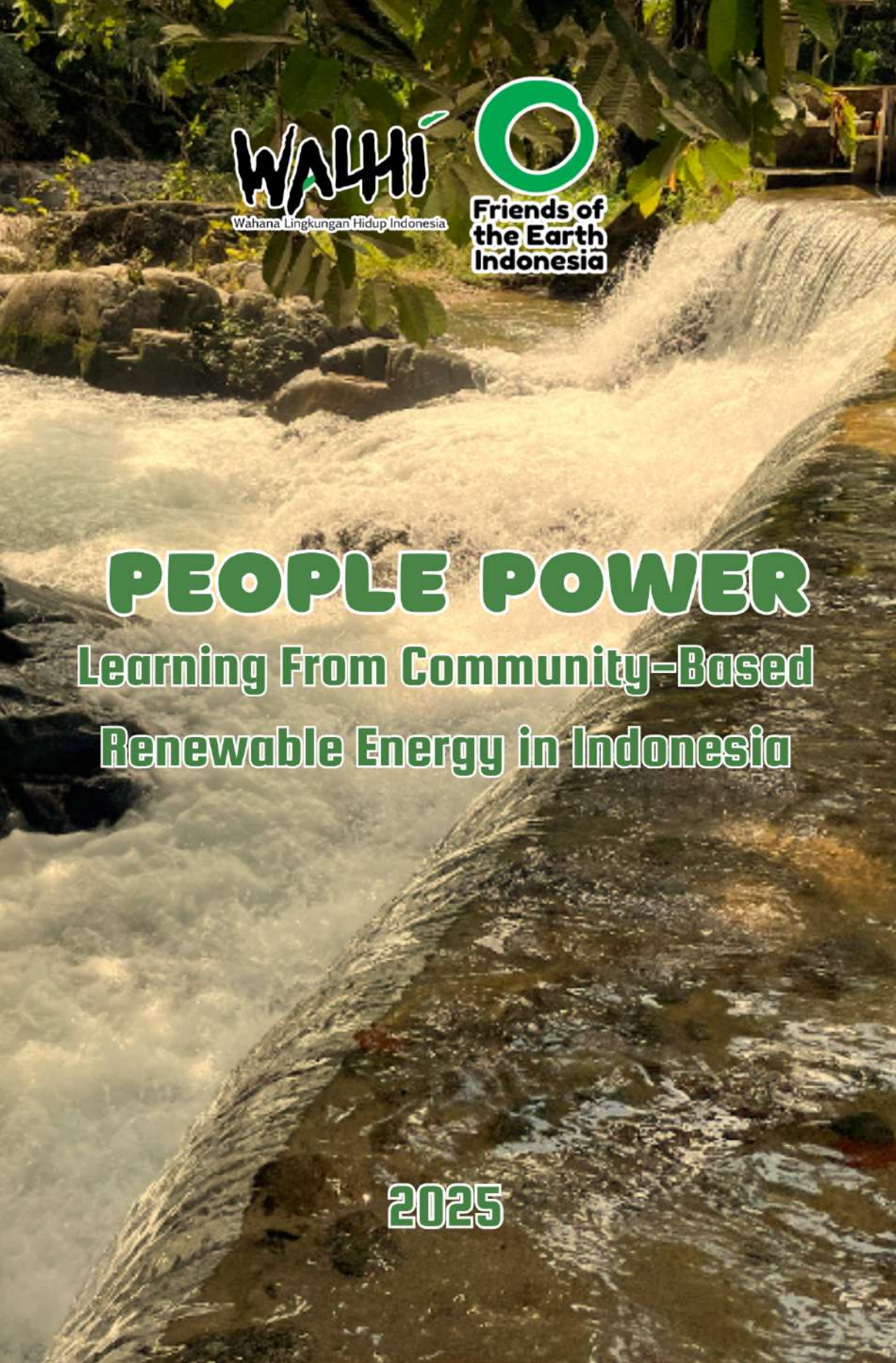

PEOPLE POWER

Learning From Community-Based Renewable Energy in Indonesia

2025

PEOPLE POWER: LEARNING FROM COMMUNITY-BASED RENEWABLE ENERGY IN INDONESIA

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PEOPLE POWER: LEARNING FROM COMMUNITY-BASED RENEWABLE ENERGY IN INDONESIA

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Because Energy is a Right

Reluctance to break free from fossil fuel addiction has caused Indonesia's energy transition to move in a superficial direction. As of 2023, the national energy mix is still dominated by fossil energy, accounting for 86%[1]. This dependence is often justified by the availability of 99.2 billion tons of coal resources, the high cost of decarbonization, minimal investment, and the low cost of coal-based electricity[2].

Historically, the surge in coal production is believed to be a response to the Asian financial crisis in 1997. Additionally, in 2003, Indonesia transitioned from being an oil exporter to an importer. The market share of oil and gas dropped from 10% in 2000 to around 2.5% in 2021[3]. The financial crisis also left PLN unable to maintain cash flow, pay debts, or secure funding for planned investments.

Post-crisis, Independent Power Producers (IPPs) emerged as a source of relief for Indonesia. Project financing structures allowed developing countries to obtain low-cost loans without fixed collateral. PLN's dependence on IPPs grew stronger during President Susilo Bambang Yudhoyono's administration, which planned the Fast Track Program (FTP) 1 to build 10 GW of coal-fired power plants, followed by FTP 2 four years later with a similar coal base load. More ambitious steps were taken when President Joko Widodo took office at the end of 2014, with a target to build 35 GW within five years[4].

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[1] Press Release Ministry of Energy and Mineral Resources "Pemerintah Kejar Target Tingkatkan Bauran EBT" 2024 https://www.esdm.go.id/id/media-center/arsip-berita/pemerintah-kejar-tingkatkan-bauran-ebt

[2] Energy transition is a 'priority' for Indonesia, but coal sector must be protected, say officials, Eco-Business, 2024 https://www.eco-business.com/news/energy-transition-is-a-priority-for-indonesia-but-coal-sector-must-be-protected-say-officials/

[3] An Energy Sector Roadmap to Net Zero Emissions in Indonesia, IEA, 2022 https://iea.blob.core.windows.net/assets/b496b141-8c3b-47fc-adb2-90740eb0b3b8/AnEnergySectorRoadmaptoNetZeroEmissionsinIndonesia.pdf

[4] Indonesia Wants to Go Greener, but PLN Is Stuck With Excess Capacity From Coal-Fired Power Plants, IEEFA, 2021 https://ieefa.org/wp-

In summary, the depletion of oil reserves and the shift in the energy industry positioned Indonesia as the world's third-largest coal producer by 2021[5]. Domestically, more than 60% of power plants are dominated by coal-fired power plants[6]. To ensure the affordability of domestic electricity rates, the government began requiring the private sector to sell coal at $70 per ton for public use[7]. This price is more than half lower than the benchmark coal price (HBA), which reached $130.44 per ton in July 2024[8].

In its development, the take-or-pay business scheme with Independent Power Producers (IPPs) obliges PLN to purchase electricity, whether it is consumed by customers or not. Consequently, in an oversupply situation, PLN still has to buy electricity from IPPs. Without serious changes, electricity oversupply is projected to reach 41 GW by 2030[9], causing losses of up to hundreds of trillions. As a result, the state budget, which should be used to improve citizens' welfare and develop renewable energy, is instead spent on paying for wasted electricity.

