A Snapshot of Energy Transition in Indonesia:

Social & Economic Impact at the Grassroots Area of PLTU (Cirebon 1) & PLTS (Selong NTB, Oelpuah NTT)

ROSA LUXEMBURG STIFTUNG
SOUTHEAST ASIA MANILA OFFICE

AKER

Author

Pius Ginting

Andi Rahmana Saputra

Meiliana Auranda Br Siregar.

Layout

Taqi

The publication of this book is sponsored by the Rosa Luxemburg Stiftung (RLS) with funds of the Federal Ministry for Economic Cooperation and Development of the Federal Republic of Germany. This book or parts of it may be used by others free of charge as long as they provide appropriate references to the original.

Published by Perkumpulan Aksi Ekologi dan Emansipasi Rakyat (AEER)
Talavera Office Park, Lantai 28, Jl. T.B. Simatupang, South Jakarta
http://aeer.or.id/

List of Contents

List of Images

List of Figures

Executive Summary

Climate change, triggered by an increase in greenhouse gases due to human activities, such as the burning of fossil fuels, has led to dramatic changes in global weather patterns. The Countries effort in reducing greenhouse gas emissions is increasingly urgent, with Indonesia raising the emissions reduction target to 41% with international assistance. Therefore, Indonesia agreed to a partnership for energy transition in the form of collaborative funding named the Just Energy Transition Partnership (JETP), and established the JETP Secretariat. Although massive efforts are still required, especially in the development of renewable energy infrastructure, these measures show the serious commitment to play an active role in addressing global climate change.

This publication is the result of a field study on energy transition that covered three locations. First, in the surrounding area of PLTU Cirebon 1 that will experience early retirement through an energy transition mechanism (ETM) involving the Indonesian government and the Asian Development Bank (ADB). This study examines the fairness and transparency of the process, questioning whether the planning and implementation were conducted in accordance with the principles of a just energy transition.

Furthermore, the on-site study on new and renewable energy projects in West Nusa Tenggara and East Nusa Tenggara aims to compare ADB-funded renewable energy projects with other projects that are independently funded by Indonesian companies. The study will also evaluate the real impacts of power plants early retirement in a participatory manner with affected communities as well as monitoring the impact of renewable energy infrastructure on local communities. Focusing on the participative and democratic aspects in its implementation.

This study applies a participatory action research (PAR) approach that emphasizes the active involvement of research subjects during the research process, aiming to produce positive change and community empowerment.

Field findings show that the PLTU Cirebon early retirement scheme has not accommodated the principles of equality and transparency at the community level. Local residents and environmental activists have not been involved in the planning of this scheme, and they were not even aware of the planned decommissioning of PLTU Cirebon 1 in October 2023 when this field study was conducted. The possible impacts of this plan are also unclear to them. Thus, the practice of fair and transparent energy transition has not been reflected in its implementation in Cirebon.

The local community welcome the presence of renewable energy infrastructure in their areas in Selong West Nusa Tenggara and Oelpuah East Nusa Tenggara. The presence of NRE infrastructure is a solution to their electricity access problems and provides affordable electricity for the community. In addition, the favorable reception from the community is also closely related to the transparency and communication between the Development project implementer and the community around the project site. Transparency and communication assist with the community acceptance of the project because they understand the benefits that they can receive.

It is important to engage communities in a participatory and collaborative manner with discussions on the aspects of the energy transition and its impacts on them. The discussions will provide an opportunity for the public to voice their views and interests regarding the planned energy transition. The engagement should also be inclusive, involving relevant stakeholders such as environmentalists, local academics, and other relevant groups, to communicate the plan to all community members who may be affected.

Chapter I
Introduction

1.1. Background

Climate change is a long-term change in Earth's weather patterns, caused by the increasing concentrations of greenhouse gases in the atmosphere. Greenhouse gases are gases trapped in the atmosphere and causes the greenhouse effect, that would enable solar radiation to enter the atmosphere and inhibits the release of Earth's heat. Some of the major greenhouse gases are carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O).

Human activities, especially the burning of fossil fuels such as coal, oil, and natural gas, have increased the concentration of greenhouse gases in the atmosphere. This has led to increased global temperatures, extreme changes in weather patterns, melting glaciers, rising sea levels, and other impacts on the environment and society.

Electrical energy generated by steam electric-power plant (PLTU) is one of the main sources of greenhouse gas emissions, especially CO2. Therefore, in order to reduce the impact of climate change, many countries are trying to reduce the use of power plants and switch to cleaner and more sustainable energy sources. One of the most commonly used alternatives is Solar Power Plants (PLTS).

Solar Power Plants is a system that generates electrical energy from sunlight by using solar panels to convert solar energy into electricity. The main advantage of Solar Power Plants is that they do not produce greenhouse gas emissions while generating electricity. By replacing power plants Steam Electric-Power Plant with Solar Power Plant, countries can reduce their CO2 emissions and contribute to global efforts to reduce the impact of climate change.

Climate change and greenhouse gas emissions have become an increasingly pressing global challenge, affecting many aspects of human life and ecosystems around the world. Indonesia, as a country with a large population and a rapidly growing economy, is also facing serious impacts from this issue.

Through Law No. 16/2016, Indonesia has officially ratified the Paris Agreement. Indonesia is legally obligated to play an active role in the global fight against climate change. In this context, ambitious efforts and measures must be taken to reduce greenhouse gas (GHG) emissions and keep global temperature rise below the 1.5 °C limit. One of the IPCC climate model results indicates that global GHG emissions must be reduced by 45% by 2030 if compared to 2010 to achieve this goal.

To respond to the mandate given by Decision 1/CMA 3, Indonesia implements efforts to strengthen its commitment to reduce greenhouse gas emissions. On September 23, 2022, Indonesia stated its commitment to align its NDC-2030 targets with the Paris Agreement Temperature Goal. To achieve this, Indonesia submitted an enhanced NDC (ENDC) to the UNFCCC Secretariat, proposing an increase in the emission reduction target from 29% in the First NDC to 31.89% unconditionally. In addition, Indonesia has also updated its NDC with a reduction target from 41% to 43.20% conditionally. This demonstrates Indonesia's heightened commitment in playing an active role in global efforts to address climate change.

As renewable energy only accounted for 12.3% of total electricity generation in 2022, Indonesia needs to make great progress in this sector to meet its target of 23% renewable energy by 2025. In September 2022, Indonesia issued a presidential regulation that aims to support these goals.

During the November 2022 G20 Summit, Indonesia and the International Partnership Group (IPG) signed a US$20 billion Just Energy Transition Partnership (JETP), which aims to achieve a power sector peak emissions target of 290 million metric tons of CO2 by 2030, to achieve a renewable energy mix of 34% by 2030, and to bring the power sector to zero emission by 2050.

The JETP Secretariat was established and started working in April 2023. One of its tasks is to coordinate collaborative efforts between the GoI and IPG in bringing together CIPP, supported by a working group with multi-stakeholder participation from international agencies, think tanks, energy cooperation programs, and civil society organizations. On November 1, 2023, the Just Energy Transition Partnership (JETP) Secretariat officially opened the draft investment plan to the public in the hope of soliciting input from the public.

While JETP targets are still not in line with the goals set out in the Paris Agreement, this is still a significant opportunity for Indonesia to accelerate the shift to more environmentally friendly energy sources and provide an opportunity for early decommissioning of coal-fired power plants.

This study involved field research activities in three locations with different contexts of JETP planning and implementation in Indonesia. The first location is the area around PLTU Cirebon 1 in relation to the Steam Electric-Power Plant early retirement plan. This early retirement scheme will be carried out through the energy transition mechanism (ETM), a collaboration between the Government of Indonesia through the Indonesian Investment Authority with the Asia Development Bank. ETM is a program to increase energy infrastructure development and accelerate energy infrastructure development towards net zero emissions with the principles of fairness (just) and affordability (affordable) in 2060 or sooner.[1] PLTU Cirebon 1 is planned to have its early retirement in 2037. Quoting the official ADB website, the PLTU Cirebon 1 was chosen for several reasons. Firstly, PLTU Cirebon 1 have been operating for half the period of its contract (since 2012 to 2045) and has a financial structure suitable for refinancing. Secondly, the power plant has active social programs and has a good relationship with the surrounding community, it is considered suitable as a location of transition or a fair dismissal of PLTU operations.[2] For this reason, we would like to see whether the transition process starting from the planning stage is actually carried out in a "fair" and "transparent" manner to the public in accordance with the standard of a fair and reasonable energy transition in the JETP.

---

1 earn more about the principle in the official website of the Fiscal Policy Agency of the Ministry of Finance of the Republic of Indonesia at the following link https://fiskal.kemenkeu.go.id/fiskalpedia/2022/11/10/21- energy-transition-mechanism

2 A more detailed explanation of ETM and Steam Electric-Power Plant early retirement plan can be found on the following pages https://www.adb.org/what-we-do/energy-transition-mechanism-etm

The next case study is the development of new and renewable energy (NRE) infrastructure in West Nusa Tenggara and East Nusa Tenggara to compare between two projects: NRE project funded by ADB and NRE project funded by Indonesian companies.

The early retirement plan of PLTU, which has been considered to have a "negative" impact on the environment, needs to be studied to describe and map its factual impact in with the participation of the surrounding affected communities (villagers, PLTU workers, vulnerable groups at the community level, and so on). In addition, the development of renewable energy-based power generation infrastructure measures to support the energy transition also need to be guarded with critical analysis over its impact on surrounding communities, as well as a comparison of the extent to which this energy transition measure has prioritized participatory and democratic principles in its implementation.

