

INDONESIA

When bigger hydropower isn't greener: Scaling challenges for energy transition

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Introduction

Indonesia is home to thousands of rivers, many of which play crucial roles in supporting ecosystems, agriculture, transportation, and power generation. The commitment of energy transition towards cleaner and more sustainable renewable energy sources makes hydropower an option for shifting away from dependency of fossil fuel. The country's topography, with mountainous regions and rivers, provides an ideal setting for harnessing hydropower with a potential estimated reach of 95,000MW including both large-scale and small-scale (5kW– 1MW).¹

Multilateral development banks (MDBs) have played an essential role in promoting renewable energy in Indonesia, notably hydropower. For example, the Kedungombo and Gajah Mungkur hydropower plants (HPPs) on Java island were supported by the World Bank (WB). The Asian Development Bank (ADB) supported megaprojects such as the Maninjau and Singkarak HPPs on Sumatra island. They are also involved in technical assistance for numerous hydropower dams in the region.

However, renewable energy should be used in a way that is just and equitable, not just in terms of technology, but also in terms of the social, ecological, and economic implications of the development. Especially for hydropower, the use of river resources as a source of clean energy must also be examined for its sustainability, as it increases the risk of disaster in the future.

The Java and Sumatra islands play an essential part in Indonesia's energy transformation. Both islands have dense populations and significant energy needs, thus incorporating renewable energy is a top priority for meeting rising energy demand. Nevertheless, all development approaches carry risks and expenses. The usage of hydropower on both islands should be a real example of benefit or harm to the country as a whole.

This case study contrasts experiences of large- and small-scale hydropower development in Indonesia to demonstrate lessons learnt for future MDB investments.

Big scale = big risk

Jatigede hydropower plant displacing Indigenous communities

In Indonesia's energy transition, large-scale hydropower is being strategically utilised as a baseload renewable energy source. This role is considered critical because baseload energy provides the steady, consistent power needed to meet the minimum energy demand over long periods. One of the large-scale hydropower projects is the Jatigede HPP, located in Sumedang Regency, West Java, Indonesia. It is situated on the Cimanuk River, where the dam was constructed. The reservoir was initially designed for multiple purposes, including flood control, irrigation, and hydroelectric power generation.

Jatigede HPP was planned to be built on an area of 4,896.22 hectares covering five sub-districts and 30 villages. It was initially planned during the Dutch East Indies era to serve as the area's largest reservoir. However, the idea was not implemented at that stage due to opposition by the Indigenous Sumedang community.²³

The initiative of the Jatigede HPP was revived in the 1980s with WB financing, but was discontinued due to a delay in 1986 and later replaced by China Bank. The initial stage was to relocate the settlements located in the reservoir building zone that affected residential, agricultural, and productive land. The first stage of land acquisition occurred in 1984/85 with eight villages, which were abandoned by 1996. Residents who had obtained compensation under the Minister of Home Affairs' Regulation 15 of 1975 then were unable to relocate due to lack of any relevant government follow-up.

The public has been critical of the Jatigede reservoir's development, which excluded the impacted

community from any decisions for its planning and development. Since making initial objections in 1984, the community has held 218 demonstrations to demand justice.

According to the testimony of directly affected communities, between 2007 and 2015, over 11,400 more families were displaced. With the length of the Jatigede Dam around 1,715m and the height reaching to 110m, the area flooded was up to 4,983 hectares. The majority of the displaced residents worked as rice or plantation farmers. But, the government not only failed to build replacement homes, they also failed to provide for the population's livelihood.

It was recorded that 48 historical sites were flooded during the Jatigede development. This also implies that the Sumedang community lost their ancestral history. As a result, the centuries-old Indigenous culture vanished instantly. Indigenous people had to relocate, causing the customary structure to disappear without trace. The elders, a term given to Indigenous peoples' leaders in the Sumedang community, had lost authority because they were also hopelessly looking for a new home to live and work in.

The people who used to reside in the Jatigede area do not see the hydropower project as a perfect example of energy transition. With a capacity of 110MW, the community affected by the construction of the Jatigede HPP did not reap the benefits at all. The government pledged in 2019 that the community would be included in the project, yet foreign labourers were more prevalent, with very few job opportunities for Indigenous people in the surrounding area.

The Jatigede hydropower project is expected to be operational by the end of 2024.⁴ Despite that, 141 plots of requisitioned land have yet to be paid for. Not to



mention the additional problem of huge waste piles upstream, which affects the population living nearby. There are no clear regulations governing the fate of the remaining afflicted population, which has been handled unfairly. Their sole option is heading to court, which further disadvantages them since it costs more than the amount they may receive.

