerable amounts of investment.

Various new and renewable energy investment targets have not been met. One reason for this is that capacity is adequate due to incomplete data. Additionally, technical data and multiple-year contract permits were not issued by the Ministry of Finance. And/or projects were not carried out in a timely fashion.

3.2 Proponents and opponents of an energy transition

The most influential and supporting agencies of an energy transition are those that regularly work on energy issues and contribute actively in policymaking processes and the implementation of projects related to new and renewable energy. The MEMR, and in particular the Directorate General of New and Renewable Energy and Energy Conservation, has strong influence over the policy and implementation processes. For policy development, the MEMR, together with the Ministry of National Development Planning and the National Energy Council, guides the development of the new and renewable energy sector in the country, which must win the approval of the parliament to become legislation. The parliament is aided in its work by technical supporting policy documents supplied by executive agencies. Nevertheless, the position of MEMR (and the central government as a whole) is inconsistent in relation to the promotion of new and renewable energy due to its continuous support for and reliance on fossil energy consumption. Support for fossil fuel is justified based on an energy security argument in terms of the country's increasing energy demand. This line of argument is anchored in national energy policies and plans, which contend that economic development will only be achievable with fossil-generated energy sources.

Local governments have strong influence in creating an enabling environment for new and renewable energy development. Civil society organizations have limited influence and yet still provide certain support for the success of an energy shift to new and renewable sources. A few donors have been encouraging the renewable energy shift in the country—the Dutch Humanist Organization for Development Cooperation (HIVOS) and GIZ (formerly GTZ) in particular. However, national and local civil society groups, such as Yayasan Rumah Energi, the Institute for Essential Service Reform, have a limited pool of funding for energy programmes. They are all donor-driven and rely on government aid to implement their programmes.

The Financial Services Authority has some influence on promoting and endorsing more investment in the renewable energy sector through, for example, their Sustainable Finance Roadmap. If the Financial Services Authority's role was strengthened, it could have more influence on investments in the sector, given its ties to financial institutions and the banking sector. Donor agencies and the private sector have shown great support to the renewable energy sector but do not have influence on the policymaking process. Proponents of renewable energy (including community-based organizations and cooperatives) are only able to provide limited contributions to a renewable energy shift because the use of fossil energy is still large, in comparison with the use of renewable energy. The Ministry of State-Owned Enterprises also only provides limited support to the State-owned enterprises (PT PLN).

The Ministry of Informatics and Communications is in a position to influence public perception in favour of an energy shift. But for this to occur, the Ministry's work must be synergized with the needs of the country and include the public in discussions and decision-making processes. Media also can influence public perception. The media in Indonesia, however, has been used by special interests to weaken the government's new and renewable energy plans. Many journalists have focused on oil and gas, criticized the removal of subsidies for oil and gas and highlighted electricity price issues. Whenever energy

prices increase, the national media cover this in the headlines. Unfortunately, the news coverage does not always represent the truth when it comes to new and renewable energy and tends not to promote its potential. Instead, media coverage focuses on how poor people will be adversely affected by any decrease in fossil energy subsidies.

Financial institutions and the banking sector are influential because they provide financing for the development of the new and renewable energy sector. Yet, they tend to support fossil fuel-based companies. They have made few financial assessments on the potential of the new and renewable energy business sector and thus they tend to hesitate to invest in technologies they do not well understand. At the same time, as long as the National Energy Plan and policies lean towards fossil consumption, financial institutions will shy away from making investments in the renewable energy sector because they fear they will be less profitable. The strong lobbying of the fossil fuel-based companies and the Chamber of Commerce has slowed investment in renewable energy.

Finally, the Association of Southeast Asian Nations (ASEAN), as an international forum, provides little support for renewable energy and has done little to influence a progressive shift towards renewable energy production and consumption in the region. Their policies and plans still support fossil energy development.

3.3 Case study: Sumba Iconic Island

Sumba Island in East Nusa Tenggara is a national leader in the development of renewable energy. With the support of the MEMR, HIVOS introduced the Sumba Iconic Island 100 per cent Renewable Energy Project in 2010. PT PLN, all district authorities in Sumba Island and the provincial government authority signed an agreement in which they expressed their commitment to realize the Sumba Iconic Island's ambitious renewable energy goal. In November 2012, the Asian Development Bank joined the project to accelerate the realization of this initiative. In February 2013, the MEMR took responsibility for realizing Sumba's renewable energy goals.