We applied a participatory action research (PAR) approach. PAR involves collaborative research between the researcher and the subject under study that is oriented towards social change (Keahey, 2020; Kindon, et al., 2009). Research subjects participation during the research process is intended to create a dialog between the knowledge of the researcher and the knowledge of the community under study (through a series of the study subjects' participation) so that it can lead to community empowerment (Keahey, 2020). Thus, the researcher and the subject are both participants in a research process so that both are committed to produce research outputs based on the principles of mutual respect, equal dialogue between researchers and study subjects, and inclusive and participatory collection methods. (Thiollent, 2011)

Thiollent (2011) described participation in participatory research can be divided into four levels. First, non-participatory research where the research process is conducted entirely by observing the research subject. Second, it involves simple questionnaires to subjects involved in the research without any commitment to further engagement. Third, limited participation recommended by the researcher to the research subject and accepted by the research subject. Fourth, active participation involves the research subject further than what is recommended by the researcher, and the research subject is actively and creatively involved in carrying out and developing the research process in place.

Studies that use PAR as a methodology always try to adjust the methods used based on public engagement methods that are considered appropriate and accepted in each community. (Kindon et al. 2009). In this research, the study will be conducted with PAR approach up to the fourth level of participation through various participatory data collection methods involving the research subjects. Participatory data collection methods involve participatory mapping techniques with communities around the PLTS and PLTU, in-depth interviews, transects, and participatory observation.

This study aims to assess the impact to and support of the affected communities for the early retirement of PLTU (PLTU Cirebon 1), and assess the existence of solar power plant in Lombok and in Oelpuah NTT on the social and economic aspects of communities around the solar power plant, issues of access to new and renewable energy for community living around solar power plant projects in order to get a portrait of justice in energy transition efforts in the two locations; to compare the implementation of energy transition at the Indonesia's self-managed solar power plant in Oelpuah and the solar power plant initiated with funding assistance from the Asia Development Bank; to observe the extent to which the two power plants can apply the principles of social justice in the energy transition process; to provide an overview on current situation in energy transition implementation around PLTS Lombok and PLTS Oelpuah so that the strategy of energy transition implementation through the JETP scheme can mitigate social impacts in the project implementation area; to assess the performance of the Oelpuah solar power plant and Lombok solar power plant based on weather conditions and assessing potential disaster threats in the solar power plant area..

Chapter II
Research Field Findings Around PLTU Cirebon

2.1. PLTU Early Retirement Research Location

Field research in four villages around PLTU Cirebon, both in Unit 1 and Unit 2, namely Citemu Village, Waruduwur Village, Kanci Kulon Village, and Kanci Village, was conducted in October 2023. The location of PLTU Cirebon can be seen in the following satellite image.

Image 2.1. Location of PLTU Cirebon Unit 1 and Unit 2

Source : www.google.com/maps

The selection of the four villages as research locations was based on consideration of the distance between these villages and the PLTU location. PLTU Cirebon Unit 1 is located in the administrative area of Kanci Kulon Village. Waruduwur Village itself is directly adjacent to the land managed by PLTU Cirebon Unit 1, both separated by a river where fishing boats are anchored and where fishermen cultivate green mussels. One interesting point is that Waruduwur Village has two hamlets, Waruduwur Hamlet (hamlet 1) and Gandawaru Hamlet (hamlet 2), which are located separately from each other. Kanci Kulon Village and Kanci Village are located in the middle of the two hamlets of Waruduwur Village.[3] Kanci Village is the location of the PLTU Cirebon Unit 2, right next to the salt ponds owned by residents. Right on the east side of PLTU Cirebon 2 and Kanci Village, there is Gandawaru Hamlet.

2.2. Profil PLTU Cirebon

PT Cirebon Electric Power (CEP) was established in 2007 as a multi-national consortium involving leading companies in the Asian energy and infrastructure industry. This consortium is bolstered by big names such as Marubeni Corporation from Japan, PT Indika Energy Tbk (INDY), Korean Midland Power (KOMIPO), and Samtan Corporation from South Korea.[4] Currently, Indika Energy, led by M. Arsjad Rasjid, holds a 20% stake in the CEP consortium.

CEP Consortium owns the 1x660 MW Unit 1 Power Plant in Kanci, Cirebon District, West Java. Operational since the end of July 2012, this first unit managed to generate 5 Terawatt hour (TWh) of electricity per year through the Java-Madura-Bali (Jamali) interconnection system. According to ADB data, PLTU Cirebon-1 has been operated since 2012 with a 30-year electricity production contract, which means it will operate until 2042.[5] As a coal-fired power plant, it supplies electricity to PLN, which is the main buyer of CEP.

[3] For more details, please see the village sketch in the Chapter on Land Disputes Around PLTU

[4] Cirebon Power. (n.d.). Profil Perusahaan: Cirebon Power. Retrieved from Cirebon Power Website: https://www.cirebonpower.co.id/id/cirebon-power/perusahaan/

[5] Alaydrus, H. (2022, November 14). PLTU Cirebon-1 Mau "Disuntik Mati" Duluan, Ini Dia Pemiliknya. Retrieved from CNBC Indonesia : https://www.cnbcindonesia.com/news/20221114154322-4-387766/pltu-cirebon-1-mau-disuntik-mati-duluan-ini-dia-pemiliknya

Supercritical technology, including Low-NOx Burners fired boilers, is used in PLTU Cirebon-1. This technology not only improves cycle efficiency, but is also claimed to reduce coal consumption and air pollution, despite using low-calorie coal. It is estimated that in one year, the Cirebon PLTU Expansion can produce 6.9 TWh of electrical energy. The electricity generated will be channeled through the Mandirancan 500 kiloVolt Substation (GI).

PLTU Cirebon 2 was established 2 km away from PLTU Cirebon 1. In 2022, the Cirebon Power Unit II 1x1000 MW Steam Power Plant (PLTU) construction project has reached its final stage. In its trial operations, the project reached a readiness level of 99.8 percent.[6] Although still in the trial period, PLTU Cirebon Power Unit II has been able to produce 581 thousand Megawatt hours (MWh) of electricity, which has been supplied to the Java-Madura-Bali network.

2.3. The Impact of PLTU Presence

2.3.1. Potential Environmental Impacts

The current operation of PLTU Cirebon Unit 1 and the construction and commissioning of PLTU Cirebon 2 have caused various impacts on environmental conditions in the surrounding villages. Several impacts that are felt and become complaints of villagers are as follows:

- **Noise in residential areas**

  Every day for almost 24 hours, especially in the afternoon starting at 05:00 PM WIB until night, residents complain about the noise when the PLTU chimney is actively operating. The noise is especially clearly heard in residential areas in Waruduwur Hamlet, located right next to PLTU Unit 1. Ratna, a resident of RT 06 Waruduwur Hamlet whose house is only about 100 meters from PLTU Unit 1, said that every day her daily activities were disturbed by the noise from the PLTU, especially at night when she and her family are trying to sleep.

[6] Izan, K. (2023, April 12). Pembangunan PLTU Cirebon Power Unit II sudah 99,8 persen. Retrieved from ANTARA: https://www.antaranews.com/berita/3484092/pembangunan-pltu-cirebon-power-unit-ii-sudah-998-persen

During the initial construction and operation of PLTU Cirebon Unit 1, there was an explosion accompanied by strong vibrations from around the PLTU. The explosions and vibrations caused some houses to suffer minor damage such as cracks in the walls of the houses. Dulloh, one of the residents whose house walls were cracked after the explosion around the PLTU told it as follows

> *"...obviously the (PLTU) machine is noisy. Especially at night, the noise is distinct. Straight this way, it's close (to the PLTU). Imagine the noise heard in the houses in Waruduwur, they are even closer. A few years back PLTU 1 exploded, it was during the day, around 10 o'clock at that time. The explosion was around 2012–2014. I forget the exact time, but at that time the PLTU was finish built, maybe it was finishing and being tested. Maybe it was due to technical error, that lead to explosion. The explosion was quite large, it was even heard in the Kuningan area. Because everyone was talking about it. Me and my wife even ran out of the house. It felt like a bomb was dropped from above. My house was broken. There was no compensation from the PLTU. It was not only 1–2 houses. It was around 50 or so houses maybe, there were cracks all over, there was no compensation. My house and my sibling's house nearby were both broken."*
> *(Field Notes, October 12, 2023)*

- **Air Pollution**

PLTU operational activities are often closely related to the issue of dust generated from the coal combustion process. This dust has the potential to cause health problems such as respiratory problems if inhaled at certain levels. The community in the villages around PLTU Cirebon is quite concerned about this potential health impact with the operation of two PLTU units around them. KARBON (Koalisi Rakyat Bersihkan Cirebon) [7] in April 2023 collected data from Astanajapura and Mundu Sub-districts' health centers to identify the top 10 diseases in the two sub-districts. Here's a list of the top 10 diseases:

[7] KARBON is a coalition of communities, students, activists, and young people of Cirebon City and Cirebon District that focuses on advocating various environmental issues in Cirebon.