The exploitation of coal in Indonesia, in turn, causes ecological damage. According to WALHI, the area of coal mines in Indonesia reaches 5.9 million hectares, including 2 million hectares in forest cover. The impact of this land use ultimately releases emissions of 349 million tons of CO2e[10]. Meanwhile, according to the International Energy Agency (IEA), in 2021, total emissions from the energy sector

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content/uploads/2021/11/Indonesia-Wants-to-Go-Greener-but-PLN-Is-Stuck-With-Excess-Capacity_November-2021.pdf

[5] Production Gap Report 2023 https://productiongap.org/wp-content/uploads/2023/11/PGR2023_web_rev.pdf

[6] RI Raja Batu Bara, Kisah Kelam Krisis Listrik Gak Boleh Terulang Lagi, CNBC Indonesia, 2024 https://www.cnbcindonesia.com/research/20240815110307-128-563260/ri-raja-batu-bara-kisah-kelam-krisis-listrik-gak-boleh-terulang-lagi

[7] Decree of the Minister of Energy and Mineral Resources Number 139 of 2021, https://jdih.esdm.go.id/storage/document/Kepmen%20ESDM%20No.%20139.K_HK.02-MEM.B-2021_new.pdf

[8] Ministry of Energy and Mineral Resources, Harga Acuan https://www.minerba.esdm.go.id/harga_acuan

[9] Belenggu Oversupply Listrik atas PLN, Trend Asia, 2024 https://trendasia.org/belenggu-oversupply-listrik-atas-pln/

[10] Terdepan Di Luar Lintasan, Tinjauan Lingkungan Hidup WALHI 2023 https://www.walhi.or.id/uploads/buku/TINJAUAN_LINGKUNGAN_HIDUP_2023_2.pdf

reached 600 million tons of CO2e, making Indonesia the ninth-largest emitter in the world[11].

Instead of repenting and transitioning to renewable energy, the government stubbornly refuses to 'sober up.' In the 2021-2030 Electricity Supply Business Plan (RUPTL), the government still permits the construction of 13.8 GW of new coal-fired power plants[12]. Additionally, regulations related to the accelerated termination of coal-fired power plants and the prohibition of new coal-fired power plant development, in Presidential Regulation No. 112 of 2022, still contain several exceptions[13].

At the global level, the Indonesian government showed a similar stance when signing the Global Coal to Clean Power Transition Statement[14] at the COP26 meeting in Glasgow, Scotland, in November 2021. Arifin Tasrif, the then Minister of Energy and Mineral Resources, only signed three out of four points of the agreement. The third point, which he rejected[15], called for stopping the issuance of new permits and the construction of new coal-fired power plant projects.

The government continued its terrible behavior by formulating 'new energy,' defined as all types of energy derived from or produced by new processing technologies of non-renewable and renewable energy sources. According to this concept, the Draft Law on New and Renewable Energy categorizes nuclear, hydrogen, and several coal-derived products[16] as part of new energy[17].

The government's stubborn attitude contrasts sharply with its ambition to develop renewable energy. Therefore, it is not surprising that the renewable energy mix is progressing very slowly. In 2021, the percentage was 12.16% and only increased by 0.14% in 2022 to

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[11] Executive Summary An Energy Sector Roadmap to Net Zero Emissions in Indonesia, IEA https://www.iea.org/reports/an-energy-sector-roadmap-to-net-zero-emissions-in-indonesia/executive-summary

[12] https://web.pln.co.id/statics/uploads/2021/10/ruptl-2021-2030.pdf

[13] https://drive.esdm.go.id/wl/?id=o8WDm5f2AXpP9Awt2y4CFnvB3t2JdOAf

[14] https://webarchive.nationalarchives.gov.uk/ukgwa/20230313120149/https://ukcop26.org/global-coal-to-clean-power-transition-statement/

[15] https://www.bbc.com/indonesia/indonesia-59209131

[16] Such as coalbed methane gas, liquefied coal, and coal gasification.

[17] https://berkas.dpr.go.id/akd/dokumen/K7-RJ-20230126-041049-3299.pdf

12.3%[18]. In 2023, the renewable energy mix increased again to 13.09%, or by 0.79%. Meanwhile, the government targets a renewable energy mix of 23% by 2025[19]. This means that in the next year, Indonesia must increase its renewable energy mix by 10%.

Given the sequence of events explained, we can certainly call the effort to achieve the renewable energy mix target a mission impossible. What is called an energy transition is nothing more than a 'change of clothes' for tycoons: from the fossil industry to an industry that appears sustainable. Consequently, the vision of saving the earth from the climate crisis, by limiting the temperature to 1.5 degrees Celsius, becomes mere rhetoric.

PLN Arrives, Micro-Hydro Power Plants Disappear

Indonesia has significant renewable energy potential. In 2022, at least 3,687 GW of renewable energy potential was identified, sourced from the sea (63 GW), geothermal (23 GW), bioenergy (57 GW), wind (155 GW), hydro (95 GW), and the largest, solar (3,294 GW). However, only 12.6 GW, or about 0.30% of the total identified potential[20], has been utilized.

In practice, not only is there a lack of effort to develop renewable energy, but the presence of the state has also disrupted the utilization of renewable energy built by community groups. A study conducted by the Energy Sector Management Assistance Program (ESMAP) noted that since 1990, more than 1,300 small-scale electricity networks (mini grids) funded by the government have been utilized by communities. By 2017, they found that 150 villages had abandoned small-scale electricity networks due to the presence of PLN, and only 6 percent of small-scale electricity networks remained operational after the main electricity grid (PLN) arrived[21].

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[18] https://ebtke.esdm.go.id/post/2023/05/08/3477/pemerintah.dorong.pln.dan.pertamina.tingkatkan.pemanfaatan.energi.terbarukan

[19] https://www.esdm.go.id/id/berita-unit/direktorat-jenderal-ketenagalistrikan/pemerintah-optimistis-ebt-23-tahun-2025-tercapai

[20] Outlook Energi Indonesia Tahun 2023, https://den.go.id/publikasi/Outlook-Energi-Indonesia

[21] ESMAP, 2018, "Mini Grids and the Arrival of the Main Grid: Lessons From Cambodia, Sri Lanka and Indonesia.

A focus group discussion (FGD) organized by WALHI[22] also documented issues in the development of community-based renewable energy. In several areas, such as Seloliman (Mojokerto, East Java), Dusun Silit (Sintang, West Kalimantan), and Kamanggih (Sumba, East Nusa Tenggara), local communities built micro-hydro power plants (PLTMH) with capacities of 25-45 kW that could provide lighting for four villages. However, these community groups also felt the threat to the sustainability of PLTMH, one of which was due to the presence of PLN. Even with the installation of poles that had not yet been electrified, residents already imagined the end of community-based energy sustainability. Of the three locations mentioned, only the community in Kamanggih was willing to sell their electricity to PLN. The rest were concerned that the technology they had built would become obsolete.

Socially, communities in various places recognize the knowledge gap in managing and maintaining the power plants they have built. Knowledge transfer from various parties is expected to strengthen the community's capacity to manage power plants, increase the role of the younger generation who are considered more technologically savvy, and include community cooperatives as managers of micro-hydro power plants (PLTMH). Another challenge revealed in the FGD is the policy or licensing that equates community-based power plants with large-scale power plants. Discussion participants stated that the state should not regard PLTMH built by residents as business competitors or equate them with large-scale power plants. Instead, it should recognize them as the collective right of the community to build, manage, and utilize energy sources independently. After all, the ancestors of many community groups had developed technology and utilized natural resources long before this country was formed.

The concerns of several community groups are certainly reasonable. Although the state 'provides opportunities' for, among others, community cooperatives to become electricity supply business operators, in an integrated electricity scheme, the state-owned

https://openknowledge.worldbank.org/server/api/core/bitstreams/4a059d16-c578-5e99-b0f9-dc76f013fcd2/content

[22] Walhi, Focus Group Discussion, "Promoting Community-Based Energy as Part of the Energy Transition in Indonesia", Jakarta Tuesday, September 10, 2024

enterprise (PLN) is the first priority in providing electricity for public use[23]. Therefore, when PLN arrives in an area, communities that have developed community-based power plants seem to have only two options: join PLN and sell their electricity at a low price or abandon the power plants they have built.

According to Yoon-Hee Ha and Surya Sapkota Kumar in the journal Energy Research & Social Science, the issue of community-based energy management in Indonesia stems from renewable energy projects being implemented with conventional governance approaches[24]—no different from how the fossil fuel industry is treated. These projects reportedly do not consider the roles of multilevel stakeholders such as local governments, civil society organizations, and local community groups. The central government, they argue, views small-scale distributed renewable energy as incompatible with the operational structure of large-scale energy systems, which emphasize economic and operational efficiency by minimizing disruptive factors.