Tampur hydropower plant – threatening wildlife and displacing Indigenous people

Another example is the Tampur Hydropower Plant that is planned to be built in Aceh on Sumatra island and has different issues. The planned length of the dam is 572.8m and the height 173.5m, meaning this project will submerge 4,000 hectares. The Tampur's dam will be built in the area of 10 hectares with the grid along 45km,⁵ which harms the designated zone for protected and productive forest. In 1991, ADB contributed the technical assistant on this planning project.

The project's development involves the breaking of wildlife corridors and increasing disaster risks. Areas that will be flooded or exposed as a result of the development process will impact the elephant corridor in the area. In addition to the threat to elephants, the biodiversity of the Mount Leuser protected forest, such as Sumatran tigers and rhinoceros, will be disrupted or lost as a result of the project's development process.

HAKA, a non-governmental organisation based in Aceh province, raised concern about the domino effect of hydropower development around the Leuser Mountains. According to the latest draft of Aceh province's Regional Spatial Plan, 35 new hydroelectric projects, in addition to Tampur, are being planned. It is expected that there will be significant losses suffered by affected residents in terms of social, environmental, and even economic factors. Lesten Village, one of the communities that will be flooded, is heavily reliant on

natural resources. If this hydroelectric power plant is developed, their homes will be moved and their lives would be jeopardised.

Furthermore, the affected area is also the home of the Indigenous Gayo people of the Leuser mountains. Indigenous people will be relocated as a result of the development of the Tampur power project. This will undoubtedly eliminate the original culture of the Indigenous people's ancestral land in Aceh Province. The Gayo people have their own way of life, thus major changes will cause damage to the structure of their community's life.

The electricity provided by the Tampur HPP will not directly benefit the affected population. Three districts are expected to suffer environmental impact as a result of the construction process. Furthermore, jobs in the Tampur Power Plant project for local residents are relatively restricted. The employees are primarily from outside the region, leaving the community with little part in and no benefit from this development.

Jatigede and Tampur hydropower are just two of numerous examples of hydroelectric power stations that resulted in significant relocations that harmed the impacted population. Looking back, older HPPs like Kedungombo reservoir, which was funded by the World Bank for \$156m in 1984–1985, continue to cause social and environmental issues for those affected or living around that area. More lessons learnt from annual flooding in the Bengawan Solo River, which was affected by the Gajah Mungkur HPP sponsored by the WB in 1970s and 1980s, have had a lasting impact, in addition to the hydroelectric power plant's declining energy output.

So, can this type of power plant still be considered sustainable?



The beauty of small-scale, with challenges to match

Gelaralam microhydropower plant - community cooperation

Small-scale hydropower, on the other hand, provides a different perspective on energy resources than river streams. Gelaralam microhydro power plant (MHP) is an excellent example of just and equitable natural energy that is renewable and sustainable. Gelaralam is located in Sukabumi Regency, West Java, Indonesia.

Gelaralam MHP is built and operated by Kasepuhan Ciptagelar, a traditional Indigenous community in that area. They follow traditional Sundanese customs and lifestyles, which include agricultural methods, cultural rituals, and social structures passed down through generations. People have been building their own wooden propellers for water turbines since 1992. At that time, the MHP generator had a capacity of 70KW, which was used to light up the surrounding area. The entire Kasepuhan Ciptagelar community worked together to build the structure.

Corporate social responsibility (CSR) funding from a Japanese company provided initial assistance to the Kasepuhan Ciptagelar community in the construction of the MHP project. The customary chief directly oversaw the power plant's development and construction. Financing is also carried out fairly, with the community contributing support as well independently.