Table 2.1. List of top 10 diseases in Mundu and Astanajapura Sub-districts

Diseases	Tahun				Amounts
	2019	2020	2021	2022	
Acute nasopharyngitis	3665	2875	1942	2216	10698
General medical examination	2912	1864	n.a	379	6155
Headache	1125	1187	n.a	1307	4566
Myalgia	1083	1076	-	914	3878
Fever of unknown cause	1267	1036	-	507	3494
Dispepsia	595	823	-	391	2373
Primary/essential hypertension	618	496	-	400	2146
Acute pharyngitis, non-specific	1174	-	400	-	2136
Allergic contact dermatitis, unspecified cause	633	472	-	386	2085
Pulpitis	796	477	-	354	1489
				Total	**39020**

Source: KARBON Team Documentation 2023

Based on the data collected by KARBON above, the highest disease in the two sub-districts is acute nasopharyngitis, which is one of the upper respiratory tract infection (URI) diseases. This disease is often known as the common cold, with symptoms such as a runny/stuffy nose, sneezing, sore throat, and coughing.[8] Communities in four villages around the PLTU suspect that respiratory diseases often suffered by residents, especially children, are the result of air pollution due to the operation of PLTU Cirebon Unit 1. However, one of the doctors from Mundu Sub-district who was interviewed could not confirm whether the URI cases that occurred in Mundu Sub-district were due to the impact of PLTU operations alone or also caused by other factors.

[8] Marianne Belleza, R.N. (2023) *Acute Nasopharyngitis Retrieved from* https://nurseslabs.com/acute-nasopharyngitis/

"For upper respiratory tract infections, there are always many patients every day. Their complaints are the same, cough and common cold. There is a possibility that it is the impact of the PLTU, but it may also be caused by other things. There is the economic factor possibility, it could be the environmental factors with air pollution, it could be factors from the family environment like family members who smoke in the house and affects the toddlers, especially yes, children, they often go to the health center a lot. Every day, the majority of the complaints are coughs and common colds." (Field Notes, October 16, 2023)

Eventhough doctors in Mundu Sub-district are unable to confirm whether the cause of high number of URI cases is caused by PLTU activities alone, it does not rule out the possibility that PLTU operational activities have contributed significantly to the occurrence of URI cases in the two surrounding sub-districts. It is important to monitor ambient air quality, and disclose the information to the public, especially affected residents and environmental organizations that provide assistance.

2.3.2. Economic Impacts

Some of the impacts of the existence of PLTU felt by residents in four villages around PLTU Cirebon Unit 1 and Unit 2 are the occurrence of yield failure in green mussel cultivation activities, a decrease in fishermen's catch, changes in the quality of salt produced in the villages around the PLTU as well as the shrinking size of salt ponds.

- **Green Mussels Yield Failure**

  One of the livelihoods of residents in Waruduwur Village, especially in Waruduwur Hamlet, is the cultivation of green mussels. One of the green mussel fishermen named Hasyim said that around 50 residents of Waruduwur Hamlet are green mussel fishermen. This means that green mussels are one of the main commodities for residents, the majority of whom are fishermen (in addition to fishermen who catch fish at sea).

Green mussel fishermen cultivates green mussels by setting up ropes around the riverbank. Throughout the year, residents can harvest green mussels twice, around March and September.[9] Green mussel fishermen can get varying amounts of yields depending on how much land on the riverbank each fisherman manages. Hasyim said he can harvest around 5 to 6 tons of green mussels in one harvest period.

However, in September 2023, green mussel fishermen experienced yield failure. According to Hasyim, around 80–90% of green mussel fishermen in Waruduwur Hamlet were unable to harvest green mussels at all due to the emergence of pests in the form of black moss, which prevented green mussels to attach themselves on the ropes set by the fishermen. Hasyim and other green mussel fishermen do not know the exact cause of the unprecedented appearance of black moss. However, they suspect that the moss growth is related to the activities of the PLTU, which is located right adjacent to the river where the green mussels are cultivated. Hasyim also said that there were allegations of PLTU waste disposal activities into the sea and rivers which caused changes in the quality of sea water and river water around the PLTU. As a result, green mussel cultivation is not the only one that experiences the impact of the PLTU presence, fishermen who catch fish, crabs, and other marine catches also felt the impact. They experience a significant decrease in the quantity of marine catches and the disappearance of several types of marine catches.

[9] The time or period of the clam harvesting may vary depending on the time green mussel fishermen first set up their lines on the riverbanks. However, in Waruduwur, some farmers often set up their ropes in September and March.

- **Penurunan Hasil Tangkapan Nelayan**

> *"Actually, concretely, yes, since the PLTU has had a big impact. It's a really big impact. The effect of coal waste is where was once a lot of crabs now there are none. This means that when the barge do deliveries to the PLTU, there is a lot of outpouring (falling coal). If one day, let's say half a quintal, multiplied by one month, how many quintals is that?"*
> *(Hasyim, Field Notes October 11, 2023*)

Since PLTU Cirebon Unit 1 began operating in 2012, fishermen's activities in surrounding villages have been affected by the presence of PLTU's jetty and PLTU's waste disposal activities into the sea. The existence of the jetty owned by PLTU Cirebon Unit 1 causes fishermen from Citemu Village to have to circle around the jetty to get to the middle of the sea, their usual fishing location. The jetty itself is located where fishermen usually fish. In addition to being forced to go around the jetty to reach the fishing location, fishermen also mentioned that the impact felt since the Cirebon Unit 1 PLTU was established is the reduced number of catches. The decline of catches is due to the shrinking population of fish and other marine life that are the fishermen's catch commodities such as crabs and swimming crabs. Dulloh, one of the fishermen in Citemu Village said

> *"Since there is the PLTU, our income has decreased a little. Both fish, crab, the amount have declined somewhat. The decline is up to 50%. There were periods of low catches, there's an up and down of the amount, but nowadays the period of low catch is more often than not. Even going to sea from 8 to 12 noon, you would still not get any fish. The development also presented disruption. Such as fishermen who want to spread their nets, they cannot pass now because of the jetty. We can go pass actually, but we have to go around first. So it adds to the distance."*
> *(Field Notes, October 13, 2023)*

The decline in fishermen's catches has made most fishermen choose not to go to sea. In October 2023, in Citemu Village, Bandengan Village, and Waruduwur Village, the rivers were always filled with anchored fishing boats that did not go to sea due to the significant decline in marine catches. This condition, according to the fishermen, has occurred since the Cirebon 1 PLTU began operating and the fishermen have concerns that a similar situation will continue to occur and may even be more pronounced if the Cirebon 2 PLTU begins operating in 2023.

Image 2.2. Fishing Boats in Citemu Village

Source: AEER Team Documentation

Dampak menurunnya hasil tangkapan laut juga dirasakan oleh para perempuan di desa-desa sekitar PLTU. Di keempat desa yang tim AEER kunjungi, mata pencaharian utama kelompok perempuan yaitu sebagai pengupas rajungan. Ketika terjadi penurunan jumlah rajungan yang ditangkap nelayan selama beberapa tahun terakhir, sumber mata pencaharian kelompok perempuan pengupas rajungan pun ikut terganggu. Ratna yang bermata pencaharian sebagai pengupas rajungan menyebutkan setidaknya sejak dua tahun terakhir, hasil tangkapan rajungan mengalami penurunan sehingga para perempuan yang bekerja mengupas cangkang rajungan pun mengalami penurunan pendapatan. Populasi rajungan berkurang sejak PLTU Cirebon 1 beroperasi dan dampak penurunan populasinya semakin dirasakan sejak dua tahun terakhir. Ratna mengatakan *"setiap hari begini, penghasilan juga kurang. Semua gara-gara PLTU. Rajungan juga tidak ada, tidak ada yang bisa dijual. Banyak yang mati juga, karena airnya panas (akibat pembuangan limbah PLTU ke laut)"*.

- **The Impact Felt by Salt Farmers**

Since around 2011, when the construction of PLTU Cirebon Unit 1 began, villagers, especially those who earn their living as salt farmers, have felt the impact of the loss of their salt ponds. The PLTU, which was built close to the seashore, forcing salt farmers to lose areas of saltponds. Now, salt farmers in Waruduwur Village, Kanci Village, Kanci Wetan Village, and Citemu Village have partially lost their jobs.

> *"...related to land, especially salt ponds that were previously large, are now narrow. Salt farmers used to be able to manage ponds around the coast, but now people could not go to the beach even if they want to, there is no access for salt farmers. Let alone access, they could not enter the PLTU even though they have a lot of land on the beach. The beach is now covered with wild growth." (Ahmad, Field Notes October 11, 2023)*

Currently, some salt farmers try to survive by working on other people's salt ponds. They rent salt ponds on a yearly basis with rental fees ranging from IDR 1,000,000–IDR 2,000,000/year. This rental fee can be covered by the profits salt farmers obtain every harvest season, which can get around IDR 15,000,000–IDR 25,000,000.[10] But this does not cover the operational costs for salt harvesting activities which could get up to IDR 5,000,000 per season.

Image 2.3. Location of residents' salt ponds in Kanci Village

Source: AEER Team Documentation

One of the salt ponds in Kanci Village is currently located on the south side of PLTU Cirebon Unit 2, the distance between the salt ponds and PLTU Cirebon 2 is only about 100m. In Kanci Village, the ponds belonging to one group of salt farmers are located under and around the SUTET (Extra High Voltage Aerial Line) tower. In this location, there are around 30 salt farmers who are actively working on the salt farming ponds to date.

[10] A salt harvest season lasts about 3–4 months during the dry season.