Conversely, Yoon and Kumar assert that small distributed renewable energy projects require designs tailored to local contexts and conditions. User participation in decision-making related to infrastructure, technology, operations, tariffs, and funding sources is crucial, as community groups are the ones who will manage the infrastructure and technology with a sense of collective ownership.

On the other hand, centralized generation requires large capacities to meet peak demand and power reserves. According to a study by the Institute for Essential Services Reform (IESR), centralized generation carries the risk of electricity losses due to long distribution and transmission lines. The electricity lost along the distribution path to end-users affects the basic cost of electricity supply (BPP). From 1960 to 2014, they noted that the average global variation in electricity losses ranged from 7-9%[25].

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[23] Article 11 paragraph (2) and (3), Law Number 30 of 2009 On Electricity

[24] Yoon-Hee Ha & Surya Sapkota Kumar, 2021, "*Investigating decentralized renewable energy systems under different governance approaches in Nepal and Indonesia: How does governance fail?"*, https://www.sciencedirect.com/science/article/pii/S2214629621003078?ref=pdf_download&fr=RR-2&rr=8c9e78809f9c497b

[25] IESR, 2019, "Desentralisasi Ketenagalistrikan di Indonesia: Studi Kasus Pembangkit Listrik Energi Terbarukan Berbasis Komunitas di 2 Daerah di

Thus, energy decentralization, which has been praised by many developed countries as a pioneer of energy democratization, presents a different picture in developing countries, especially Indonesia. According to Vikas Menghwani et al., electrification with a conventional approach without planning can lead to many small low-carbon projects being discarded or neglected, creating tension between consumers, investors, and the government. Therefore, for the use of renewable energy to be recognized as one of the most important ways to mitigate climate change, the government must understand and reduce the vulnerabilities of local communities[26].

Why Community-Based Energy?

The challenges faced by communities in managing small-scale renewable energy should be addressed by strengthening human capacity, not by weakening roles and participation or diminishing the concepts of decentralization and energy independence. Research shows that the development of community-based renewable energy brings various positive impacts in social, economic, and ecological aspects.

These positive impacts can be seen in the management of the Cinta Mekar Micro-Hydro Power Plant (PLTMH) in Subang, West Java, and the Kamanggih PLTMH in East Nusa Tenggara (NTT). Susana Guerreiro (2015)[27] noted that the operation of the Cinta Mekar PLTMH since April 2004 has created partnerships between public organizations, the government, the private sector, and local communities. Through this partnership, the community cooperative can collect around $2,000 or approximately IDR 30 million (at an exchange rate of IDR 15,000) each month. Most of the income is used for education, health, and loans. Additionally, the new water channels have increased local agricultural production.

Indonesia", https://energiterbarukan.org/assets/2019/12/IESR-SP-E-Desentralisasi-Ketenagalistrikan-di-Indonesia.pdf

[26] Vikas dkk, 2019, "Tanpa Perencanaan yang Baik, Masa Depan Infrasruktur Energi Terbarukan Tak Menentu", The Conversation, https://theconversation.com/tanpa-perencanaan-yang-baik-masa-depan-infrastruktur-energi-terbarukan-tak-menentu-114633

[27] Susana Guerreiro, 2015, *"Empowering Communities – a Framework for Assesing the Drivers and Barriers to Community Renewable Energy Projects in Indonesia".*

In Kamanggih, the direct impact of the PLTMH is the electrification of 90% of households in the village, as well as changes in the villagers' habits: children can study at night, and women spend their evenings making crafts such as mats, weaving, or traditional fabrics to sell at the market. Electrification also brings other important benefits such as kerosene savings, improved indoor air quality, and reduced respiratory problems. Income from the PLTMH also allows for the fulfillment of basic needs such as clean water and sanitation provision.

On a broader scale, a study by the Center of Economic and Law Studies (CELIOS) illustrates the benefits of implementing community-based renewable energy. Over 25 years, the growth of community-based renewable energy could generate an average economic output of IDR 745 trillion per year. This figure is derived from renewable energy investments and job creation for installation and maintenance[28]. A thriving economy will also create jobs in peripheral areas. They estimate that over 25 years, thousands of community-based renewable energy projects could absorb more than 96 million workers, with the highest absorption in green jobs in the manufacturing and distribution of renewable energy equipment, project development, construction and installation, operation and maintenance, and general cross-sector fields.

Despite the achievements in several communities and future economic projections, the development and utilization of energy by communities should be understood as a human right, not a commodity[29]. The sun, water, wind, and various energy sources have cultural and spiritual value, as well as being common resources that should not be exploited for corporate or individual gain. As natural resources, energy belongs to no one and should be available to everyone. Furthermore, energy is a human right and a necessary condition for a dignified life. We need energy for fuel, electricity for various needs, ensuring everyone can access basic services such as

[28] Bhima Yudhistira, "Bukan Recehan: Energu Terbarukan Berbasis Komunitas Mampu Ciptakan Manfaat Ekonomi Rp.18ribu Triliun", https://theconversation.com/bukan-recehan-energi-terbarukan-berbasis-komunitas-mampu-ciptakan-manfaat-ekonomi-rp18-ribu-triliun-231182

[29] *Friends Of The Earth International*, 2018, *People Power Now! an Energy Manifesto*

health and education, communicate and travel, and share and access information.

The development and utilization of community-based energy should also be based on the understanding that energy sources have environmental and social costs. Even all renewable energy has costs: solar panels depend on heavy metals mined for production, and the increase in small-scale renewable energy and off-grid systems can lead to large-scale lithium battery production. Therefore, the affected communities must be the ones to decide which impacts can be managed and which cannot. Thus, among the demands for the right to energy and sustainable energy systems, a balance must be found.

Based on this, WALHI[30] asserts that the concept of 100% renewable energy universally demands adequate energy access for all, positively impacting public health and environmental cleanliness. However, this demand must not stand alone; it must be accompanied by a just transition, sufficient energy needs, energy sovereignty, and energy democracy. Therefore, efforts must consider equity and access to energy generation resources and technology.

The best approach to pursue is at a local, decentralized scale, easily adoptable, and placing community members at the forefront of energy management. Consequently, access to the necessary technology, knowledge, and skills for management must be available to local communities. Energy systems should also be designed to protect biodiversity, strengthen land rights for local and indigenous communities, and avoid exploitation in the production chain.

As we know, the ideals of climate justice—and a just energy transition—will never be realized without social justice. Therefore, energy must be freed from the prison of privatization. In this regard, energy democracy is key.

[30] Position Paper WALHI, 2023, "Beware The Commodification of Energy Transition", https://www.walhi.or.id/uploads/buku/WALHI%20-%20Position%20Paper%20on%20Energy%20Transition%20Mechanism.pdf

METHOD

This writing uses the narrative method as described by Christine Bold (2012) in her work Reporting Narrative Research.[31] This approach emphasizes the use of storytelling techniques to present information chronologically, with community experiences at the core of the report. Thus, this report not only conveys facts and data, but also describes how communities experience, understand and respond to community-based renewable energy practices. Basically, this writing process tries to re-narrate what has been told by the resource persons through their experiences or daily lives. Then the stories from the sources are assembled and connected to each other to show a phenomenon, in this case a story about efforts to build and apply good practices of New Renewable Energy (EBT) on a local scale.

During the writing process, there were three locations that became the focus of research, namely the first Kalimaron MHP located in Dukuh Janjing, Seloliman Village, Mojokerto Regency, East Java Province. The second location is Silit Village MHP located in Silit Hamlet in Nanga Pari Village, Sepauk District, Sintang Regency, West Kalimantan Province. Finally, the third location is Kamanggih MHP, which is located in Kamanggih Village and Kambata Bundung Village in Kahaungu Eti District, East Sumba Regency, East Nusa Tenggara. During the writing process, the authors conducted in-depth interviews with the community by visiting directly. Involved in village meetings, then conducted direct field observations to find out the practice and work of the MHP. Then the findings are assembled into notes which are then analyzed into a narrative about community-based renewable energy practices.