Sumba Island was chosen based on research by HIVOS and Winrock in 2010.[19] The research showed that Sumba had huge renewable energy potential with hydropower, solar, wind and biogas (from animal waste). See table 14 for more recent data on the potential for new and renewable energy and installed capacity.

Based on the 2010 National Social Economy Survey,[20] the percentage of the Sumba population living in poverty was 23 per cent . East Nusa Tenggara includes 10 of the 33 provinces with the highest poverty rates and ranks sixth in terms of the percentage of poverty. Generally, Sumba is a dry island; the dry season lasts eight to nine months, with a rainy season of three to four months.

Sumba's population lives dispersed across the remote island, making the cost of electricity network development high. In 2011, most of the 700,000 Sumbanese people did not have access to electricity. By 2016, 55 per cent of the electricity demand on the island was met by renewable energy. The Sumba Iconic Island Project has contributed to the electrification of 4,158 households, to a renewable energy investment of more than 9,703 million US dollars and to 27 research projects.[21]

The electrification ratio of Sumba Island increased from 24.5 per cent in 2010 to 42.67 per cent in 2015. The total capacity of new and renewable energy was 6.76 MW, with a total investment value of 11,851 million US dollars in 2016.[22] The Sumba Iconic Island Project was based on a multi-actor approach involving the government, the private sector, banks, NGOs and communities and a joint financing approach involving the national revenue and spending budget and private funders, overseas grants and community contributions.

Capacity building supported three cooperative community units that now manage the new and renewable energy business. Impacts are evident:

Table 14. Potential of renewable energy in Sumba Iconic Island

Types of energy	Amount	Installed capacity	Potential
Hydro energy	12 units	3.421 KW	7.1 KW
Wind energy	100 units	50 KW	10 MW
Solar energy	39 units (centralized) 1.4829 units (spread)	9.119 KWP 439 KWP	3 units of solar-powered water pump 6.6 KW
Biogas	557 units	4.920	8,962,870 sq m
Biomass	1 unit	30 KW	10 MW

Source: Sumba Iconic Island, "Iconic Island Sumba—Sumba Pursue Acceleration". Last modified April 11, 2017. http://sumbaiconicisland.org/sumba-kejar-akselerasi-program-sumba-iconic-island/.

Due to increased wealth and easier access to health centres, the Sumba Iconic Island Project has contributed towards a decline in the number of mothers and infants who have died in childbirth (in 2008, there were 330 mother and infant deaths, but the number decreased to 159 per 100,000 births in 2014).[23] Education has increased because students are now able to study at night using electric lights. Women have become more independent because they can do crafts and other entrepreneurial activities at night.

Twenty windmills in Kamanggih village in eastern Sumba Island, East Nusa Tenggara, generating 10 KW of electric power and reaching 22 households

Photo © Eko Rusdianto, www.mongabay.co.id/2016.

For the sustainability of the project, strong commitment is needed not only from the government but also from the private sector and communities. On March 1, 2017, the government of the Netherlands provided a grant of nearly 1.7 million US dollars for 18 months (through September 2018) to develop a solar panel system for schools and households in Sumba and to install solar panels for corn processing.[24]

Indonesia-specific challenges for an energy transition

Energy is a sensitive issue in Indonesia and has often been used to promote populist agendas by the government, political parties and the parliament. Former energy policies were issued often only to fulfil short-term agendas related to political and, at times, economic interests. This has worked against long-term planning and the promotion of a more sustainable approach to energy. It has stymied the investment necessary for new and renewable energy use. It is important to push the parliament, political parties, the country's president and executive agencies to work together with the private (business) and financial sectors to support the expansion of new and renewable energy.

As a developing country, Indonesia is trapped in long-term agreements and an economic architecture that depends heavily on fossil fuel-based production and consumption. The fiscal structure is also closely linked to fossil energy interests. Despite the global trend towards greater attention to climate change that was agreed on during the Conference of Parties 21 in Paris, industrialized countries continue to support the fossil fuel industry. Massive exploitation, production and consumption of fossil fuels are occurring throughout the world. Indonesia's export of oil and gas to other countries raises questions about the true extent to which energy security is a concern of policymakers. As the same time, Indonesia has become dependent on imported energy—even though the country is rich in energy resources.