The problem faced by salt farmers today is not only the loss of salt farming area previously owned by each farmer nor the location of salt farms that are too close to the SUTET (Extra High Voltage Aerial Line) towers. The main concern of salt farmers is the quality of salt produced, that has been impaired since the operation of the PLTU around the salt ponds. Ahmad Adung, one of the salt farmers in Kanci Village tells it as follows

> *""So the impact of PLTU 1 or PLTU 2 is felt in Kanci and Kanci Wetan Villages. Now that PLTU 2 has been established, no one has fixed the waterways, meaning that seawater does not reach the salt farmers. Causing salt farmers to experience seawater shortages. The second impact on salt farmers is that the salt used to be clean, now it is tainted with black color. Unsure whether it's from the coal, or diesel-fuel. Because at the time the salt patches emerged, there are blackish-green mucus on it. There were also black spots in the corner of the salt patches that were black.*
> *(Ahmad Adung in Field Notes, October 11, 2023)*

The impact of pollution in the form of black slime (of which the main cause is still unknown) is thought to be the result of the Cirebon Unit 2 PLTU operation activity, which was conducting a trial phase at the time of this research in October 2023 . Due to the black slime, the quality of the salt products is declining affecting the salt selling price, where in some cases the salt could not even be sold. Salt farmers saw a price decline to about 50%. Before the PLTU Cirebon was built, according to Rastum (a salt farmer), the price of salt was around IDR 1,500/kg. In October 2023, salt prices ranged from IDR 600–IDR 800/kg. The income that can be obtained each season with an effective salt harvest time of about a month, on a net basis, ranges from IDR 6,000,00–IDR 15,000,000/season (depending on the land area and operational costs required). This is the amount of income that can be earned provided the quality of the salt is good, without any of the salt being damaged or contaminated. If there is salt that cannot be sold because it is black due to the black slime that Ahmad described, salt farmers would earn an even lower income.

Image 2.4. Salt ponds polluted with black dust and oil

Source: AEER Team Documentation

2.3.3. Social Impact: Shrinking Public Space

Although it is not an object targeted for early retirement by ADB's ETM or JETP's November 2023 CIPP document, the Cirebon Unit 2 PLTU built in the Kanci Village area also has an impact to the life of the surrounding community. One of the impacts is the narrowing of public spaces in residential areas. In our interview with one of the school principals in Waruduwur Village, he said that the construction of PLTU Cirebon Unit 2 caused residents, especially children and adolescents, to lose their playground space. As a result, the school grounds are often used as their playground.

For the school, this can be disrupting to the teaching and learning activities at school because the school environment cannot be sterile or fully utilized for the benefit of school community. Residents also often drive through the school environment using motorized vehicles because road access is increasingly reduced after several roads are closed around the PLTU. Until the time of this research, there had not been any discussion regarding this issue between the school and the PLTU. Meanwhile, for the school, this impact needs to be mitigated in order to maintain and to run the teaching and learning activities at school in a conducive manner, and ensuring the safety and security of students in their daily activities in the school environment.

2.4. The Dynamics of Land Status Around PLTU

To understand the landscape conditions around the Cirebon PLTU area, you can see a sketch of the area that the AEER Team made in a participatory manner with residents around PLTU Cirebon 1.

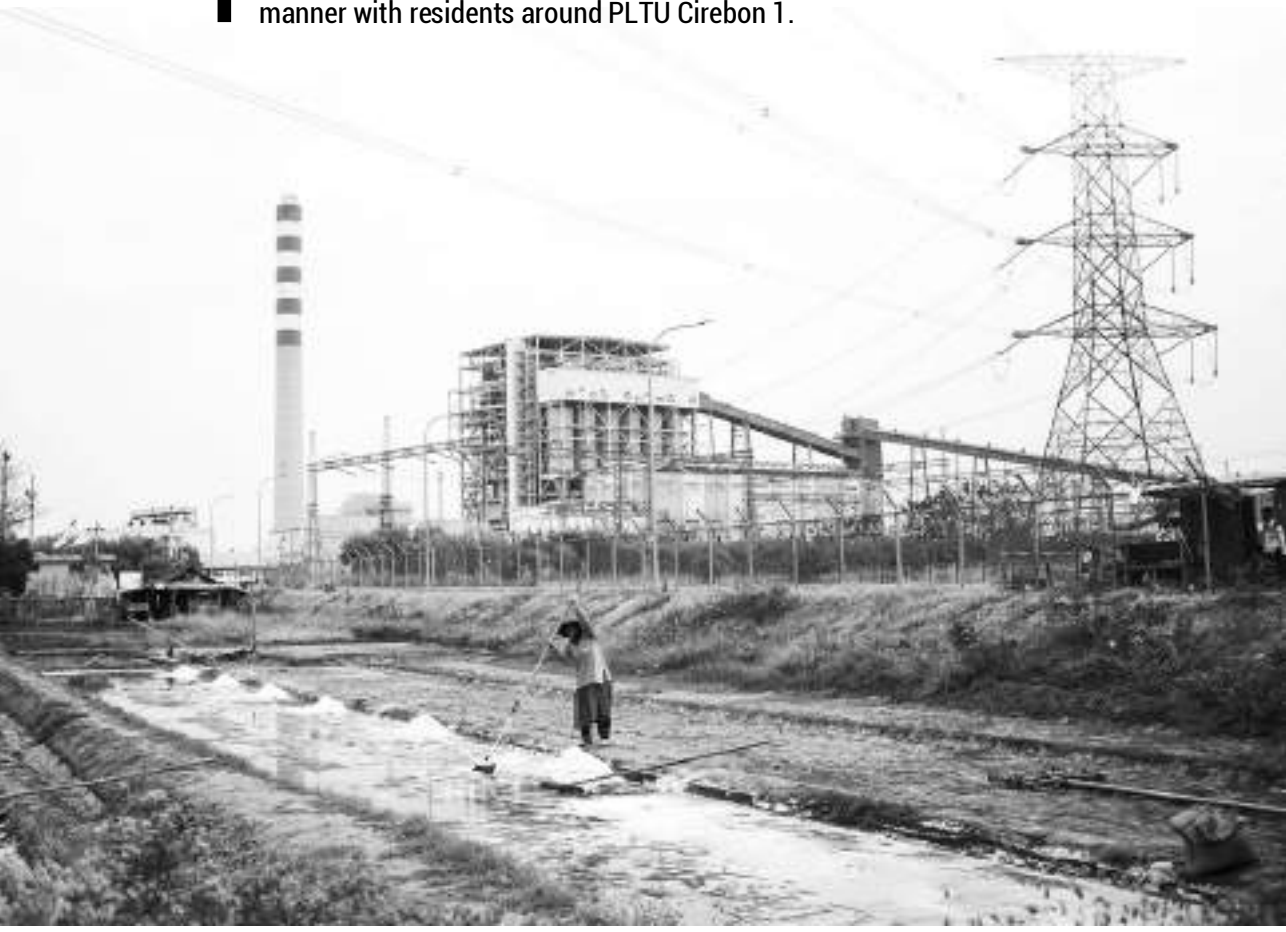


Image 2.5. Sketch of the Territory around PLTU Cirebon Unit 1 and Unit 2

Source: Result of AEER Team Research 2023

According to information from residents in Citemu Village, the land around PLTU Cirebon 1 is a sand bar.[11] For generations, these areas have been managed as salt ponds by residents around the coast in Cirebon District (including the four villages where the research was conducted). On the North side (see sketch), around the Cirebon PLTU area, both Unit 1 and Unit 2 are sand bar areas. There are salt ponds around the PLTU, managed by residents from the surrounding villages. There are also settlements around the PLTU. On the coast, there is a mangrove area overgrown with api-api trees (genus Avicennia) which allows the process of deposition of soil and mud around the seashore, therefore the area around the PLTU is a sand bar area.

[11] A sand bar is landforms formed naturally through the process of deposition that occurs in rivers, lakes, beaches, or new islands whose control is controlled by the state.

After the Cirebon 1 PLTU construction process took place around 2011–2012, the land acquisition process was met with many problems. First, the status of the land in the salt pond area, which is sand bar area, is mentioned as state property (Barang Milik Negara/BMN). However, Cirebon Power as the company managing the Cirebon PLTU conducted sale and purchase transaction of land with the community. In fact, the status of land ownership around the PLTU goes through quite complex various dynamics that are starting from around the 1980s. Andi, one of the lawyers who helped the community around the PLTU to fight for their rights over the land in the PLTU area that they claimed to belong to the community, recounted the dynamics of land tenure in the sand bar area as follows

> *For a little bit of prelude, in 1985–86 there was land acquisition for the food center. A private sector entit, Marines Samudra Persada, did the land acquisition. Not the Ministry of Forestry. Due to the lack of capital providers at the time, it became stalled. At that time, Marines had made collective payments to the community, it was not rights relinquishing. However, the collective payment was used as a release of rights by the Ministry of Forestry to seize customary land. Whereas, the Ministry of Forestry cannot buy land from communities. The community also never transferred their land certificates in the form of letter C, grants, etc. It was never transferred. All of a sudden, the land rights were already shifted to the Ministry of Forestry. Then in 2013 the area was designated as state property, immediately became a BMN. So now we are filing an administrative appeal to the government and we have gone to the president's staff office. We are trying to provide evidences that the Ministry of Forestry has never purchased the land from the community. Let alone the Ministry of Environment and Forestry. It is even funnier that in 2013 it has been designated as BMN by the Ministry of Finance. Between 2014–2016 there was a sale and purchase of land in that area, between the community and Cirebon Power. Even though the status is already BMN, but Cirebon Power bought the land from the community. Isn't it odd? Is it allowed to buy and sell BMN land? It shouldn't be allowed, right?*
> *(Field Notes, October 16, 2023)*

Based on the information from Andi, since before the 1980s, residents of Mundu Sub-district and Astanajapura Sub-district, especially those in the coastal area and have the potential as salt producers, have managed the area around the seashore as salt ponds. As the land increases in size through the process of soil deposition in the sand bar area, the coastline becomes increasingly protruding into the ocean. Citemu Village resident Nursalim said that the location of the harbor for fishing boats in Citemu Village and Bandengan Village, for example, is an area that only existed around the 1990s, that came to form as part of the process of sand bar formation.