[31] Bold, C. (2012). Using narrative in research. SAGE Publications Ltd, https://doi.org/10.4135/9781446288160

Kalimaron MHP powered by Maron River, Dukuh Janjing, Seloliman Village, Mojokerto, East Java

Learning from Renewable Energy in Seloliman Village

Wahyu Eka Styawan

Seloliman Village is located in Trawas District, Mojokerto Regency, East Java Province. Located in the sub-upstream area with an altitude of about 550 meters above sea level. In more detail, it is on the slopes of Mount Penangunggan and close to Mount Arjuno Welirang. In this village there are two fairly fast-flowing rivers, namely the Maron River and the Sempur River, in addition, this village is also passed by many water veins from upstream of the Brantas River Basin Area, so it is home to water sources, there are approximately more than 10 water sources in this village. Seloliman Village has a population of around 2,600 people with details of 1,346 men and 1,314 women spread across 3 hamlets, 9 Citizens' Associations, and 20 Neighborhood Associations. The density of the area is around 576, which means that each hamlet-level area is filled by that number of residents

The majority of the population of Seloliman Village are farmers, they manage 380 hectares of food land with the use of 316.5 hectares of fields and 64 hectares of irrigation land. From the commodities, the villagers produce rice, corn, peanuts, and several chili commodities. The harvest area for rice fields is 125 hectares, then corn is 165 hectares, and peanuts are 40 hectares. For chili commodities, residents can produce 30 tons in one harvest period, which is around 3 months, then rice can reach 750 tons every harvest period of around 4 months, corn can reach 1,320 tons in one harvest period of around 4 months, and finally, peanuts which can reach 80 tons in one harvest period or 4 months.

In addition, the residents of Seloliman Village also have poultry farms, including 2,718 local breed chickens, 68,294 broiler chickens, 576 ducks, and 305 Muscovy ducks. In addition to poultry, the villagers also raise around 505 cows, with details of 302 male cows

and 203 female cows. There are also goats with details of 473 local goats and 212 sheep.[32]

Some Seloliman residents also work in the nature-based tourism sector, such as nature and history tourism, namely the Jolotundo sacred bathing (petirtaan) temple, then educational tourism such as providing camping grounds, outbound and forest field trips, and micro-hydro power plants. Some of them also open food stalls, coffee shops, and grocery stores around the tourist area.
Almost all of the electricity used by some of the residents of Seloliman Village comes from renewable energy (EBT). Here, residents use river flow to drive turbines that generate electricity, known as Micro-hydro Power Plants (PLTMH). The existence of PLTMH has a significant impact on the residents of Seloliman Village because, amidst limitations, they strive to achieve energy independence. Electricity from PLTMH is not only economical because of its cheap rates but also provides additional income through village tourism.

However, the process of forming the PLTMH in Seloliman Village, known as PLTMH Kalimaron according to the name of the river whose flow is utilized, has quite a long story. This power plant was born from the desire of the residents of Seloliman Village to enjoy affordable electricity without damaging the environment while providing benefits to more than 600 villagers. This desire arose as a response to the inequality they felt for dozens of years, where until the 90s, most of the Seloliman Village area had not been connected to electricity

Development History

On July 3, 2024, the author visited the Seloliman Environmental Education Center (PPLH) located in Seloliman Village, Trawas District, Mojokerto Regency. There, the author met with the Kalimaron PLTMH manager, several residents, and representatives from the Seloliman PPLH. This meeting revealed the story related to the birth of the Kalimaron PLTMH and how it is managed to date.

[32] BPS Kecamatan Trawas 2023, "Kecamatan Trawas Dalam Angka 2023." Dapat diakses di https://mojokertokab.bps.go.id/publication/2023/09/26/93e469a0fc06db6a978544c4/kecamatan-trawas-dalam-angka-2023.html

The story of the birth of the Kalimaron Micro-hydroelectric Power Plant began in 1993 when the PLN network finally reached Seloliman Village. However, electricity at that time only covered the Balekambang, Biting, and part of Sempur Hamlet areas. Due to the difficult terrain, the Janjing Hamlet area located in Sempur Hamlet did not receive electricity, so its residents felt neglected and experienced development inequality. Although only 2 km from the highway, Seloliman Village has experienced electricity shortages for decades. Before the road was widened and repaired, reaching Seloliman was quite challenging because the route was rocky, dark, and surrounded by rivers and forests.

Dukuh Janjing is the most inaccessible area due to steep roads and large river crossings. These geographical challenges limit educational opportunities for villagers, many of whom do not complete primary school due to distance and cost. The secondary school is in another village, causing many residents to stop their education after primary school. This situation contributes to high rates of early marriage, with little knowledge of contraception, resulting in many families having more than four children. Seeing this condition, PPLH Seloliman, an organization that focuses on environmental conservation education, took the initiative to improve the quality of life of the community through empowerment. One of the initial steps was to provide supporting infrastructure, namely electricity. Therefore, PPLH Seloliman initiated the construction of a Micro-Hydro Power Plant (PLTMH) to supply electricity to Dukuh Janjing and part of Dusun Sempur which lacked electricity.

PPLH Seloliman then received assistance in the form of micro-hydroelectricity technology from Germany and began building a micro-hydro power plant together with the community of Dukuh Janjing, Dusun Sempur, Seloliman Village. Grant funds from the German Embassy and financial support from community cooperation enabled the construction of the micro-hydro power plant on the Kalimaron River to begin in late 1993. The community actively participated, working together to build water channels, and power plants, and erect poles for electric cables. In August 1994, after one year of construction, the micro-hydro power plant began operating and distributing electricity to Dukuh Janjing, part of Dusun Sempur, and the PPLH Seloliman basecamp. With a capacity of around 25 Kilowatts, the Kali Maron micro-hydro power plant can light up

approximately 70 households in the village.ccording to local residents, the existence of the Kalimaron Micro-hydroelectric Power Plant is their effort to be independent, as a response to the inequality of development that does not reach their area. Initially, the Kalimaron Micro-hydroelectric Power Plant was born from the inequality of electricity access, but over time, its existence has provided an important lesson. Electricity generated from river flows has a low risk of environmental impact and is more environmentally friendly. In addition, residents also realize the importance of caring for and maintaining the environment so that the electricity supply from the river flow is maintained.

Their efforts include maintaining forest areas, especially protected forests, to remain intact. The existence of forest areas is an important factor in maintaining springs and maintaining the rapid flow of the Maron River and Sempur River. Residents also maintain the cleanliness of the river from garbage, because piles of garbage can damage power plants. Once, the Kalimaron PLTMH stopped operating because the turbine was damaged by piles of garbage. In addition, climate change factors, such as long dry seasons and low rainfall due to the climate crisis, cause river water discharge to decrease, so that electricity production is hampered.

From this experience, residents realized that the sustainability of the ecosystem greatly affects the sustainability of their economy. They live from ecosystem services such as the flow of water and the availability of water sources. If the water source is disturbed, then their lives will also be disturbed. The existence of the Kalimaron PLTMH provides an understanding that if the ecosystem is well maintained, it will provide benefits, namely the availability of sufficient energy, from food to electricity. All of this supports the sustainability of the lives of the residents of Seloliman Village, especially those in the Dukun Janjing area and part of Sempur Hamlet.

Participation as the Key

In 1994, the Kalimaron PLTMH was managed directly by PPLH Seloliman until the early 2000s, before finally being managed by the residents through an association. PPLH Seloliman as the initiator encouraged the formation of the Kalimaron PLTMH Association, which later became the manager of the Kalimaron PLTMH, through a

series of training and mentoring. This training includes capacity building in professional organizational governance, including the preparation of clear articles of association, customer tariff systems, the establishment of supervisory institutions, daily management, and the preparation of a compensation framework for daily managers. PPLH Seloliman acts as a discussion partner and partner in the development and maintenance of the Kalimaron PLTMH, often collaborating with residents who are members of the Kalimaron PLTMH Association.

