

# 'The Failure' of Micro-Hydro Technology in Central Java

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## Key Messages

- Despite massive enthusiasm, investment, and installation from local, national, and international stakeholders, micro-hydro technology has yet to be successfully commercialized in Central Java, Indonesia.
- Using the Banyubiru micro-hydro project as a case study, 'the failure' resulted from a lack of experience in energy commercialization and 'centralization', rather than issues with the technology.
- Institutional capacity building for commercial renewable energy is required to support communities with limited resources.



## Introduction

Indonesia has a large number of rivers and rain-falls, making the development of micro-hydro technology feasible. Micro-hydro technology is frequently used by the local population to address sustainable energy supply in remote areas. Micro-hydro powered village grid systems have been shown to have negative abatement costs and can significantly cut emissions [1]. However, their efforts do not always bear fruit, notably in Central Java.

In light of this, in this policy briefing we focus on 'the failure' of the case example of the Banyubiru project: a 170 kW micro-hydro plant in the Semarang region, Central Java. We selected the Banyubiru project as a case study because it has received considerable amounts of funding, as well as widespread coverage in the national media and attention from a variety of stakeholder organizations at the local, national, and international levels. However, at the moment, the Banyubiru project has been unable to accomplish the expected outcome of market integration through the Indonesian State Electricity Company (PLN) power grid.

## Methods

To assess how the Banyubiru project developed over time and ultimately 'failed,' we used Pinch and Bijker's Social Construction of Technology (SCOT) framework [2] and the notion of failed innovation [3,4]. This notion suggests that all attempted innovations are failures if they fail to capture a sizable share of a profitable market and/or generate profits, despite working technically.

We traced the Banyubiru project since its inception in 2008, the year in which several micro-hydro technologies were also being deployed in Central Java.

We collected data using qualitative methodologies. These included hybrid (online and in-person) semi-structured interviews with 13 individuals, including the project developers of Banyubiru, representatives from energy companies, energy professionals, consultants, members of the local community, and representatives from a farmers' union. Site visits and observations, as well as document analysis, which included official planning documents, media coverage, copies of contract documents, social-economic and environmental assessments, and correspondence letters, were all part of the data collection process.

## The Rise and Fall of the Banyubiru Project

### • 2008–2010

The Qaryah Thayyibah Farmers Union (SPPQT), a social foundation dedicated to social and environmental justice, initiated the Banyubiru project in 2008. Given the union's primary environmental and economic issues, it sought to generate sustainable energy and integrate it into the electricity market through the PLN power grid, thereby benefiting both its members and the local populace.

The SPPQT proposed collaborating with Hivos, an international non-governmental organization. Hivos agreed to support the Banyubiru project, because it addressed environmental, renewable energy, and social empowerment concerns.

### • 2010–2011

Following the agreement, Hivos appointed Inisiatif Bisnis dan Ekonomi Kerakyatan (the People Centered Business and Economic Institute, or IBEKA), a Jakarta-based enterprise, as a major contractor. IBEKA was in charge of constructing the Banyubiru project between 2010 and 2011.

The SPPQT signed a 15-year contract with PLN on October 17, 2011, through its Limited Partnership Qaryah Thayyibah, in order to achieve its goals. The Banyubiru project was compatible with the PLN's primary carbon-reduction efforts and intended to increase renewable energy installations across the country.

### • 2012–Present

In May 2012, Dahlan Iskan, Indonesia's Minister of State-Owned Enterprises, formally launched the Banyubiru project. Technically, the micro-hydro plant worked on the day of its launch, but the project has yet to be connected to the PLN power grid. This is still the case at time of writing due to the inability to provide a Composing Certificate (SLO).

The SPPQT, as the main beneficiary, was required to complete several documents, including the SLO: a written document that proves that the micro-hydro is fit for operation and has been issued by a recognized technical inspection agency, which was the union's main barrier.

To obtain an SLO, the SPPQT needed to provide specific information about the micro-hydro technology to a third-party company and pay the associated charges. After the third party reviews

and authorizes all administrative paperwork, the technical aspects of the micro-hydro are checked and analysed to see if they meet Indonesian National Standards (SNI). If all of the technical features satisfy the standard, the third party would issue an SLO. However, the bureaucratic process was more challenging at the time. The SPPQT was a new social organization with no prior experience in commercializing micro-hydro technology, but the union was required to manage both administrative and technical requirements in order to satisfy the SLO.

According to the SPPQT, it was anticipated that IBEKA, as the contractor, would have met all technical standards. IBEKA, on the other hand, claimed to have completed their work on the technical construction of the Banyubiru project.

Moreover, some technical components of the Banyubiru project needed to be repaired in order to meet SLO requirements. It would cost between 800 million and 1 billion Rupiah (USD 56,250 to 70,475). The SPPQT and IBEKA did not have the resources to do so.

The SPPQT plans to negotiate with IBEKA and PLN in an attempt to reach an agreement on the Banyubiru project.

The Banyubiru project is still in its early stages of development, with no closure or stabilization in sight.

## Conclusion

Hydropower, including micro-hydro power plants, has historically contributed the most to renewable energy in Indonesia. Its contribution is critical to achieving the goal of reducing carbon emissions by 41% by 2030 [5] and having 23% renewable energy shares in Indonesia's energy use by 2025 [6].

'The failure' of renewable energy projects, such as the Banyubiru project, could jeopardize Indonesia's renewable energy and carbon reduction goals.

In addition to a lack of experience in micro-hydro commercialization and dealing efficiently with administrative and regulatory processes, 'the failure' of the Banyubiru project was aggravated by 'centralized regulation' in energy commercialization. It contrasts with the design of micro-hydro, which is typically related to decentralization (local stakeholders' expertise, financial situation, and geography) [7].

## Recommendations

As illustrated in the case study, our historical and sociological examination reveals that the Banyubiru project's 'failure' was caused by a lack of expertise with energy commercialization and 'centralized regulation' in the energy sector. As a result, the following actions are recommended:

- First, state technology agencies should build institutional capacity for commercial renewable energy to assist low-resource local

communities in completing technical requirements to satisfy national standards.

- Second, there should be a framework for business-government partnership in the development of commercially viable micro-hydro technology. This needs to be more inclusive to accommodate local stakeholders' expertise, financial situations, and geography.

## References

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## Notes

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**Image Credit:** the authors

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