Governance that supports fossil energy hampers the development of new and renewable energy use in the country. Policies and programmes for renewable energy are weak and underdeveloped. More innovations are needed to expand renewable energy use, such as the establishment of a public–private partnership model for the new and renewable energy sector. It is important to find ways to stimulate the private sector to develop renewable energy businesses. A good example is the Sumba Iconic Island, through which social and cultural understanding of renewable energy was promoted and community capital was used to invest in renewable energy. Renewable energy production will be more sustainable when it is owned by communities, and the risks for private sector investors are reduced.

Policy recommendations

Investment by the public and private sectors is insufficient to meet projected energy needs.

- Develop cooperation between the Financial Services Authority and the MEMR and issue advocacy documents that encourage financial agency financing (banking) of renewable energy sector projects. Revise the following documents to include statements about financing of renewable energy projects:
  1. The Sustainable Finance Roadmap in Indonesia, 2015–2019, produced by the Financial Services Authority.
  2. The memorandum of understanding between the Financial Services Authority and the MEMR.

  There is a global trend to push the banking sector to greater engagement in sustainable development investing. Given their financial capacity, banks can directly influence the private sector to pursue more sustainable business approaches and to support alternatives that are complementary and integrated.
- Consolidate the fiscal capacity (for example, tax credits or incentives) and finance capacity (such as grants or financing) that support policy and actions for renewable energy development.
- Ensure coordination between ministries to disburse funding efficiently and effectively to prevent policy overlap. Coordination is also important to ensure the sustainability of publicly funded projects to provide energy services to citizens.
- Establish incentives for various steps of technology development, which would also support research and development agencies to enhance their capacities. The government should make incentive schemes for renewable energy more measurable, especially for innovation and investment.
- Encourage and promote public–private partnerships in the energy sector.

A shifting from fossil energy to new and renewable energy is imperative.

- Increase knowledge and understanding of policymakers at the national and local levels to make it possible for them to develop a policy and regulatory framework that supports renewable energy development and sustainability. This will require reforms of energy, fuel and electricity subsidies to make renewable energy more competitive. Centrally, subsidies for coal and oil fuel need to be reduced. These subsidies then can be used to facilitate the development of technology and the installation of new and renewable energy power plants.
- Increase domestic tax revenue to enhance the government's fiscal scope. The government must also stipulate targets by planning each step of renewable energy technology distribution, especially for off-grid supply and for small-scale projects. The government's budget has a strict schedule, which creates bottlenecks for on-grid distribution.

Inefficient use of energy is harming the country.

- Provide long-term financing. There is no multi-year programme to finance small-scale renewable energy power plants. A project (feasibility study, engineering design, the public's preparation, organizational development, installation and evaluation) often takes more than a year.
- Ensure that the gradual increase of energy prices is carried out without political influence (because energy is a sensitive issue and often is used to gain political support during campaigns and in pre-election period). Although the housing sector receives most subsidies, the government needs to do in-depth analyses of potential beneficiaries. The government's plan to increase the price of electricity gradually is appropriate because the basic tariff is low when compared with

other countries. Electricity subsidies should be reduced gradually based on the subsidy reduction road map.
- Encourage socialization for energy efficiency in an integrated manner by all ministries, agencies, mass media and education agencies.

Project implementation could be strengthened.
- Develop performance indicators and frameworks for the evaluation and supervision of objectives. It is important to strengthen the coordination of all projects that contribute to new and renewable energy in the country, including local and national government agencies and State-owned enterprises.
- Provide a registration system for all renewable energy projects that are implemented in the country as well as a general guideline to monitor and evaluate project performance that could be used by governments at all levels.
- Increase coordination with donors who support renewable energy development. The coordination should be across agencies to avoid overlap of initiatives.
- Socialize the utilization of renewable energy and conduct deeper analysis and evaluation of the feasibility of system operation in the field with the development of several pilot projects for renewable energy.
- Increase promotion related to energy utilization and environmental conservation efforts with the media (online and offline).
- Prioritize development in areas with high potential renewable energy resources, both technical and socioeconomic.
- Provide cross-subsidies to ease the financial burden at the development stage. Subsidies that are granted can be returned by the consumer in the form of accounts that must be paid at any given time period. Funds collected from these accounts can be used to subsidize the construction of electrical energy generating systems in other regions, especially areas that have not yet been supplied with electricity.