Until 2000, the Kalimaron Micro-hydro Power Plant was supervised by the Seloliman PPLH. At that time, electricity was distributed directly to the community at no cost. Residents of Dukuh Janjing and some residents of Sempur Hamlet used electricity mainly for lighting, with the main users including households, prayer rooms, mosques, and the Seloliman PPLH office. In 1999, a small business unit in Sempur Hamlet that focused on processing paper and cotton waste began to emerge. As the need for electricity increased, including demand from new households, the capacity of the Kalimaron Micro-hydro Power Plant was expanded to 25 kW in 2000. The peak load at that time was calculated at 7 kW, mainly for lighting between 18:00 and 23:00 WIB. To enjoy electricity from the Micro-hydro Power Plant, residents were asked to pay Rp100 per kilowatt-hour for the maintenance of the Micro-hydro Power Plant.

The practice of involving residents in the management of PLTMH continues to this day. However, the existence of PLTMH Kalimaron is inseparable from the applicable regulations, such as Law No. 20 of 2002 concerning Electricity which requires every business that produces electricity to have a permit and be connected to an electricity provider, namely PLN. This regulation is reaffirmed in Law No. 30 of 2009, which states that the provision of electricity is carried out by the state and regulated by a State-Owned Enterprise as the holder of a business permit for the provision of electricity with exclusive rights.

In response to this regulation, PPLH Seloliman and the Kalimaron PLTMH Association proposed interconnection with PLN, especially due to the development of PLN transmission to the Seloliman area. The interconnection process began, including the construction of the necessary infrastructure such as system synchronization and security. PPLH and the Kalimaron PLTMH

Association reached an agreement with PLN regarding the distribution of electricity from the Kalimaron PLTMH, especially in Dukuh Janjing. This agreement includes the sale of excess power to PLN as well as electricity supply from PLN when the PLTMH experiences a supply shortage, for example, due to decreased water discharge or technical problems. The Kalimaron PLTMH Association initially proposed a sales tariff of IDR 650/kWh to PLN, but after negotiations, a tariff of IDR 533/kWh was agreed upon. In 2016, this tariff was reduced to IDR 410/kWh at the request of PLN which was experiencing oversupply.

The success of the Kalimaron Micro-hydroelectric Power Plant has sparked new initiatives, such as the construction of the Wot Lemah Micro-hydroelectric Power Plant. The story began in 2005 when the need for electricity increased due to the booming tourism and small businesses in the village. The capacity of the Kalimaron Micro-hydroelectric Power Plant was increased to 30 kW. Because of this success, the Seloliman residents then planned to build a new Micro-hydroelectric Power Plant in their village.

PPLH Seloliman, the Kalimaron PLTMH Association, Seloliman Village residents, and the Seloliman Village government agreed to build a new PLTMH. They developed a strategy because the cost of building one PLTMH can reach 450 million rupiah. One of the strategies implemented was to encourage multi-party involvement, such as the local government, central government, PLN, and donor agencies. In 2007, the Wot Lemah PLTMH with a capacity of 20 kW was built and connected to the PLN network. The electricity price for the community was adjusted to Rp450–750/kWh, depending on the electricity installation group (450–3500 VA). Income from PLN and residents was managed through the Kalimaron PLTMH Association, generating income of around Rp6–7 million per month. The funds were used to purchase lubricants, meet incidental management needs, compensation for the Kalimaron PLTMH Association management including operators, and payment of regional levies. The remaining funds were kept in the Kalimaron PLTMH Association cash for maintenance and replacement of generator components. The financial balance of the Kalimaron PLTMH Association is reported quarterly to the association's supervisors and annually at the general meeting.

Positive Impact

The Kalimaron Micro-hydroelectric Power Plant has brought about major changes for the surrounding community, especially the residents of Dukuh Janjing and the management of PPLH Seloliman. Before the construction of this power plant, the village experienced limited access to electricity, with most residents relying on expensive and polluting diesel generators. Now, the Micro-hydroelectric Power Plant provides a reliable and renewable source of energy, which has significantly improved the standard of living in the area. One of the most obvious benefits is the availability of electricity for homes, schools, public facilities, and small businesses.

With access to electricity, the residents of Dukuh Janjing have seen a major change in the local economy. Small businesses have begun to flourish, and new economic opportunities have emerged. Some community members have started small-scale businesses, such as food processing and tourism services. These activities contribute to the economic vitality of the village and provide a sustainable source of income for many families.

In addition to the economic impact, the existence of the PLTMH also brings significant social and environmental changes. Community involvement in the planning, construction, and operation of the PLTMH has fostered a strong sense of ownership and shared responsibility. PPLH Seloliman plays an important role in this, by implementing training programs to increase local residents' knowledge on how to maintain and manage the power plant and ensure its long-term sustainability. As a result, the PLTMH has strengthened the social ties of residents through cooperation and mutual assistance to achieve common goals.

From an environmental perspective, the Kalimaron Micro-hydroelectric Power Plant promotes sustainable renewable energy and is oriented towards protecting nature. The plant operates with minimal impact on the local ecosystem, using a flow-of-river approach that avoids the need for large dams that damage the environment, displace residents, and violate human rights. In addition, the PPLH Seloliman together with residents of Dukuh Janjing and other Seloliman Villages, utilize the Micro-hydroelectric Power Plant as a means to raise awareness about protecting springs and rivers. This has triggered initiatives such as ecosystem protection and

restoration, including efforts to protect springs, forests, and rivers through village regulations on environmental protection. One of the initiatives that emerged was the rehabilitation of the area through reforestation carried out by villagers.

Challenges to Face

According to the residents who manage the PLTMH and PPLH Seloliman, the biggest challenge in keeping the Kalimaron PLTMH operating optimally is technical issues. This power plant relies heavily on consistent water flow, which can fluctuate due to seasonal changes or environmental factors such as deforestation and the climate crisis. Although the design of the plant has taken these fluctuations into account, maintaining stable energy output requires continuous monitoring and technical adjustments. This challenge is further exacerbated by the current climate crisis, with a longer dry season causing the Kalimaron River discharge to decrease, as well as a rainy season with high rainfall that often causes major flooding, carrying mud and other materials such as tree trunks and trash.

In addition to technical challenges, financial sustainability is also a significant obstacle. Although the plant can meet the electricity needs of the community, funding for ongoing maintenance and capacity expansion remains an issue. Initially, the project relied on external grants and donations. However, to ensure long-term sustainability, a financial model is needed that relies on community contributions and revenues from the sale of excess electricity to the local electricity grid managed by PLN. This revenue is essential to cover maintenance costs and investment in community development projects. However, financial challenges remain a serious concern, especially due to the high costs of maintenance and purchasing spare parts, with some components having to be imported directly from Europe, particularly Germany.

Another equally important challenge is maintaining community involvement and consistency of participation over time. Initial enthusiasm is indeed high, but maintaining this level of involvement requires ongoing education and outreach efforts. This is especially true for the younger generation whose involvement in the PLTMH is very minimal. Various factors are the cause, ranging from economic conditions to lack of education from parents. To overcome

this, PPLH Seloliman is trying to integrate the PLTMH into a broader environmental education program, as well as establish relationships with the younger generation through village youth organizations such as Karang Taruna Desa Seloliman. These efforts are expected to increase the involvement of the younger generation and provide them with an understanding of the importance of maintaining the ecosystem as well as water and energy sources.

Learning From Experience

As renewable energy, the Micro-hydro Power Plant has an important role in the energy transition, especially in rural areas or areas not covered by the electricity grid, where large infrastructure projects are difficult to implement. PLTMH utilizes energy from flowing water, usually from small rivers, to generate electricity. Unlike fossil fuels, the continuous water cycle ensures a consistent and sustainable energy supply. The use of this water flow is a sustainable practice that is in line with ecosystem preservation, making it a valuable component in the transition from fossil fuels to renewable energy sources.