If we look into the local regulations that apply to Cirebon District, the status of designation and land use around the coast has also changed. The Cirebon District Regional Regulation No. 17/2011 on the Cirebon District Regional Spatial Plan 2011–2031,[12] states that area around the wetland (among them are coastal areas and mangrove areas), are designated for agriculture and livestock/fisheries. This provision has changed in the Cirebon District Regional Regulation Number 7 of 2018 concerning the Cirebon District Regional Spatial Plan 2018–2038, which states that the area around the coast of Cirebon District can be used as an industrial area. In terms of socio-cultural and economic functions, these changes have resulted in the community loss of access to their salt ponds around the coastal area. Andi, the attorney emphasized

> *"The land is actually a national strategic land. How can it be converted into a PLTU? It's already a violation of the Regional Spatial Plan. Should the Regional Spatial Plan can be amended, the compensation should be given to the community. Of the 200 hectares, there are more than 350 land-owners. Should one person expect an income from tje state land, from farmers, shrimp farm, salt ponds, let's say 5–10 million per month. Consider how many lives earned their living from that land. Of the household of the land owners, one household may have up to 4–5 family members. Now times that by 350, there are thousands of people who depend their living from the land. This was not included in the consideration. Because of the private interests, the community land is seized." (Field Notes, October 16, 2023)*

[12] Hereinafter referred to as the Cirebon District Regional Spatial Plan document

One question was always asked in our conversations with the communities around the PLTU, "*When the PLTU is stopped, would it be possible to have the land returned to the community?*". This question can only be answered when the energy transition scheme through early retirement of PLTU Cirebon 1 involves participatory dialog with these affected communities. Those who have lost their access and rights to the land that they used to manage, are now also experiencing a similar fate with the Cirebon 2 PLTU.

2.5. Residents' Understanding & Response to the Cirebon PLTU Early Retirement Plan

When this research was conducted, residents in the four villages said they did not know about the early retirement plan of PLTU 1 Cirebon. They only knew about the information after they met with AEER research team per October 2023. Dulloh, whose livelihood is as a fisherman, he's also the head of one of the fishermen groups in Citemu, and he had never heard of the Cirebon 1 PLTU early retirement plan. Similar to Dulloh, Ratna who resided in Waruduwur Village had also never heard of the plan. Ratna and other Waruduwur residents who live in an area very close to PLTU Cirebon 1 knew nothing of the early retirement plan. They lived so close to the PLTU that 100 m from Ratna's house is the Cirebon Power Vocational building.

On the other hand, there are also residents who already know about the Cirebon 1 PLTU early retirement plan but they got this information from online news channels. Among these people are the teachers at SD 1 Waruduwur Elementary School, who found out that the Cirebon 1 PLTU is planned to be retired within the next few years. However, the school, which has been interacting with the Cirebon PLTU, has never received any information about this plan from the company.[13] Residents around PLTU Cirebon 1 have also never received any information regarding the PLTU's early retirement plan, or the impact they might've felt that is related to the plan.

[13] According to the Principle of SD 1 Waruduwur Elementary School, since around 2014, PLTU Cirebon 1 has provided several training programs for students at SD 1 Waruduwur as part of their corporate social responsibility program. These trainings include computer training and English language training, which are usually provided once per year.

> *"...in all honesty, if the PLTU is shut down the community is rejoicing, because what benefits does it give to the community? Actually none. Only, pardon me saying, only certain people gets the benefits leveraging certain people and officials. For the community, we got none, instead, there is a lot of complaining. We beg your pardon, as 80% of our community are fishermen, and with the impact of coal their income is reduced, this is a negative impact, not a positive one for the community. If the PLTU is no longer operational, we are happy (benefited) here." (Reihan and Hasyim*,[14] in Field Notes October 11, 2023)

Upon hearing the news about the early retirement plan of PLTU Cirebon 1, the residents responded by expressing their approval of the plan. For fishermen groups, the termination of PLTU Cirebon 1 operations is expected to help restore the aquatic ecosystem around the PLTU, which will have an impact on the recovery of fish populations and other marine biota, which ultimately leads to an increase in fishermen's catches.

[14] Reihan and Hasyim are residents of Waruduwur Village. Hasyim himself is one of the community leaders who is often involved in the campaign against the existence of the Cirebon 1 PLTU together with Wahana Lingkungan Hidup (WALHI) West Java organization.

Although grassroots communities have welcomed the early retirement plan, at the time of this research in October 2023, there was still no clear scheme in place. According to Wahyu (better known as Iwang), the Director of WALHI West Java during interview with AEER Team on November 3, 2023, the early retirement plan has not been based on participatory and transparent values with the public, especially the people in Cirebon. He explained as follows

> *"The plan to gradually close or known as the early retirement of PLTU 1 Cirebon is not based on any participatory and transparent values. The company's power purchase agreement (PJBL) scheme with PLN has no openness to the public. We, WALHI Jabar, have no detailed knowledge on the government procedure to retire PLTU 1 Cirebon with clear, measurable plans that are able to answer the anxiety felt by the public. One of the reason is that we were never involved in the early retirement scheme of PLTU 1 Cirebon, we have confirmed that the community on the site had never received any transparent information regarding this plan. We also don't know if the scheme through the ETM program really answers the ecological restoration, which should have been the responsibility of the company. Because when we studied this scheme, the company is never at a disadvantage at all. Even in terms of PJBL, when the private sector does not sell electricity, PLN is still obliged to buy it, so the value or form of loss for the private sector does not exist when PLN is forced by the state to buy electricity power from them. Secondly, the private sector will experience no loss at all with the early retirement scheme because this ADB program called ETM buys PLTU with a range of 200–250 USD, so there is no perceivable loss that will be obtained by the Company." (Wahyu in Field Notes November 3, 2023)*

The government's lack of openness to the public regarding the Cirebon 1 PLTU early retirement plan has led to concerns from environmental activist groups that this plan may not actually be implemented, or it would be implemented but not provide any solution for the community. Dhinda, a member of KARBON, expressed her concern that the early retirement scheme of PLTU 1 Cirebon is a sweet promise that will not be realized as long as there is no openness to the public. Dhinda also emphasized the need for a room for dialogue with the public, especially the grassroots community, so that the transition process goes smoothly and the surrounding community understood the impact on their lives when the PLTU is retired.

2.6. How Should the Transition Be Done?

Based on our findings, the energy transition process carried out in Cirebon through the early retirement of PLTU Cirebon 1 has not gone through a transparent process. Community engagement as a stakeholder with the right to democracy in the energy transition has not been a priority. As seen in the interview with Wahyu from WALHI West Java who stated that until now, neither WALHI West Java nor the grassroots community have been invited or involved in the process of preparing the PLTU early retirement plan and scheme.

In fact, an equitable and transparent energy transition at the community level requires holistic and sustainable measures. There are at least two things that need to be done so that the energy transition process carried out in Cirebon can be successful by prioritizing fair and transparent principles.

- Communication outreach to grassroots communities and relevant stakeholders: so people understand the purpose of energy transition and support the energy transition process with more awareness of the positive impacts it will bring.

- Community Participation: Involving the community in decision-making regarding the energy transition. This community engagement must be participatory, inclusive, and equal. Communities can convey their concerns about the energy transition process, and together with policy makers and energy transition project implementers, they can help develop strategies to mitigate the impacts of the transition that will be faced by communities.

Energy transition at the community level requires a combination of approaches involving not only appropriate financing strategies but also inclusive and intensive community participation. As such, these measures would help create positive change towards a more sustainable and environmentally-friendly future.

Chapter III
Research Field Findings Related to PLTS

3.1. Two Solar Power Plant Sites Visited

The renewable energy infrastructures operating in Indonesia are located in Lombok Island, West Nusa Tenggara and Kupang City, East Nusa Tenggara. In Lombok, there are three solar power plants (PLTS), PLTS Selong (7 MWp), PLTS Pringgabaya (7 MWp), and PLTS Sengkol (7 MWp). Meanwhile, in Kupang there is PLTS Kupang (5 MWp). The three PLTS in Lombok Island are independent power producers that were built using funds from the Asia Development Bank (ADB). Unlike the Lombok PLTS, the Kupang solar power plant was built by PT LEN Industri.

In August 2023, we conducted field research in the communities around the Selong solar power plant and the Kupang solar power plant to see how the presence of solar power plants in the two areas has impacted the lives of the surrounding communities, especially related to access to electricity for residents. It became important to assess whether the energy transition process through the development of new renewable energy infrastructure in Indonesia can be done in a fair manner and provide benefits to communities around project sites. PLTS Selong is located in the Geres Village and Suryawangi Village, East Lombok District. PLTS Kupang, in Oelpuah Village, Kupang Tengah Sub-district.