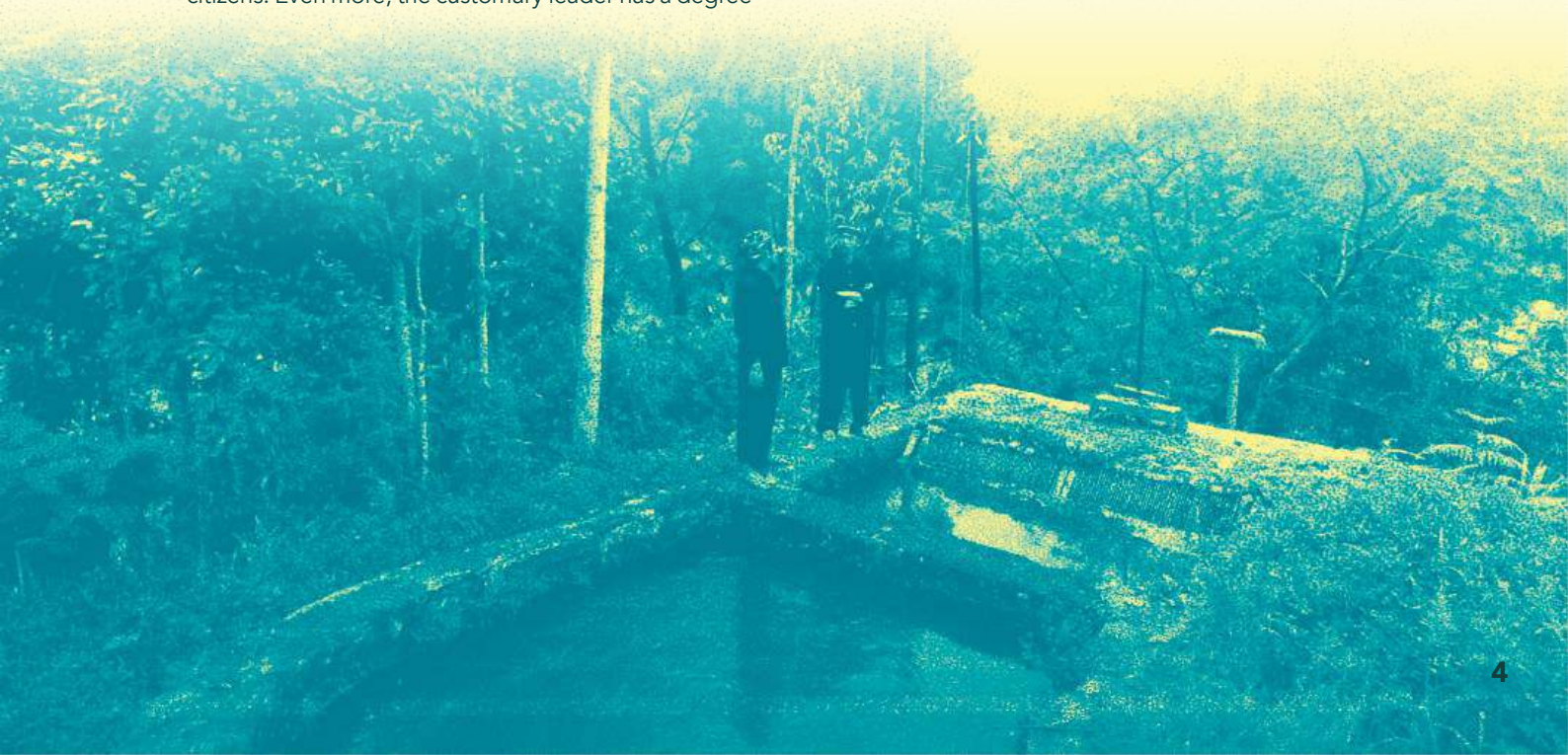
The technical operators are knowledgeable local citizens. Even more, the customary leader has a degree

in engineering. Gelaralam's MHP operations are based on monthly citizen fees of Rp.50,000/house monthly (\$3.5). They received high-quality electricity, which supports direct economic activity. Many home-based industries, for example, are powered by the energy produced by this MHP.

The challenge arises when there is significant damage to the plant; the community is overburdened with the cost of repairing damage and replacing tools. This is not covered by fees, which are typically just sufficient to pay operators and technicians. They are reliant on the customary chief, who is actively seeking other sources from grants or development projects.

Despite these challenges, the community contends that there should be a regulation that encourages the use of renewable energy on a community scale to promote efforts to use sustainable energy as they do.

As an Indigenous community, Kasepuhan Ciptagelar has worked to preserve its cultural heritage while adapting to contemporary environmental challenges, making it an example of how local wisdom can contribute to sustainable living and ecological balance. They emphasise environmental stewardship, particularly through sustainable farming and forest conservation. It is no coincidence for its sustainability of Gelaralam MHP, since the community is mindful of the environment in order to be resourceful while also benefiting society.



Batusonggan microhydro plant – the importance of community training to maximise benefit

A different story comes from the land of Sumatra, located in Kampar Regency, within the province of Riau, the Batusonggan microhydro plant (MHP) is built in the middle of the bush without access to transportation besides a boat. It is an example demonstrating that small hydropower plants are good for communities, yet constantly struggling.

Before the power plant was built, this area did not have access to electricity. With the introduction of the Batusonggan MHP in addition to lighting, consumers gain directly from MHP through the use of domestic electronic devices, and it encourages economic activities like boatbuilding.

From initial planning to development, the community has been actively involved. This activity was led by the village authority, and everyone worked together to develop the entire MHP. The local community manages the MHP's financing, and the central government provides direct support.