Micro-hydro power plants offer several advantages that make them an attractive option for generating renewable energy, especially in remote or rural areas. An example is the practice of the residents of Dukuh Janjing, Dusun Sempur, and Seloliman Village through the Kalimaron Microhydro Power Plant. First, they utilize natural water flow, a renewable resource, to generate electricity. This ensures a consistent and sustainable energy supply through the ongoing water cycle. Unlike fossil fuels that are limited and pollute the environment, micro-hydro systems utilize renewable resources without depleting them. In addition, this system has a low environmental impact compared to large-scale hydropower projects. Less infrastructure is needed, so disruption to local ecosystems is also minimal and often does not require the construction of large dams, so its ecological footprint is further reduced.

The use of river flows for micro-hydropower also contributes to energy independence by providing reliable energy in areas that are not connected to the national electricity grid. This increases energy security and reduces dependence on imported fossil fuels. Once installed, the system is very cost-effective, with low operating and

maintenance costs, so it can operate for decades with minimal maintenance. This long-term cost efficiency makes it well-suited to sustainable rural development. In addition, micro-hydropower plants can be developed and customized to meet the specific energy needs of small communities or households. The energy produced can also be integrated with other renewable energy sources, such as solar or wind, to create a more reliable and sustainable hybrid system.

Micro-hydro power plants, as one of the implementations of renewable energy, offer a viable and sustainable solution for the energy transition, especially in rural and remote areas. They contribute to reducing greenhouse gas emissions, increasing energy security, and driving local economic development. Despite some challenges, the benefits of micro-hydro systems make them a key component in the global shift towards renewable energy, as has been practiced in Seloliman Village through the Kalimaron Micro-hydro Power Plant.

Activities of residents of Dukuh Janjing, Seloliman Village with PPLH Seloliman in managing the Kalimaron MHP

Conclusion

The Kalimaron micro-hydro power plant, located in Seloliman Village, Trawas, Mojokerto, provides valuable insights into how small-scale renewable energy (EBT) projects can be successfully implemented in rural communities. The success of this project emphasizes the importance of community involvement, the application of appropriate technical solutions, and the integration of environmental management into development projects. The model developed in Seloliman has been shared with other communities in Indonesia, demonstrating that similar approaches can be replicated elsewhere.

In the context of Indonesia and other countries' efforts to find sustainable solutions for rural electrification, the lessons from the Kalimaron micro-hydro power plant in Seloliman Village become increasingly relevant. The project highlights the potential of micro-hydro power not only as a renewable energy source but also as a catalyst for developing the knowledge capacity of villagers and environmental conservation. By empowering villagers and fostering a sense of ownership, renewable energy development projects like this can make a significant contribution to the global sustainable energy transition.

In conclusion, the Kalimaron Micro-hydroelectric Power Plant in Seloliman Village is a testament to the power of a village-driven initiative, working with NGOs and other communities. This success inspires us to initiate similar projects in Indonesia, especially in rural areas, emphasizing that sustainable development is most effective when it is inclusive, locally driven, and committed to preserving the surrounding ecosystem.

MHP Kampung Silit in West Kalimantan

Bright Village in Merangin Jungle Valley

Hendrikus Adam

Silit is one of six hamlets administratively located in Nanga Pari Village, Sepauk District, Sintang Regency, West Kalimantan. It is approximately 132 km from Sintang City and takes approximately 10 to 12 hours of travel if the trip starts from the capital city of West Kalimantan province in Pontianak City. To get to this hamlet inhabited by the Dayak Seberuang community, if you use a car, you can usually only reach the Nanga Pari village area. If the road conditions are passable, you can travel by car directly to the Silit hamlet, but if not, the journey can only be made by motorbike or on foot.

The natural conditions inhabited by 86 families with a total of 303 residents consisting of 159 men and 144 women are still maintained with stretches of rubber plantations, bawas (former fields), dense forests, and rocky rivers that are still cool and clear. The terrain contour in this area is hilly with hard yellow dirt roads in the hot season and slippery during the rainy season. Most residents in this area farm fields, tap rubber, hunt, and gather in the forest. However, there are residents who do activities outside their village.

The good condition of natural resources and environment, makes this area have the potential of Silit River to support the survival of residents by using renewable energy. One of them is as a source of hydroelectric power generation turbine engine through dammed river water.

Based on the self-reliance and mutual cooperation carried out by residents in working on it with the direction of consultants, the Pegelang Peraya Bersinar Micro-hydro Power Plant was finally completed in 2016. Residents in Silit have since then started using electric lighting from Micro-hydro Power Plant. The dark times that were only lit by lamps fueled by tengkawang sap and turning on diesel fuel, have now entered an era of energy independence. Residents have also started using electronic equipment such as refrigerators, rice cookers, turning on televisions, and a number of other electrical equipment.

The existing hydroelectric power only covers the Silit area with a generator capacity of 95 kw from the Micro-hydro Power Plant turbine engine used. Meanwhile, all residents of Silit are beneficiaries of this renewable energy, which based on data as of June 2024 consists of 86 heads of families with a total of 303 people consisting of 159 men and 144 women. The initial members at that time numbered 52 people/family.

Development History

Historically, residents in this area have long had the desire to transform river water into a source of electrical energy in their area. Especially since they learned about an example of a Micro-hydro Power Plant that was lit in Layung village, Kambong area - Sepauk sub-district, about 3 hour's drive from Silit. In addition, there is also a Micro-hydro Power Plant in the Puring Kencana area, Kapuas Hulu after receiving similar information from the credit cooperative network in Nanga Pari. Therefore, at that time, residents in Silit began to explore the opportunity to establish hydroelectric power and after finding a consultant with financing and a self-help process assisted by a grant of IDR 130 million at that time, finally, the intention was carried out. The process experienced ups and downs and even stalled because the initial financing from the grant fund ran out while residents were faced with promising financing offers from other consultants and continued through the initial consultant until it finally turned on in 2016.

In the early days of electricity, for the trial at that time, the electricity was turned on for a week, and each house was advised to turn on only one lamp. However, because they were happy and so enthusiastic, it turned out that some people turned on several lamps in their homes. As a result, some of the lamps that were turned on were damaged (broken). To overcome this, the strategy was changed by dividing the cable into 3 lines and adjusting the balance. After going through a trial for a month and there were no problems, the hydroelectric power for the residents of Kampung Silit has remained on until now.

After the electricity was turned on, from that moment on the Micro-hydro Power Plant management was formed, and also the operator who would be assigned to turn the turbine engine on and

off was determined. The following names have been the heads of the Pegelang Peraya Bersinar Micro-hydro Power Plant from the beginning until now, namely Makarius Inus, Uti, and F Yus.

Specifically, the development of renewable energy through hydroelectric power in this area at that time was solely to ensure that residents could obtain electric lighting from the natural potential they had.

The practice carried out by residents in Silit who successfully transformed river water into a source of electrical energy needs to be the concern of many parties, especially the government, that the potential of natural resources needs to be optimized to provide benefits for residents. Even if necessary, the government can provide subsidies for its residents who will develop their natural resource potential from renewable energy. On the other hand, of course, what the Silit residents have done is expected to be an inspiration for other residents and can raise public awareness as a source of future energy that needs to be continuously developed.

Sabaruang Dayak Indigenous Community, Silit Village are operating the PLTMH

Good Practices of Community

The process of establishing the Pegelang Peraya Bersinar Micro-hydro Power Plant in Silit began with members who at that time numbered 52 people/families. Each of them took part either through the costs that had to be incurred for each member by paying in installments through a credit cooperative or in working on the establishment of turbine engines, dams, and other needs. With an initial capital of Rp. 130 million in grant funds from proposals from district legislative members and with additional costs from community self-help through a credit scheme, the process of building the Micro-hydro Power Plant through mutual cooperation at that time continued until it was finally completed.

There is no special training that residents undergo in the process of operating or managing the existing Micro-hydro Power Plant management. To turn on and off and understand the turbine engine with all its devices, residents only learn autodidactically besides getting a brief guide from the consultant.

Meanwhile, to ensure the management of the Micro-hydro Power Plant , residents formed a management consisting of a chairman, secretary, treasurer, and members by appointing several other residents as advisors. There are also those assigned as operators to turn on and off the turbine engine.