Recommendations for Friedrich-Ebert-Stiftung Indonesia

To support a renewable energy transition in Indonesia, FES should focus on the political dynamics between the relevant institutions in the policy discourse. FES Indonesia should encourage and facilitate discussion in the public sphere across institutional actors and resources, resulting in coordination, planning, monitoring and evaluation of energy sector development in Indonesia. Projects could target the following issues.

1. Preparation of Indonesia in achieving the Electricity Supply Business Plan, 2016–2025

The policy discourse can break down the problems and the steps to be taken to resolve them and thus lead to stronger coordination and allocation of resources at the central level (ministry and institution level). Potential study topics:

- A mapping of renewable energy technologies that have been developed in Indonesia.
- The implementation of a feed-in tariff scheme to encourage the development of renewable energy enterprises.
- The impact of energy subsidies in Indonesia from an economic standpoint (particularly fiscal) as well as political and socio-cultural changes in the society from 1945 to 2016.
- A mapping of the labour market and human resource vocational competence in the field of renewable energy.

2. Financing investments in the renewable energy sector

FES Indonesia should provide a space for dialogue among the banking sector, the Financial Services Authority and other government agencies and civil society organizations to discuss the appropriate funding model that will encourage renewable energy development efforts. The following guides would be useful such discussion:

- Handbook on investment in renewable energy business development for financial institutions.
- Renewable energy financing academic paper for policymakers.

3. A transition towards renewable energy at the regional level

FES Indonesia should provide a space for dialogue at the regional level to encourage a renewable energy transition. Studies might be conducted in the following areas:

- ASEAN's readiness to transition to renewable energy in the ASEAN power grid.
- Feasibility study on cross-border investments for new and renewable energy.

Notes

1 BBC, "The Number of Disasters in Indonesia Reached a Record in 2016". Last modified December 29, 2016. http://www.bbc.com/indonesia/indonesia-38456759.

2 R. Moediarta, and P. Stalker, The Other Side of Climate Change: Why Indonesia Must Adapt to Protect the People (Jakarta: UNDP Country Office, 2007).

3 Ministry of Energy and Mineral Resources (Jakarta: MEMR, 2017).

4 Ministry of Energy and Mineral Resources, Handbook of Energy and Economic Statistics of Indonesia 2016 (Jakarta: MEMR, 2016).

5 National Energy Council, Indonesia Energy Outlook 2015 (Jakarta: National Energy Board, 2016.)

6 ibid.

7 Ministry of Energy and Mineral Resources, Socialization National Energy Plan in the Framework of the Preparation of the General Plan of the Energy Area (Jakarta: MEMR, 2016).

8 PT Perusahaan Listrik Negara, Electricity Supply Business Plan 2016–2025 (Jakarta: PT PLN, 2017).

9 Asian Development Bank, Indonesia: Energy Sector Assessment, Strategy and Road Map (Manila: ADB. 2016).

10 Estu Suryowati, "Tidak Masalah Pemerintah Pungut Dana Ketahanan Energi dari Konsumen BBM", in Kompas. Last modified December 27, 2015. http://ekonomi.kompas.com/read/2015/12/27/154957926/.Tidak.Masalah.Pemerintah.Pungut.Dana.Ketahanan.Energi.dari.Konsumen.BBM

11 P. Tharakan, Summary of Indonesian Energy Sector Assessment. ADB Papers on Indonesia (Manila: ADB, 2015).

12 F. Ariyanti, Proyek investasi asing serap 40 ribu tenaga kerja RI. Last modified July 15, 2015. http://bisnis.liputan6.com/read/2270235/54-proyek-investasi-asing-serap-40-ribu-tenaga-kerja-ri.

13 Friedrich-Ebert-Stiftung, Green Jobs in Asia—Potentials and Prospects for National Strategies (Singapore: FES Regional Forum, 2012).

14 Ministry of Energy and Mineral Resources, Socialization National Energy Plan in the Framework of the Preparation of the General Plan of the Energy Area (Jakarta: MEMR, 2016).

