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Public Engagement in Micro-Hydro Technology in Central Java, Indonesia

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Key Messages

- Indonesia's abundance of rivers and waterfalls boosted the potential for micro-hydro in remote areas.
- Public engagement in micro-hydro is important to Indonesia's decarbonization targets.
- The engagement has been driven mostly by social and economic concerns, as well as environmental ones.
- Micro-hydro development requires equitable engagement between local stakeholders and credential experts, supported by decentralized regulations.

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Introduction

The Indonesian government has established electrification programmes and targets; however, the National Electricity Company (PLN)—a state-owned company tasked with the responsibility of producing, transmitting, and distributing electricity—frequently struggles to reach remote areas. This reality therefore has pushed both the people and the state to establish other forms of energy production that are more accessible in those areas, such as micro-hydro technology.

While the role of credential experts (individuals with formal degrees from accredited institutions, formal job titles, and other forms of recognition conferred by formal institutions) [1] in the development of micro-hydro has been widely documented, the role of local stakeholders (local residents who have not received formal education in engineering or related subjects) has received little attention.

This policy brief focuses on the role of local stakeholders in the development of micro-hydro in Central Java, Indonesia. The brief considers how these stakeholders constructed the technology to generate electricity for themselves (off-grid micro-hydro) or to connect to the market through PLN's power grid (on-grid micro-hydro), and it identifies the major institutional barriers in these cases.

We examine the development of micro-hydro in five different locations: Desa Kebumen (Semarang), Desa Baseh and Karangtengah (Banyumas), Desa Ngesrepbalong (Kendal), and Desa Igirklanceng (Brebes). These locations have a wide range of potential energy production capacities, reaching up to 3,000 kW depending on geographical location, financial conditions, and technological sophistication.

The data for this brief were gathered using qualitative methods. We employed several methodologies, including hybrid (online and in-person) semi-structured interviews with local farmers and entrepreneurs as well as energy specialists as credential experts. Additionally, observations and site visits were done in Central Java, where local stakeholders had constructed micro-hydro.

The Current Emergence of Micro-Hydro

The massive development of micro-hydro in Central Java started around 2007. At this point, the Indonesian government announced a national policy addressing the conversion of kerosene to gas for households. Additionally, the Indonesian National Nuclear Energy Agency (BATAN) pushed to re-promote the construction of a nuclear power plant in Muria, Central Java, in 2006 [2].

Lack of electricity and scarcity of kerosene pushed people to seek alternative energy sources. In Kebumen, the threat of nuclear risks also contributed in the development of micro-hydro. The local stakeholders resorted to their environment in an attempt to find a solution to their energy problems.

The decision to develop micro-hydro rather than other alternative energy sources was made after local stakeholders took into account the geographical conditions in the area, the potential benefits, the environment, the safety of the public, and the expertise required to handle such technology.

Off-Grid Micro-Hydro

Local farmers initiated and built micro-hydro in two areas, Ngesrepbalong and Karangtengah. Moreover, in Igirklanceng, the central government designed and built the micro-hydro power technology in 2009 as part of the Self-Sufficient Village Energy Programme to promote the use of sustainable energy in Indonesian villages.

All of these locations did not have access to PLN, so their main practical purpose was to provide sustainable energy for public spaces, households, and small business enterprises. In Ngesrepbalong, the technology has also been used for educating elementary school students about alternative energy and environmental conservation.

On-Grid Micro-Hydro

Economic motives, as well as environmental concern, are more tangible in locations where the PLN power grid has been installed. For instance, in Baseh, where a private company constructed micro-hydro, the primary goal is to supply sustainable energy through the sale of electricity to PLN.

Meanwhile, in Kebumen, where local farmers partnered with a private organization and an international non-governmental organization to develop micro-hydro, a similar goal was intended. Besides the economic motivation and the need for sustainable energy, the local stakeholders in Kebumen also wished to promote educational tourism and empower local residents. However, this micro-hydro is incapable of accomplishing the objective.

Institutional Challenges

Concern for the betterment of the environment and neighbourhood in Ngesrepbalong, Karangtengah, and Baseh plays a significant role in sustaining the commitment to maintaining micro-hydro. The positive growth of micro-hydro is more evident in these three regions. Additionally, in Karangtengah, local stakeholders established a small organization named Sinar Alam (Natural Lights) to handle micro-hydro maintenance following its completion.

This is in stark contrast to the situations in Igirklanceng. When the Igirklanceng micro-hydro began running in 2011, several local farmers were assigned to run and manage it. However, the micro-hydro was shut down in 2013. There was insufficient water to turn the turbines due to environmental degradation. As a result, the turbine's components were damaged. The public's enthusiasm for this new technology lacked government support for maintenance and environmental protection.

In addition, in Kebumen, the micro-hydro 'failed' to integrate with PLN and create a profit. To commercialize the micro-hydro, local farmers must complete extensive administrative paperwork and the micro-hydro's technical components should meet the Indonesian National Standard (SNI). National standards and regulations have a tendency to disregard the diverse knowledge, capacities, and characteristics of local communities. At time of research, the micro-hydro in Kebumen ends up in limbo due to bureaucratic complexities for commercialization. [3]

Taking these cases into account, two institutional barriers to micro-hydro development are identified: (1) complicated bureaucracy in energy commercialization that favours 'centralization' for on-grid micro-hydro; (2) The government's lack of support for off-grid micro-hydro maintenance and environmental conservation.

Conclusion & Recommendations

Public engagement in micro-hydro development is an important factor with regards to accomplishing Indonesia's goals of having 23% renewable energy shares in energy use by 2025 [4] and reducing carbon emissions by 41% by 2030 [5]. The engagement is varied and dynamic. It has been driven mostly by social and economic concerns, as well as environmental ones.

- While micro-hydro design is typically associated with decentralization (local stakeholders' expertise, financial situation, and geography), 'centralized regulations' in energy commercialization have emerged as a major institutional barrier.
- As a result, we suggest that decentralized regulation is necessary to stimulate new growth and assure the long-term viability of micro-hydro.
- Based on our study, ensuring equitable engagement between local stakeholders and credential experts, supported by decentralized regulations, is crucial for micro-hydro development.

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Notes:

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