Through the management that was formed, the mechanism around the operation of the Micro-hydro Power Plant was regulated and discussed together. Through meetings scheduled once every six months, it became a space for the management to convey various things to members and customers. Some of the language conveyed from the meeting was related to financial conditions, challenges experienced, community service planning, evaluations, and others.

One of the things that residents implement through the management policy that is jointly agreed upon by members is regarding the rules for turning on electricity. Based on mutual agreement, the turbine engine is usually only turned on at night and on Sundays or other days if there is a shared need related to the Thanksgiving event by residents for the rice harvest, and others. This is done as a strategy to keep the engine durable because, in addition on normal days, residents also do activities outside the home while their children go through school routines.

Unlike PLN (State Electricity Company) which usually cuts down trees in the path of installing poles and electric cables, according to residents, Micro-hydro Power Plant only installs one pole to support the cable without having to cut down the area of the electric cable installation path.

Specifically, the establishment of Micro-hydro Power Plant in Kampung Silit did not have any collaboration with the government other than an injection of grant funds from legislative members and the inauguration after several years of standing by the Regent of Sintang, Jarot Winarno at that time.

Challenges of Implementing

The operational process of the Micro-hydro Power Plant that has been built in Kampung Silit is not without obstacles and challenges. The absence of human resources who have special skills to repair machines if they are damaged is one of them. As a result, in the beginning, they still depended on consultants who helped establish the Micro-hydro Power Plant , both for consultation and to ensure the type of equipment needed and to ask them to work on it directly. However, in its journey now, if there is damage, the Micro-hydro Power Plant management usually asks for help from Anton, a machine technician who lives in the Lengkenan area. However, while learning autodidactically, several residents in Kampung Silit are now starting to learn to handle it themselves if there is damage.

Another challenge faced is the difficulty of the management to ensure that all members attend the scheduled community service. In addition, not all members and customers fulfill their obligation to pay contributions. There are still those who are in arrears with the status of the administration of the management being marked red. This situation has the potential to impact the cash condition to finance urgent needs or for operator costs. However, the policy related to members and customers who are in arrears is given a tolerance of 3 months. If it exceeds the tolerance period given, the management can enforce a policy of temporarily disconnecting electricity until the obligation to pay contributions is paid off.

Meanwhile, if there is heavy rain and flooding, usually the turbine engine turns off by itself because the river water flow that

should push the turbine engine elements to rotate to produce power is blocked by leaves. In this situation, it is usually difficult to turn it back on, especially if it happens at night because the water gate must be closed first so that the leaves that block the water channel into the pipe towards the turbine are cleaned first.

Conclusion

Learning from the experience of the residents of Kampung Silit in developing renewable energy from the Silit River that flows in their area, it turns out that the process is not easy. It takes ups and downs, full of joys and sorrows coloring the process of establishing the Pegelang Peraya Bersinar Micro-hydro Power Plant until finally the glow of electricity illuminates the village in the Bukit Merangin valley.

However, strong determination to never give up, patience, and the spirit of mutual cooperation through self-reliance have become important and primary capital when developing renewable energy as exemplified by the Dayak Seberuang community in Kampung Silit. Another important thing is related to the potential of energy sources that do exist and are owned in this area.

Meanwhile, finding someone who can guide you in the process of establishing it because in the village no one has the skills and knowledge is also an equally important part.

In addition, ensuring that there are administrators who are responsible for managing the operation of the Micro-hydro Power Plant that has been built is needed to maintain the sustainability of what has been built with great difficulty. It's just that in the management of Micro-hydro Power Plant in Kampung Silit, there is no specific guideline regarding the management arrangements. Several existing rules are only discussed and recorded per point when there is a joint deliberation as a reference.

By considering the above points, of course, there is nothing wrong if the good practices carried out by residents in Kampung Silit develop renewable energy as an example for other residents who have the potential and desire to establish a Micro-hydro Power Plant. Several residents in several surrounding villages have practiced similar things after learning from the efforts made by residents of Kampung Silit by establishing a hydroelectric power plant from the potential of

renewable energy sources that they have such as in Tangkit, Butu, Km 68, and others.

Therefore, the recommendation offered is to learn from what has been started and is now energy-independent in Kampung Silit;

1. The development of power plants from renewable energy sources needs to ensure the availability of potential in the area.
2. It is necessary to find the right people with knowledge and skills in the Micro-hydro Power Plant development process so that unwanted risks can be minimized.
3. A spirit of togetherness and solidarity needs to be possessed so that various needs related to financing, manpower to work on and obstacles faced can easily find a way out through existing social capital.
4. There needs to be management of Micro-hydro Power Plant that is formed based on an agreement decided in a joint deliberation.
5. There needs to be a policy that is formulated together in writing to be a guideline for administrators and members in managing Micro-hydro Power Plant as well as a joint binding rule so that making policies and decisions will be easier.

Mbakuhau MHP in Kamanggih, East Sumba, East Nusa Tenggara

Kamanggih Micro-hydro Power Plant: Independence Based on Community Mutual Cooperation

Umbu Wulang Tanaamahu Paranggi

Kamanggih Village and Kambata Bundung Village are located in the Kahaungu Eti District of East Sumba Regency, East Nusa Tenggara. Geographically, these two villages lie to the east of Waingapu City, the capital of East Sumba Regency. The topography of these areas consists of limestone hills with a dominant savanna ecosystem.

This topographical condition makes livestock farming the primary livelihood of the local community. The dominant livestock includes buffalo, horses, cows, and goats, which are herded in the hill fields. The livestock sector plays a crucial role in meeting the daily needs of the community, covering both primary and secondary needs, from the household economy to the costs of education and family health.

In addition to livestock, the local people also rely on dry land farming. Local agriculture includes secondary crops and rice fields, primarily rain-fed. Many residents cultivate porang plants (Amorphophallus muelleri) for market sale, alongside other food commodities such as chilies and shallots, which are marketed outside the village.

The water sources for both villages come from several springs and tributaries, including the Kalanjir spring and the Mbakuhau River, which flows through both villages. This tributary runs through the valley between the hills and is a vital resource for the 1,427 residents of Kamanggih Village and the 1,255 residents of Kambata Bundung Village.

Recently, the Mbakuhau River has also become a source of electrical energy for the people in these two villages. The Mbakuhau Micro-hydro Power Plant, managed since 2011, provides electricity not only to Kamanggih and Kambata Bundung but also to Laimbonga Village and Meo Rumba Village.

The number of Micro-hydro Power Plant electricity users in these four villages has reached 700 households. The Mbakuhau

Micro-hydro Power Plant generates a capacity of 37 to 45 KW. The community independently manages this electricity through the Jasa Peduli Kasih Kamanggih cooperative organization. The community is aware of their natural resources and utilizes them to achieve energy sovereignty in their village.

Development History

The development of electrical energy in Kamanggih Village and its surroundings began in 2011. The local community experienced an electricity crisis because the Diesel Power Plant (PLTD) built by PLN in 2004 could not serve the entire community. Additionally, due to limited resources such as unavailable diesel fuel, electricity was not available 24 hours a day. The PLTD-operated electricity was only available from 6 pm to 6 am.

This situation left many people without access to energy for household and educational needs. "At that time, we generally still used oil lamps and gas lamps for our lighting in Umbu Rundi Hamlet, Kamanggih Village," explained Yance K Windi, a resident of Umbu Rundi Hamlet, Kamanggih Village.

The community faced significant challenges in developing the family economy due to limited energy. Similarly, children's study time at night was almost nonexistent due to the lack of electricity. In every village meeting, such as the Village Development Planning Meeting (Musrenbangdes), this was always a key concern of the residents, but it could never be realized.

The impact on education is significant. There is an imbalance in knowledge because the learning process is not the same as in Waingapu City, especially when students have to study at home. Similarly, in the economic sector, family economic development cannot be done at night, causing household income to stagnate or even decrease. For example, traditional work such as weaving cloth or mats, which are sources of family income, cannot be done quickly because they cannot be done at night.

This condition also hampers the government's programs for economic development and strengthening education in villages. The government aims to accelerate the improvement of human resources and welfare, but the existing infrastructure does not support the

success of these programs. This was acknowledged by Melkianus Umbu Huki, the Head of Kambata Bundung Village.