15 Ministry of Energy and Mineral Resources, MEMR Strategic Plan 2015–2019 Energy Sector Program (Jakarta: MEMR, 2016).

16 P. Tharakan, Summary of Indonesian Energy Sector Assessment. ADB Papers on Indonesia (Manila: ADB, 2015).
Tharakan's analysis in his writing is very much relevant and has described the reality in Indonesia at the time of research. Even though there are additional information written as per the context in 2017, but sub-section 3.1 based on his writing.

17 ibid.

18 L. Leonard, Coal Production Predicted Still High. Last modified November 9, 2016. http://industri.bisnis.com/read/20161109/44/600898/produksi-batu-bara-diprediksi-masih-tinggi.

19 See https://hivos.org/fuel-independent-renewable-energy-iconic-island-preliminary-resource-assessment-august-2010.

20 Central Statistic Bureau, National Socio-Economic Survey, 2010 (Jakarta: Sub-Directorate for Household Statistics, 2010). Last modified September 17, 2014. http://microdata.bps.go.id/mikrodata/index.php/catalog/128/study-description

21 Sumba Iconic Island, "Iconic Island Sumba—Sumba Pursue Acceleration". Last modified April 11, 2017. http://sumbaiconicisland.org/sumba-kejar-akselerasi-program-sumba-iconic-island/.

22 ibid.

23 BeritaSatu, Maternal Mortality Rate Declines Dramatically in NTT. Last modified June 19, 2015. http://www.beritasatu.com/kesehatan/283977-

Bibliography

Asian Development Bank. Energy White Paper. Manila: ADB, 2014.

___. Indonesia: Energy Sector Assessment, Strategy and Road Map. Manila: ADB, 2016.

Agency for the Assessment and Application of Technology (BPPT). Indonesia Energy Outlook 2016: Energy Development to Support Green Energy. Jakarta: BPPT, 2016.

Ariyanti, F. "Proyek investasi asing serap 40 ribu tenaga kerja RI". Last modified July 15, 2015. http://bisnis.liputan6.com/read/2270235/54-proyek-investasi-asing-serap-40-ribu-tenaga-kerja-ri.

Bappenas. Sustainable Infrastructure Program Assistance: Technical Guidance for RPJMN 2015–2019. Jakarta: ADB, 2014.

BBC. "The Number of Disasters in Indonesia Reached a Record in 2016". Last modified December 29, 2016. http://www.bbc.com/indonesia/indonesia-38456759.

BeritaSatu. Maternal Mortality Rate Declines Dramatically in NTT. Last modified June 19, 2015. http://www.beritasatu.com/kesehatan/283977-angka-kematian-ibu-di-ntt-menurun-drastis.html.

Directorate General of New and Renewable Energy and Energy Conservation. Management of Renewable Energy and Energy Conservation. Jakarta: Ministry of Energy and Mineral Resources, 2017.

Directorate of Statistics Household. National Economic Social Survey 2010. Jakarta: Sub-Directorate of Statistics Household, 2010.

Friedrich-Ebert-Stiftung. Green Jobs in Asia—Potentials and Prospects for National Strategies. Singapore: FES Regional Forum, 2012.

Leonard, L. Coal Production Predicted Still High. Last modified November 9, 2016. http://industri.bisnis.com/read/20161109/44/600898/produksi-batu-bara-diprediksi-masih-tinggi.

Ministry of Energy and Mineral Resources. Handbook of Energy and Economic Statistics of Indonesia 2016 Jakarta: MEMR, 2016a.

___. MEMR Strategic Plan 2015–2019 Energy Sector Program. Jakarta: MEMR, 2016b.

___. Statistics EBTKE 2016. Jakarta: Directorate General of New and Renewable Energy and Energy Conservation, 2016c.

___. Socialization National Energy Plan in the Framework of the Preparation of the General Plan of the Energy Area. Jakarta: MEMR, 2016d.

Ministry of Energy and Mineral Resources and Directorate General of New and Renewable Energy and Energy Conservation. Performance Report 2015 Ministry of Energy and Mineral Resources. Jakarta: MEMR, 2016.

___. Management of Renewable Energy and Energy Conservation. Jakarta: MEMR, 2017.

Moediarta, R., and Stalker, P. The Other Side of Climate Change: Why Indonesia Must Adapt to Protect the People. Jakarta: UNDP Country Office, 2007.