3.2. Profile of the Two Solar Power Plants (PLTS)

- **Profile of PLTS Selong**

PT Terbarukan Buana is a Solar Power Plant (PLTS) industry that shares and demonstrates renewable energy source technology in Indonesia, one of which is in Selong, East Lombok, West Nusa Tenggara (NTB) PLTS, under the management of PT. Vena Energy. The improvement of PLTS in Selong, East Lombok, West Nusa Tenggara is certainly an advantage to help the distribution of electricity, where in this situation PLN gets a supply from a sustainable resources that is certainly cheaper and cost effective. PLTS Selong has a capacity of 7 MWp and has been operational since 2019.

PLTS Selong at East Lombok, West Nusa Tenggara has a total land area of 9.18 hectares with 5.4 hectares of PV Module (Solar Panels) installation based on the 9.18 hectares. In a land area of 5.4 hectares, 270 tables are installed consisting of 80 PV Modules for each table with a total of 21,600 PV Modules, 40 Array Boxes, 2 PV Boxes in which there are 8 Inverters and 8 DCBoxes.[15]

[15] Koko Hermanto, S. F. (2022). Pengaruh Beban Kerja Terhadap Stres Kerja Karyawan Pada PT Infrastruktur Terbarukan Buana Plts Selong Lombok Timur. HEXAGON, Jurnal Teknik dan Sains, Universitas Teknologi Sumbawa, 34-35.

Image 3.1. Selong Solar Power Plant in Geres Village

Source: AEER Team Documentation

- **Profile of PLTS Kupang**

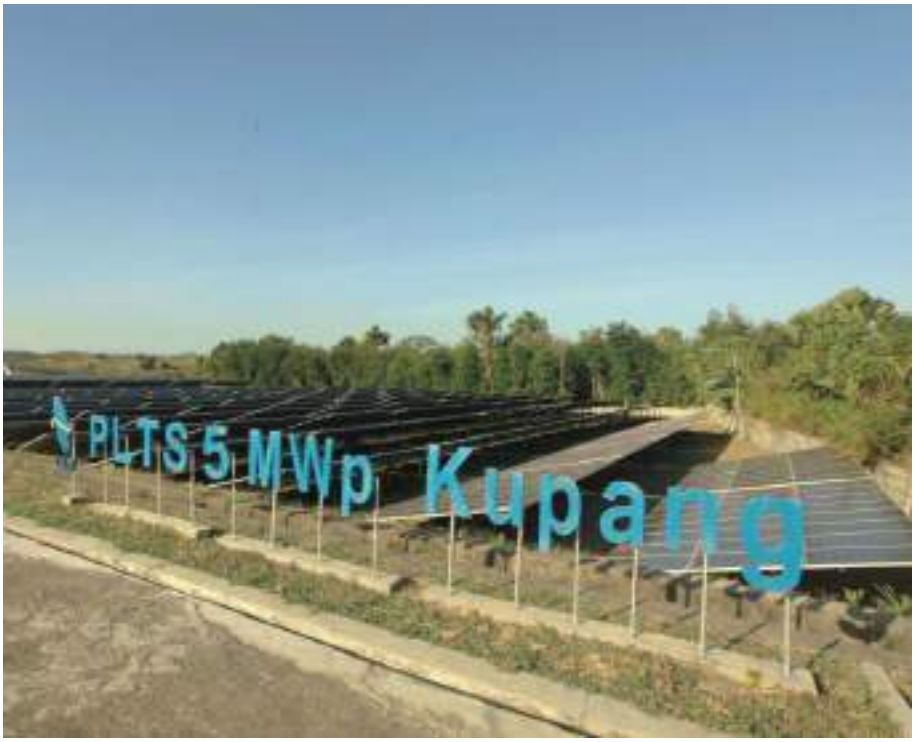
  Rapid population and economic growth has significantly increased the demand for electricity. In 2014, the electrification ratio in East Nusa Tenggara (NTT) only reached 58.91% (Source: Directorate General of Energy and Mineral Resources, 2014). To cope with this increasing demand, the utilization of renewable energy sources, such as solar energy, has become one of the environmentally friendly alternatives.

  Solar energy has great potential of implementation in NTT. NTT has abundant solar energy potential with a solar radiation intensity of 5.117 kWh/m2, higher than the average of other provinces that only has 4.7 kWh/m2. Coupled with the climatic conditions of NTT, with 8 months of dry season and only 4 months of rainy season in a year, it has a great potential for the development of solar power plants.[16]

[16] Micklon Edison Nakmofa, J. N. (2018). Kajian Kualitas Lingkungan Fisik-Kimia Akibat Pengoperasian Pembangkit Listrik Tenaga Surya Terpusat Di Desa Oelpuah Kecamatan Kupang Tengah Kabupaten Kupang. *Jurnal Bumi Lestari*, 51-53

The Kupang District Government, with support from PLN and PT LEN Industri, has built a centralized solar power plant (PLTS) in Oelpuah Village, Kupang Tengah Sub-district, Kupang District.

Image 3.2. Kupang Solar Power Plant in Oelpuah Village



Source: AEER Team Documentation

Oelpuah Solar Power Plant (PLTS) has a generation capacity of 5 Megawatt peak (MWp). It is equipped with 22,008 units of solar modules, which occupy an area of 75,143 square meters. Each solar module has a capacity of 230 Watt peak (Wp) and is divided into 917 strings. Each string consists of 24 series (1 string) which are then paralleled with other strings. It uses a string inverter topology with a total of 250 inverter units, each with a capacity of 20 kilowatts (kW).[17]

[17] Frans J. Likadja, W. F. (2022). ANALISIS PENYAMBUNGAN PLTS OELPUAH 5 MWPKE SISTEM SALURAN UDARA TEGANGAN MENENGAH 20 KV PT. PLN UNIT LAYANAN KUPANG. *Jurnal Media Elektro*, 18.

This solar power plant started operating on March 1, 2016 and is connected to the on-grid system, meaning that the electricity generated is directly channeled to the PLN electricity network through a connection system. As a result, this solar power plant only supplies electricity to PT PLN during the day. However, when cloudy weather or the rainy season arrives, the performance of the solar power plant may be affected as temperature and humidity affect the efficiency of the photovoltaic modules. The voltage generation is also affected by humidity and temperature.

PLTS Oelpuah is connected to the 20 kV Kupang Medium Voltage Line (SUTM) through the Oesao feeder to the Undana Substation of PT PLN Kupang Service Unit. Since the generation power of this plant is quite large, any disturbance can have an impact on the distribution system. Power delivery from the Oelpuah solar power plant is greatly affected by climate and weather, especially since the plant is not equipped with a storage battery. The quality of power received by consumers is highly dependent on technical conditions, including power losses and voltage drops in the electrical power delivery system.

3.3. Records of Electricity Access and Comparison of Electricity Prices After Solar Power Plant

Before PLN entered the East Lombok area in 2005, the electricity used by residents was produced by the Sinar Rinjani Rural Electricity Cooperative (KLP). The KLP is a diesel power plant (PLTD), running on fossil fuel. PLTD KLP Sinar Rinjani is located in Aikmel Sub-district, East Lombok District. The electricity produced by KLP Sinar Rinjani is distributed to nine sub-districts in East Lombok including Aikmel and Labuan Haji sub-districts.

While subscribing to electricity supplied by KLP Sinar Rinjani, residents often experience power cuts for days. They could predicted the schedule of the routine power outage every week. Usually the community would receive electricity for three days, and have a black out for three days. During the three days that they have electricity power, the voltage was often unstable, causing residents to be reluctant to use electronic equipment for household needs as well as for business needs, such as in grocery stores, workshops, and others.

residents in Geres Village, Labuan Haji Sub-district said that electricity supply by KLP Sinar Rinjani is more expensive than the current price of electricity obtained from PLN. In the early 2000s until 2005, the price of electricity produced by KLP Sinar Rinjani was around IDR 51,000 per kWh.[18] In contrast to current conditions, the electricity price set by PLN is around IDR 50,000 per 33 kW. This means that the difference in electricity prices between KLP and PLN is fairly significant. One of the residents of Geres Village named Khalid said that the electricity costs from KLP Sinar Rinjani were indeed greater than after PLN took over electricity production for the electricity system in East Lombok.

> *"In the past, the price of electricity when it was still produced by KLP was around more than IDR 3,000 (almost IDR 4,000) per kW. We used to pay around IDR 50,000–IDR 100,000 or even more per month for electricity, but now Rp 20,000 can cover our electricity needs for a month as long as we don't have too many electronic devices. Now that electricity prices are getting cheaper, people are cooking with electricity using rice cookers. Even carpenters, nothing is done manually anymore, everything is done with electronic tools." (Khalid in Field Notes, August 23, 2023*)

[18] *Kilowatt hour*

The higher electricity price not accompanied by a stable flow of electricity causing residents to feel that using electricity from KLP Sinar Rinjani is "burdensome". In 2006, there were protests from residents against KLP Sinar Rinjani by vandalizing the KLP Sinar Rinjani power plant building. Based on news from Liputan6.com in January 2006, hundreds of residents from 42 villages in six sub-districts in East Lombok occupied the power plant building owned by KLP Sinar Rinjani.[19] They demanded that the government take over the KLP and provide cheaper electricity to residents. Since 2006, after the protests from residents in East Lombok, PT Perusahaan Listrik Negara (PT PLN) has taken over electricity production and distribution activities in East Lombok. One of the realized projects related to electricity procurement in East Lombok is the collaboration with ADB to build three solar power plants on Lombok Island which then supply electricity, especially in the Lombok region.