In 2011, Umbu Hinggu Panjanji, along with other community residents, initiated the introduction of the village's energy potential. This initiative was presented to various parties, including the village government, district authorities, and civil society organizations in East Sumba Regency. The community then met with an organization called the Institute for People's Business and Economy (IBEKA) to convey the energy potential they had.

Community Experience with Good Practices

Together with IBEKA, the community led by Umbu Hinggu Panjanji made an agreement to construct a Micro-hydro Power Plant funded by HIVOS. The construction was carried out through mutual cooperation and self-reliance of village residents, utilizing local labor and raw materials.

The successful management of Micro-hydro Power Plant electricity led to the construction of another Micro-hydro Power Plant in Kalilang, Kambata Bundung Village. The local electricity management is handled by the Peduli Kasih Service Cooperative, which consists of four managerial administrators and five operator staff, headed by Umbu Hinggu Panjanji.

The cooperative management team is composed of local residents to ensure sustainability. Residents are actively involved in cooperative meetings, such as member meetings and discussions on Micro-hydro Power Plant issues. One joint agreement between Micro-hydro Power Plant users and the cooperative management is the existence of monthly dues for the operation and maintenance of Micro-hydro Power Plant infrastructure. Customers either come to the cooperative to pay dues or, if transportation is an issue, the cooperative management visits the residents based on an agreement.

Initially, cooperative managers received training in cooperative management and Micro-hydro Power Plant infrastructure maintenance techniques, with some managers even training outside the region, such as in Kupang and Jakarta. The division of tasks within the cooperative is well-organized, and managers always inform residents about power outages. For example, if there is a flood at the

Micro-hydro Power Plant location, the electricity will be temporarily shut down, and the community is already aware of this protocol.

The cooperative team's capabilities are still limited to financial and maintenance management, but these are continuously being developed to ensure improvement at various management levels. In terms of transparency and accountability, community aspirations and input are crucial for improving Micro-hydro Power Plant management. Currently, the community feels that the guidelines for managing Micro-hydro Power Plant electricity are insufficient, as they are mostly oral. Therefore, a written guide is needed for sustainable management.

In addition to being managed by the cooperative, in 2012, the cooperative collaborated with PLN to strengthen the Micro-hydro Power Plant. The cooperation model involves PLN purchasing electricity from the cooperative at 475 IDR per KWH. This cooperation is ongoing to ensure that electricity is available 24 hours a day, except during floods or when water discharge decreases. "This is also to ensure the sustainability of the Micro-hydro Power Plant as a local asset and a symbol of energy sovereignty at the village level," said Umbu Hinggu Panjanji.

Currently, cooperatives and village governments are exploring further cooperation. This initiative was conveyed by the Head of Kambata Bundung Village, Melkianus Umbu Huki. According to him, to ensure the sustainability of environmentally friendly renewable energy management, a more established structure and system are needed, given the high costs of operation and maintenance. "Moreover, poor people who cannot afford to pay contributions can be subsidized by the village government," he said. He continued, stating that independently managed electricity needs government support, especially in terms of sustainability, and that village-level regulations are essential for strengthening this effort

This cooperative has also continued to strengthen collaboration with other parties, such as Non-Governmental Organizations. For example, they participate in various social empowerment training sessions and management of community service organizations, including partnerships with the MCAI Consortium and the YRE Institute.

Mbakuhau MHP is powered by the flow of Mbakuhau River

Challenges Faced

The community faces both internal and external constraints in ensuring the sustainability of the Micro-hydro Power Plant. Internally, one major constraint is the limitation in strengthening cooperatives as a symbol of independent energy management. One issue is the problem of financing the management team, which is relatively lacking due to limited funding. This causes some administrators to not focus solely on managing the cooperative but also to take on other work to meet their daily needs.

Another obstacle is the village's topography, which results in very high operational costs. For example, many community members still live far apart, necessitating more electrical cables. Additionally, the level of equipment security is not guaranteed due to limited expertise in equipment maintenance. These obstacles have led cooperatives to collaborate with PLN to reduce their burden.

Externally, the community in Kamanggih Village no longer depends solely on the Micro-hydro Power Plant because PLN has established an electricity network directly connected to the power plant in Waingapu City. The Micro-hydro Power Plant now serves as an alternative if the electricity source from Waingapu City experiences issues, such as blackouts.

This situation worries the community and village government about losing their sovereignty in producing their own environmentally friendly electricity. Kayapas, a Kamanggih resident, regrets that PLN electricity might cause the Micro-hydro Power Plant to become obsolete. He believes that Micro-hydro Power Plant electricity should remain the primary energy source for the village. Other community members are also concerned that not making Micro-hydro Power Plant the main electricity supplier will reduce the enthusiasm of administrators to manage and maintain it.

Given these challenges, the community hopes for recognition of their energy sovereignty through policies that protect the sustainability of the Micro-hydro Power Plant. They also emphasize the importance of campaigns promoting the use of environmentally friendly energy, starting with renewable energy education in local schools.

Conclusion

The experience of Kamanggih Village and its surroundings serves as a valuable lesson that communities can independently manage environmentally friendly energy. It is crucial to continue introducing the potential of natural resources for public benefit in various communities. The challenge of limited human resources for the comprehensive management of renewable and environmentally friendly energy is a shared issue that must be addressed. Equally urgent is the need to disseminate campaigns for environmentally friendly and sustainable energy, and to halt the use of dirty energy. This agenda cannot be postponed any longer.

CONCLUSION

This writing is not just a series of stories about how electricity can be brought to remote corners of the nation. It is a story of hope, of ordinary people who dare to step forward amid inequality, and of how communities can become the engine of change when the state has not yet fully arrived. Behind every wire and micro-hydro turbine, there is collaboration, there are tears, and there is an unyielding spirit.

We learn from Seloliman Village, Kamanggih, and Silit Hamlet—that energy is not just a technical matter. It's not just about how much power can be generated. More than that, energy is about a more dignified life—about children who can study at night, women who can weave and sell their crafts, about cleaner air, and rivers that remain clear and flowing.

Community-managed energy opens our eyes: that people have the capacity, that they can, and that they are already doing it. They prove that the energy transition is not some distant, lofty ideal, but something entirely possible—if given the space. Unfortunately, the reality on the ground shows that their path is not easy. They face many challenges—from unfavorable regulations, pressure from the national electricity system, to the growing threat of climate change.

Often, it is the state—which should protect and encourage such good initiatives—that comes with rigid, centralized approaches. In some places, the arrival of the state's electricity grid has even shut down power plants painstakingly built by the community. At the same time, existing regulations do not yet fully support more democratic, equitable, and locally appropriate energy models.

Yet, energy decentralization—energy managed by the people, for the people—is the key to energy justice. It's not just a technical issue, but a matter of social justice. It's about ensuring equal access to energy, not just for those living in cities or with high purchasing power. It's about giving communities control over the resources around them, without having to submit to market logic or state monopolies.

The energy transition will only be meaningful if it is just. If everyone can participate, not just watch. If the process respects

community rights and does not repeat the old exploitative patterns. If this change also becomes a way to repair humanity's relationship with nature—not just a superficial shift from "dirty" to "greener" energy, but a transformation beyond the same industrial logic.

The efforts made by people in the places we visited prove that change can start from below. That when given the opportunity, communities are not only capable of building power plants but also protecting their forests, rivers, and land. That electricity can be a gateway to self-reliance, not a new dependency.

Therefore, moving forward, we must push for policies that support local initiatives. The state must be present—not to take over, but to support. It must open legal pathways, provide technical and financial assistance, and ensure communities are not sidelined in the future energy system. We also need to build stronger solidarity among communities, academics, civil society organizations, and others who believe that energy is a right, not a commodity.

What these communities have started is the first step toward a fairer and more sustainable energy system. But they must not walk alone. All of us—as part of the people—must step forward too. Because in the end, energy is not just about turning on the lights. It's about keeping hope alive. About a fairer world. And about a brighter future—for all of us.

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