The Batusonggan village has attempted a diesel-powered power plant and feels disadvantaged because the cost is high and it only operates for a few hours at night. Batusonggan's MHP capacity reaches 30KW, enough to power 80 houses for 24 hours a day in the rainy season. After the building was completed, the implementing authority abandoned it without giving

the community adequate guidance or skills to maintain the facility. As a result, the MHP halted, and it took several years until the community received aid for technician training, after which it resumed operation.

The operational finance is supported by contributions of Rp.30,000 (\$2) per month per house. Yet, it faces a hurdle when it encounters annual maintenance and when it encounters substantial unforeseen damage, due to the community's inadequate technical expertise. The Batusonggan community believes that regulations to support community-based renewable energy are necessary so that similar issues can be overcome and become a priority for government management.

Based on the Gelaralam and Batusonggan's MHP compared with Jatigede and Tampur's HPP, we see that a small-scale hydropower plant gives more benefits to local communities than a large power plant that causes social disputes, harms the environment, and even degrades the community's economic level. Rather than financing a large hydropower development, MDBs could encourage smaller-scale power plants, which have been proved to support and improve community welfare while also promoting a just and equitable energy transition. However, community-based plants must be managed effectively so that those with limited technical skills can receive full funding for training. Regulations are also required to ensure that community-scale plants are prioritised in the development of just renewable energy transition.



Note from the Author: This article is compiled from interviews with residents of Jatigede, Batusonggan, and Gelaralam, along with insights from the NGO HaKA and findings from a field study conducted in Jatigede, Sumedang.

Endnotes

¹ Balai Besar Survei Dan Pengujian Ketenagalistrikan, Energi Baru, Terbarukan, Dan Konservasi Energi [Centre for surveying and testing of electricity, new, renewable energy and energy conservation] (2021, January 30). *Peta Potensi Energi Hidro Indonesia 2020 [Map of Indonesia's Hydro Energy Potential 2020]*. https://p3tkebt.esdm.go.id/pilot-plan-project/energi_hidro/peta-potensi-energi-hidro-indonesia-2020

² Universitas Padjadjaran [Padjadjaran University], Bandung (2008) *Jatigede Dalam Tinjauan Sejarah Dan Budaya [Jatigede in Historical and Cultural Perspective]*. <https://pustaka.unpad.ac.id/wp-content/uploads/2013/10/JATIGEDE-DALAM-TINJAUAN-SEJARAH-DAN-BUDAYA.pdf>

³ Humas Disparbud Jabar [West Java Tourism and Culture] (4 August 2023) *Sejarah Asal Usul Waduk Jatigede Sumedang [History of the Origin of Jatigede Reservoir Sumedang]*. <https://disparbud.jabarprov.go.id/sejarah-asal-usul-waduk-jatigede-sumedang/>

⁴ PNL (5 September 2024). *Pasokan Listrik EBT Terus Bertambah, PLN Bakal Operasikan PLTA Jatigede 110 MW [Renewable electricity supply continues to grow, PLN to operate 110 MW Jatigede hydropower plant]*. <https://web.pln.co.id/media/siaran-pers/2024/09/pasokan-listrik-ebt-terus-bertambah-pln-bakal-operasikan-plta-jatigede-110-mw>

⁵ Junaidi Hanafiah (25 November 2017). *Masyarakat Aceh Tamiang: Kami Resah dengan Pembangunan PLTA Tampur [People of Aceh Tamiang: We Are Concerned with the Construction of the Tampur Hydroelectric Power Plant]*. Mongabay. <https://www.mongabay.co.id/2017/11/25/masyarakat-aceh-tamiang-kami-resah-dengan-pembangunan-plta-tampur/>

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Page 1: "Gajah Mungkur Dam" by Triunt, 2009. Public domain. Modified from the original. Retrieved from https://commons.wikimedia.org/wiki/File:Gajah_Mungkur_dam.jpg. Accessed October 2024.

Page 2: "View of Jatigede Dam from top of hill" by Erlan Ristiano, 2021. Licensed under CC BY-SA 4.0. Modified from the original. Retrieved from https://commons.wikimedia.org/wiki/File:View_of_Jatigede_Dam_from_top_of_hill.jpg#/media/File:View_of_Jatigede_Dam_from_top_of_hill.jpg. Accessed in October 2024.

Page 3: A press conference in Jakarta to present a study on the dangerous ecological impacts and permitting process violations behind the Tampur hydropower project. Photo by Forest Nature and Environment Aceh, 2018. Used under Fair Use for educational purposes. Modified from the original. Retrieved from <https://www.facebook.com/share/p/z3fseprWycX4wnjt/>. Accessed October 2024.

Page 4: "Gelaralam microhydropower plant" by Trend Asia. Modified from the original.