Image 4.3. Electricity use by residents

Source: AEER Team Documentation

[19] Covered by Liputan6.com on January 2006, can be read in the following link https://www.liputan6.com/news/read/115795/gedung-pembangkit-listrik-lombok-timur-masih-diduduki

In Kupang, the same thing happened before the Kupang solar power plant was built by PT LEN Industri. Residents who have received electricity from PLN since the 1990s mentioned that prior to the PLTS, the electricity delivered to their homes was often unstable. Yakoba Tipnoni, a resident of Oelpuah Village, Kupang Tengah Sub-district, said that since the 1990s, electricity has been available in Oelpuah Village, but there were still frequent blackouts until 2016. According to Yakoba, power outages occured due to frequent disruptions in the electricity system from PLN due to bad weather and trees that fall and damage PLN's electricity cable network.

However, changes was seen since 2016 when the Kupang solar power plant began operation. Since then until 2023, the electricity obtained from PLN has become more stable, with blackouts rarely happening. Power outages still does occur occasionally but only for a few seconds or less than 5 minutes. Manto, a technician at PLTS Kupang, recounted the condition of electricity access in Kupang before the PLTS was built

> *"The electricity blackouts used to happen frequently here, but since there is PLTS blackouts rarely happen. Since the PLTS was built, blackouts in this area are handled more quickly, it used to take several days. Now blackout only last about three to four hours at most. In the past, electricity was still from PLTD, now the only PLTD remains is owned by PLN. There is no home diesel used except maybe in the workshop when the electricity from PLN goes out." (Field Notes, August 29, 2023)*.

3.4. The Presence of Solar Power Plant and Its Impact

Since the switch of electricity production from KLP Sinar Rinjani to PLN, there have been significant changes in electricity prices. The change has been more pronounced since the solar power plant in Lombok was established. Residents in East Lombok shared that changes in electricity prices are felt through the costs incurred for electricity purchase every month. As Khalid had explained, the price of electricity has now become more affordable for residents, thus making it more accessible and increases the use of electricity both for household needs and the needs of economic activities by businesses. A more affordable prices and easier access to electricity after the installation of solar power plants in Lombok and Kupang have opened up new economic opportunities, as seen with the emergence of electricity-dependent business sectors such as carpentry, motorcycle repair shops, and other business sectors.

> *"I myself spend around IDR 60,000/month for electricity for the household and the grocery store (two refrigerators, lights, rice cooker, television). Residents are now not afraid to use electronic devices because the electricity is stable and it is easy to increase the power at the kwh meter. Nowadays, each house has its own kwh meter, unlike before when one kwh meter was used for two or three houses. Since the PLTS has been operating, there has never been an increase in electricity prices." (Khalid, Field Notes, August 24, 2023*)

During the communication outreach process prior to the construction of solar power plants in Lombok (Selong, Sengkol, and Pringgabaya), residents mentioned that there were concerns the solar power plants might have an impact on the surrounding environment. The concern is mainly related to the heat source required by the solar power plant. In the minds of the residents, the presence of the solar power plant might cause an increase in the temperature around the plant.

One of the residents in Geres Village said, "Before the PLTS was built, we had worries about the PLTS, we are afraid that it would get hotter around here, that the PLTS would raise the temperature in this area." However, this concern is considered not to have occurred after PLTS Selong began operating in Geres Village. After about four years of operation of PLTS Selong, residents around PLTS, especially in Geres Village, Ijobalit Village, and Suryawangi Village, have not felt any environmental impact from PLTS activities. In fact, according to residents around the PLTS, the presence of PLTS actually has an impact considered to be "beneficial" because it increases the selling price of land around the PLTS.

3.5. Green Jobs Potential

With the increasing awareness of the renewable energy potential in Indonesia, especially in eastern Indonesia such as in East Nusa Tenggara (NTT), several vocational high schools (SMK) in Kupang are responding to this opportunity with the opening of a new major, Renewable Energy Engineering (RET). There are already 6 SMKs with RET majors in NTT, including SMK Negeri 5 Kupang and SMK Negeri 2 Ende in Soe, which already had this major since about the last five years. The RET major studies three types of renewable energy: solar energy, wind energy, and hydro energy. Every year there are about 60–80 students graduating from the RET program in both schools.

For the last four years, PLTS Kupang has hosted students of SMKN 2 Ende for their field work practice (PKL) program. In July 2023, there were seven students from SMKN 2 Ende for their PKL program at PLTS Kupang. They perform practical work activities in the technician section for routine inverter checks, replacing damaged PVs with new ones and other technical matters. Niver, one of the students doing the PKL at PLTS Kupang, said that the RET program was opened in Kupang because of the large potential for NRE in the eastern region, especially in NTT. When Niver and the other PKL students chose to study RET, they saw new job opportunities around NTT. As awareness of the potential of renewable energy in Indonesia increases, especially in eastern Indonesia such as in NTT, several vocational high schools (SMK) in Kupang have responded to this opportunity by opening a new department, Renewable Energy Engineering (RET). At least two schools in Kupang, SMK Negeri 5 Kupang and SMK Negeri 2 Ende in Soe, have opened this program in the last five years. The RET major studies three types of renewable energy: solar energy, wind energy, and hydro energy. Every year there are around 60–80 students graduating from the RET program in both schools as more and more renewable energy power generation infrastructure such as solar power plants and micro-hydro power plants (MHPP) are built.

In addition to PKL students from the RET major, PLTS Kupang has also hosted several final-year university students majoring in electrical engineering who conducted their final project research at the PLTS. However, up to the time of this research, there was no department that specifically studied renewable energy in universities in NTT. Niver explained that graduates of RET major at SMK 2 Ende, if they continued their education to the undergraduate level, they will enter electrical engineering study program. Should they decided to work after graduating from SMK, they would work for PLN or other companies related to the electricity industry, not specifically in the renewable energy sector. This is because massive job opportunities have not yet opened up that can absorb RET major graduates in NTT.

> *"Some RET major graduates are working and some continue their studies. Those who work mostly work at PLN. In NTT, solar power field still have limited job opportunities. In PLN, RET major graduates usually work in the residential installation (electricity network) section. In PLN they use their own network that is installed to the (residential) house." (Niver in Field Notes, August 29, 2023*).

The potential opening of jobs classified as "green jobs" is a challenge for the government and private companies engaged in the renewable energy industry. Skilled workforce of RET graduates around Kupang at least needs to find employment opportunities that are in line with their knowledge. In PLN, employment that focuses on the installation or development of renewable energy infrastructure is still relatively minimal in NTT. Manto, a technician at PLTS Kupang, said that even in the private sector, there is still no industry in Kupang that can absorb workers from RET major.

> *"There are no companies that provide rooftop panel installation services in Kupang, only companies from Java do. But the workers can be sourced from Kupang. RET graduates must study subjects outside the RET field in order to work in other fields of electrical power, for example at PLN. Otherwise, they won't be able to get a job."*
> *(Manto in Field Notes August 29, 2023*)

3.6. Other Benefits of Solar Power Plant: Empowerment Programs

In addition to getting benefits in the form of more stable access to electricity, the existence of PLTS Selong also provides other benefits in the form of community empowerment programs. The program implemented in Geres Village is the establishment of micro, small, and medium enterprises (MSME) Jege Buana Lombok—commonly abbreviated as JBL MSME. JBL is an MSME engaged in the business of making and marketing cassava crackers, a typical snack of East Lombok.

A bit of information on cassava cracker, in East Lombok region, especially in Geres Village, the geographical terrain is dry sandy soil with not much groundwater content. This condition prevents residents to do agricultural or plantation activities because only a few types of plants can grow in this area, such as cassava, bananas, and coconuts. In Geres Village, the main commodity crops are coconut and cassava. Cassava is utilized, among others, as a basic ingredient for cassava crackers.

PLTS Selong, which was built with ADB funding and managed by PT Infrastruktur Terbarukan Buana (PT ITB), sees Geres Village cassava crackers as a potential for community economic development. Mainly because cassava is the main agriculture commodity in Geres and the residents have long used cassava crackers as a source of income.