National Energy Council. Indonesia Energy Outlook 2015. Jakarta: National Energy Board, 2016.

___. Indonesia Energy Outlook 2016. Jakarta: National Energy Board, 2016.

PT Perusahaan Listrik Negara. Electricity Supply Business Plan 2016–2025. Jakarta: PT PLN, 2017.

Sumba Iconic Island. "Iconic Island Sumba—Sumba Pursue Acceleration". Last modified April 11, 2017. http://sumbaiconicisland.org/sumba-kejar-akselerasi-program-sumba-iconic-island/.

Suryowati, E. "Tidak Masalah Pemerintah Pungut Dana Ketahanan Energi dari Konsumen BBM", in Kompas. Last modified December 27, 2015. http://ekonomi.kompas.com/read/2015/12/27/154957926/.Tidak.Masalah.Pemerintah.Pungut.Dana.Ketahanan.Energi.dari.Konsumen.BBM.

Tharakan, P. Summary of Indonesian Energy Sector Assessment. ADB Papers on Indonesia. Manila: ADB, 2015.

Tribunners. "Given the Commitment to Reducing Carbon Emissions". Last modified July 4, 2016. http://www.tribunnews.com/tribunners/2016/07/04/menilik-komitmen-pengurangan-emisi-karbon.

United Nations Development Programme. Convergence Development Agenda Nawa Cita, RPJMN, SDGs. Jakarta: UNDP, 2015.

United Nations Environment Programme. Renewable Energy World. Washington, D.C.: UNEP, 2008.

___. Renewables 2016 Global Status Report. Paris: REN 21 Steering Committee, 2016.

Widiaryanto, P. "Merging into Ministry, REDD + Should Be More Effective". Last modified January 31, 2015. http://www.thejakartapost.com/news/2015/01/31/merging-redd-ministry-should-be-more-effective.html.

Wiranata, T.A. Public Perception in Implementing Energy Efficient Home: IPLBI Scientific Meeting Proceedings. Bandung: Institute of Technology, Bandung, 2016.

World Wildlife Fund. Sustainable Energy Finance. Jakarta: WWF, 2014.

About the authors

Maria Lauranti is the Program Manager at Perkumpulan Prakarsa, a research institute working to gather and explore innovative ideas for welfare improvement through independent study and active engagement with stakeholders. Having graduated from the Master's Program in the Department of Social Welfare, University of Indonesia, she has worked as a consultant in various government agencies, international and local NGOs and companies addressing a range of social, education, health, humanitarian and environment issues. Since 2016, she has been in charge of the coordination of program and research at Perkumpulan Prakarsa on poverty and inequality, fiscal policies, welfare policies and sustainable development.

Eka Afrina Djamhari is a Researcher at Perkumpulan Prakarsa. Her research interests include education, child protection, gender, poverty reduction, economic development and sustainable development. She holds a master's degree in social welfare from the University of Indonesia. Planning, monitoring and evaluation at project level are among her core competences.

Imprint
© 2017
Friedrich-Ebert-Stiftung | Indonesia Office
Jl. Kemang Selatan II No. 2A Jakarta 12730
Indonesia

Responsible:
Sergio Grassi | Country Director

Phone: +62 21 719 37 11
Fax: +62 21 717 913 58
Email: info@fes.or.id
Website: www.fes-indonesia.org

Friedrich-Ebert-Stiftung (FES) is the oldest political foundation in Germany. Founded in 1925, FES is named after Friedrich Ebert, the first democratically elected president of Germany. With an international network of more than 100 offices worldwide, it contributes to fostering the core values of social democracy - freedom, solidarity and social justice. Promoting sustainable development models for many decades, FES established a new global working line focusing on climate justice and social-ecological transformation in 2010.

Since 2015, FES Vietnam has served as a regional hub in the field of climate change, energy and the environment for the work of FES in Asia.

FES established its Indonesia Representative Office in 1968. In recent years, FES Indonesia has conducted various activities to support social security reform, welfare state, and social economic development in Indonesia as well as social transformation on city level. FES continues to promote Indonesia as a reference to other countries in the region and at the international level for democratization and socioeconomic and peaceful development.

www.fes-asia.org

EFQM
Committed to excellence