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A Challenge for Sustainable Electrification, Respecting the Local Tradition in Ciptagelar Village, West Java, Indonesia: Complementary Approach with a Private Company

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Abstract

Ensuring access to affordable, reliable, sustainable modern energy is a key challenge in reducing poverty in developing countries. Off-grid rural electrification based on decentralized renewable energy has been recognized as an effective way to increase access to energy in remote areas. However, there is some doubt about its long-term sustainability. Previous studies have indicated that once renewable energy generation facilities are installed, the responsibility for operation and maintenance is often handed over to the local community, and, eventually, the project fails because of a lack of maintenance budget. This paper discusses issues related to the sustainability of MHP-based rural electrification as a case study in a remote village in West Java, Indonesia, that is deeply steeped local traditions. A complementary approach between the community and a private company was introduced to improve the economic sustainability of MHPPs while simultaneously conserving local traditions and livelihoods.

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Nomenclature

AHB	Asosiasi Hidro Bandung
FIT	Feed in Tariff
JICA	Japan International Cooperation Agency
MDGs	Millennium Development Goals
MEMR	Ministry of Energy and Mineral Resources, Indonesia
MHP	Micro Hydro Power

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MHPP	Micro Hydro Power Plant
NGO	Non-Governmental Organization
PEU	Productive End Use
SDGs	Sustainable Development Goals

1. Introduction

Access to affordable, reliable, and sustainable modern energy is a must for reducing poverty in developing countries. Industrial and commercial activities that result from economic development are underpinned by guaranteeing energy access to create employment and generate wealth [1, 2]. Access to electricity and advancement in socio-economic conditions are closely correlated in rural areas of developing countries [3, 4]. Globally, 85.3% of the population had access to electricity in 2014, an increase of only 0.3% since 2012. Thus, 1.06 billion people still function without electricity [5]. In 2015, countries adopted the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs) [6]. Of the 17 SDGs, SDG 7 calls for access to affordable, reliable, and sustainable modern energy for all.

Off-grid rural electrification, based on decentralized renewable energy, has been recognized as an effective way to increase access to energy in remote areas [7]. Renewable energy systems can create more jobs per invested dollar than conventional energy supply projects [2]. However, there is some doubt about their long-term sustainability. Although many such programs have been implemented, the rate of success (i.e., ensuring a long-term sustainable program) is low [1]. Many of these programs have failed to appropriately address social and cultural issues of target communities, resulting in low or no acceptance by the users.

Micro Hydro Power (MHP), which is mainly distributed in rural areas, is one of the most important renewable energy technologies to be considered for rural electrification in developing countries [8]. Many Micro Hydro Power Plants (MHPPs) have been installed globally, but the performance of these projects has not been well-documented [1]. A few studies have been conducted to evaluate the sustainability of MHP rural electrification. Ranzanici [9] and Purwanto & Afifah [10] assessed the sustainability of MHPPs using technical, economic, social, environmental, and institutional indicators. They concluded that the most important factor affecting sustainability is a lack of a maintenance budget, which should cover the large costs entailed to repair damage caused by disasters.

Indonesia is one of the most active countries to promote MHP-based rural electrification. The government and non-governmental organizations (NGOs) such as *Asosiasi Hidro Bandung* (AHB) have supported hundreds of MHP projects for rural electrification and community development. This paper discusses issues related to the sustainability of MHP-based rural electrification as a case study in a remote village in West Java, Indonesia, that is deeply steeped local traditions. A complementary approach between the community and a private company was introduced to improve the economic sustainability of MHPPs while simultaneously conserving local traditions and livelihoods.

2. Site characteristics

To address the sustainability problem of MHPs in remote areas, we selected Ciptagelar village (about 130 households with 300 people) as the study area. It is located in the forested, mountainous area of Sukabumi District, West Java Province, Indonesia (Fig. 1). The area is difficult to access, especially during the rainy season. Ciptagelar is the heart of the Sundanese indigenous people, the Kasepuhan *adat* community. It is estimated that there are about 16,000 people in the Kasepuhan community, and they are distributed in the West Java and Banten Provinces [11]. The highest leader of the Kasepuhan community, *Abah Ugi* (*Abah* means a father, and he plays a role similar to that of a king), lives in Ciptagelar. He serves the needs of the members of the community in matters concerning this (material) world and beyond (the spiritual realm).

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