In 2020, the PLTS proposed to the Geres Village Government a program to establish MSMEs. Village officials and residents then responded by forming several cassava cracker producer groups. In total, there are five cassava producer groups in Geres Village that received assistance and training from PLTS Selong in collaboration with Mataram University. The provided training is related to the production process, product hygiene, the use of production aids, product packaging, marketing methods so that products can be marketed in shopping centers and online marketplace, to assistance in obtaining BPOM permits [20] and halal certification from MUI.[21]

> *"There was a selection, there was a sample test where our products were taken to Unram (Mataram University), if it passed the test, we from the Geres Bage Elen (tamarind tree) Neighborhood passed in terms of halal, all kinds of standards for the crackers ingredients. And then the JBL house was determined afterwards. There were five places, one here and four in Geres Daye. In Geres Daye, all of them (residents) are cracker makers." (Nurmala, in Field Notes August 22, 2023*)

The impact of this MSME program is the improvement of the economic conditions of MSME members. Nurmala and Ridho'ah, members of JBL MSMEs, said that before the PLTS empowerment program, their economic condition was "pre-prosperous". Previously, they had already produce cassava crackers as their source of livelihood. However, due to limited capital resources and skills, as well as the fact that the production process is only done together with their husbands, they are only able to produce crackers two to three times a month. The condition is different after they joined JBL MSME and received training and assistance from PLTS Selong. For the past three years, JBL has been able to produce cassava crackers every week. The process of cassava crackers production starts with peeling the cassava, soaking the cassava, making the dough, drying, to packaging and marketing, all are done in stages every day so that every week there are cassava crackers ready for sale. Each JBL member plays a different role in every stage of production up to marketing. The roles are always in rotation so all JBL members get to learn to do the entire production and marketing process. Nurmala's economic situation has changed significantly over the past three years. She shared the following

[20] Badan Pengawas Obat dan Makanan (Indonesian Food and Drug Authority)

[21] Majelis Ulama Indonesia (MUI) (Indonesian Council of Ulama)

"The change after JBL is amazing. We have enough money for our daily expenses so we don't have to go out looking for work. We (Ridho'ah and her husband) used to work in a pumice quarry, as laborers going here and there, but since this MSME is established, we just need to stay at home, we don't need to go anywhere. When we worked in pumice quarries, if we have little ability (labor), we also receive little money. Here, we can earn money every day. I used to earn only IDR 50,000 per day at the pumice quarries, it was only IDR 500 per sack we collected. We sunbathed (working under the sun) non-stop from morning to evening. That was what our pre-prosperous life like. Now with MSMEs, the work place is cool under the shades, you can earn IDR 300,000–400,000 per day. Alhamdulillah, for us both husband and wife, we no longer have to bust ourselves working outside under the sun. Now I can buy a motorcycle. In the past, I couldn't afford a motorcycle. At JBL now I can save a little." (Field Notes, August 22, 2023)

Learning from the benefits felt after the JBL MSME empowerment program for the past three years, PLTS Selong, according to Nurmala and Ridho'ah, plans to provide another empowerment program that will utilize coconut as one of the other potential resources in Geres Village. The empowerment program has the benefit of improving the relationship between the electric energy service provider and its surrounding community. Residents of Geres said that they are increasingly accepting and welcoming the solar power plant in their neighborhood.

Image 4.4. Oven to dry the cracker dough during the rainy season (an alternative to sun drying)

Electricity Potentials of Solar Power Plants

3.7. Potensi Listrik dari PLTS

The operational activities of PLTS Selong and PLTS Kupang is from the morning around 06:00 AM–06:00 PM WITA. Operating hours is only as long as duration of day light when the solar power plant location gets sunlight due to both plants not using batteries to store the oversupply of electricity. As a result, if there is excess electricity production (exceeding the agreed capacity between PLTS and PLN), the operator/technician at each PLTS will turn off several solar panel units to keep the production capacity from exceeding its quota. For example, PLTS Kupang with a total production capacity of 5 MWp, have agreed to supply 3 MWp of electricity to the Eastern Electricity System grid.[22] If, during operational hours, the solar ray potential causes electricity production to exceed 3 MWp, the operator will turn off some blocks of solar panel modules so that the amount of electricity production does not exceed the maximum power to be supplied to the PLN grid.

[22] Covering Kupang and other areas of East Nusa Tenggara.

Similar conditions also occur in Lombok, especially in PLTS Selong, although the PLTS is capable of producing up to 7 MWp of electricity, the agreement with PLN limits the production of electricity by PLTS Selong to 5 MWp. The Selong solar power plant also does not use batteries for storage of the electricity produced. Both PLTS only operate for 12 hours a day and do not store electrical energy that exceeds production capacity in accordance with the agreement with PLN.

In fact, the solar power potential in both areas (Selong and Kupang), still allows for an increase in electricity production capacity of the solar power plants. However, up to the time of this study, there were no plans to increase the capacity of either PLN or PLTS.

Chapter V
Conclusion and Recommendation

4.1. Conclusion

Indonesia is pursuing an energy transition from fossil fuels to renewable energy through the financially supportive Just Energy Transition Partnership (JETP). Despite being already on going until 2023, the implementation Of JETP is still at the investment planning stage. AEER conducted research to evaluate the smooth process of energy transition in Indonesia supported by this funding, ensuring that the implementation adheres to the principles of equity and fairness as mandated by the JETP. This study focuses on the impact of energy transition on the sites of power plants to be retired and sites of renewable energy infrastructure that are already in operation. AEER's field findings show that PLTU Cirebon's early retirement scheme has not accommodated the principles of equality and transparency at the community level. Residents around the project and environmental activists have not been involved in the planning of this scheme, and they are not even aware of the plan of operation retirement of PLTU Cirebon 1. The possible impacts of this plan are also unclear to them. Thus, fair and transparent energy transition practices have not been reflected in its implementation in Cirebon.

In contrast to Cirebon, in regard of community's responses to the presence of renewable energy infrastructure in the form of solar power plants (PLTS) in East and West Nusa Tenggara, the community welcomed the presence of renewable energy infrastructure in their area. The presence of NRE infrastructure is a solution to their electricity access problems and provides affordable electricity for the community. In addition, the favorable reception from the community is also closely related to the transparency and communication between the Development project implementer and the community around the project site. Transparency and communication assists with the community acceptance of the project because they understand the benefits that they can receive.

4.2. Advice (Recommendation)

In order to ensure that the energy transition process is fair and transparent, it needs to be done in several ways

1. Participatory and collaborative community involvement in the implementation of discussions on aspects of the energy transition and its impact on society. Communities must be involved and provided with space to voice their views regarding the various energy transition plans that will be carried out.

2. Inclusive community involvement is not limited to community leaders in program planning and implementation, but also involves various relevant stakeholders such as environmentalists, local academics, and so on. At the very least, it is necessary to conduct Communication outreach involving all members of the community who will be affected by the energy transition plan.

3. Access to national and global funding to improve the quality of renewable energy power plants, such as the construction of battery systems to maximize the use of electric power.

4. Prioritize the use of renewable energy into the electricity system in NTT, by reducing the use of fossil fuels-based electric power, so that the capacity factor of power plants from renewable energy can be optimal.

5. Further research on the impact of the energy transition process is needed. The research not only examined the impact of the transition process in financial terms but also in terms of impacts on the social, economic and cultural life of communities around energy transition projects.

Bibliography

Alaydrus, H. (2022, November 14). *PLTU Cirebon-1 Mau "Disuntik Mati" Duluan, Ini Dia Pemiliknya*. From CNBC Indonesia: https://www.cnbcindonesia.com/news/20221114154322-4-387766/pltu-cirebon-1-mau-disuntik-mati-duluan-ini-dia-pemiliknya

Asian Development Bank. (n.d.). From Energy Transition Mechanism : https://www.adb.org/what-we-do/energy-transition-mechanism-etm

Badan Kebijakan Fiskal Kementerian Keuangan Republik Indonesia. (n.d.). From Energy Transition Mechanism: https://fiskal.kemenkeu.go.id/fiskalpedia/2022/11/10/21-energy-transition-mechanism

Cirebon Power . (n.d.). From Profil Perusahaan Cirebon Power Retrieve from Cirebon Power: https://www.cirebonpower.co.id/id/cirebon-power/perusahaan/

Frans J. Likadja, W. F. (2022). ANALISIS PENYAMBUNGAN PLTS OELPUAH 5 MWPKE SISTEM SALURAN UDARA TEGANGAN MENENGAH 20 KV PT. PLN UNIT LAYANAN KUPANG. *Jurnal Media Elektro*, 18.

Izan, K. (2023, April 12). *Pembangunan PLTU Cirebon Power Unit II sudah 99,8 persen*. From ANTARA: https://www.antaranews.com/berita/3484092/pembangunan-pltu-cirebon-power-unit-ii-sudah-998-persen

Keahey, J. (2020). Sustainable Development and Participatory Action Research: A Systematic Review . *Systematic Practice and Action Research* , https://doi.org/10.1007/s11213-020-09535-8.

Koko Hermanto, S. F. (2022). Pengaruh Beban Kerja Terhadap Stres Kerja Karyawan Pada PT. Infrastruktur Terbarukan Buana Plts Selong Lombok Timur. *HEXAGON, Jurnal Teknik dan Sains, Universitas Teknologi Sumbawa*, 34-35.

Liputan6. (2006, Januari 13). From Gedung Pembangkit Listrik Lombok Timur Masih Diduduki: https://www.liputan6.com/news/read/115795/gedung-pembangkit-listrik-lombok-timur-masih-diduduki

Marianne Belleza, R. (2023, July 22). *Acute Nasopharyngitis*. From Nurselabs : https://nurseslabs.com/acute-nasopharyngitis/#google_vignette

Micklon Edison Nakmofa, J. N. (2018). Kajian Kualitas Lingkungan Fisik-Kimia Akibat Pengoperasian Pembangkit Listrik Tenaga Surya Terpusat Di Desa Oelpuah Kecamatan Kupang Tengah Kabupaten Kupang. *Jurnal Bumi Lestari* , 51-53.

S. Kindon, R. P. (2009). Participatory Action Research . *Elsevier* .

Thiollent, M. (2011). Action Research and Participatory Research: An Overview . *International Journal of Action Research, 7(2)*, 160-174.

AKSI EKOLOGI DAN EMANSIPASI RAKYAT

Talavera Office Park, 28th floor
Jl. TB Simatupang Kav 22-26,
Jakarta 12430

aeer.or.id
@AEER_INFO
info@aeer.or.id
@AEER_INFO
AEER - AKSI EKOLOGI & EMANSIPASI RAKYAT
AEER - AKSI EKOLOGI & EMANSIPASI RAKYAT