

The Impact of Village Funds on Village Electrification in Indonesia

Adhe Novita Sari*, Muhammad Halley Yudhistira

Universitas Indonesia, Jakarta, Indonesia

*adhe.novita@ui.ac.id

Abstract

As an archipelagic country with a dense population, Indonesia develops a huge gap in development of economic, social etc in the urban and rural area. One of the disparity is in providing electricity. This study aims to analyze the effect of village funds on village electrification in Indonesia. The study examines the correlation between village funds for the provision of infrastructure and the acceleration of village electrification with the method of quantitative descriptive approach with a panel data regression method with a fixed effect model. The result of the study shows that village funds are positively correlated with village electrification in Indonesia. It says that every 1% increase in village funds is completely correlated with a 0.98% increase in village electrification ratio. Other results show that the influence of village funds on increasing electrification is seen to be higher in villages outside Java and the coastal region. Although village funds are not intended directly to increase village electrification in Indonesia, the study concludes that village funds can be a catalyst for increasing electrification ratios in areas with basic infrastructure needs.

Keywords: Village Fund; Electrification Ratio; Infrastructur; Fixed Effect

Introduction

Indonesia ranks fourth as the country with the largest population in the world, with a total of 275 million people (BPS, 2022). With an exponentially growing population and predictions of a demographic bonus in 2030, these present unique challenges for the government to create equal development and well-being for all citizens. Indonesia's Gini Index shows that inequality and poverty levels have increased from the previous year's 37.6 to 37.9 in 2021 according to World Bank data in 2022. The Central Statistics Agency (BPS) also reported that the poverty rate in urban areas was 7.5%, while the percentage was higher in rural areas, at 12.29%. To address this gap, one of the government's efforts to create equal development throughout Indonesia is to improve the electrification ratio.

Electrification and electricity consumption in a country are closely related to its economy and development, making national electrification a priority for countries worldwide (Burke & Kurniawati, 2018). Sufficient electricity availability can boost productivity and improve the community's economic condition, ultimately contributing to poverty alleviation efforts (Mursanti & Tumiwa, 2019). Ministry of Energy and Mineral Resources stated that Indonesia's electrification ratio had reached 99.52% in the first quarter of 2022, but rural communities in developing countries still lack access to affordable, reliable, and sustainable energy (Mekhilef et al., 2012), partly due to cost recovery pressures and dependence on the private sector to distribute electricity widely (Cook, 2011). Data from the Directorate General of Electricity showed that from September to December 2021, the national electrification ratio increased from 99.40% to 99.45%, and the electrification ratio in villages increased from 99.62% to 99.65%, with a total of 293 villages still without electricity. The electrification ratio shows a fairly rapid upward trend, although it has not yet reached the 100% electrification ratio target set in the 2020–2024 National Medium-Term Development Plan (RPJMN). This is because there are still areas in nine provinces of Indonesia that have electrification ratios below the average stated Ministry of Energy and Mineral Resources.

The achievement of the electrification ratio and village electrification ratio are indicators of the success of rural electrification programs (Hoke et al., 2017), which have shown significant improvement since the program was launched in 2017 (Mursanti & Tumiwa, 2019). The strategy employed in providing rural electricity is to build renewable energy generators for remote villages that do not have electricity, as stipulated in Presidential Regulation Number 47 of 2017 on the Provision of Energy-Efficient Solar-Powered Lights (PLTSHE) for Communities Without Access to Electricity. This program has been shown to result in a decrease in birth rates, illiteracy rates, and poverty rates in rural areas (Hoke et al., 2017). The development of off-grid renewable energy-based electricity networks can significantly increase the number of small industries in villages, which can serve as an intermediary mechanism where electricity has a positive effect on poverty alleviation (Wirawan & Gultom, 2021).

Despite a significant increase in the electrification ratio, there are still obstacles and challenges to implementing rural electrification programs in remote, isolated and outer most areas (3T). The challenges include difficult-to-reach environmental conditions, high investment costs, and limited government support with a limited budget (Mekhilef et al., 2012). For example, the rural electrification assistance program in Margo Rahayu Village, Mesuji Lampung, cannot be fully enjoyed due to the limited facilities provided by the government (Setiawan, 2017). Similarly, Ban village, located in the remote area of Kubu District, Karangasem Regency, Bali, has installed 120 units of photovoltaic with SHS (Solar Home System) or centralized PLTS for 15 hamlets, but 65.83% of SHS cannot operate due to damaged components and limited community knowledge, resulting in the abandonment of the SHS system and a return to conventional lighting (Ameliola & Nugraha, 2013). Therefore, the support of all relevant parties is needed to monitor every progress in providing rural electrification, from planning, implementation, utilization of the results, and evaluation (Setiawan, 2017), to ensure that rural electrification is not only about quantity but also long-term quality that can be enjoyed by the community in a cost-effective and efficient manner (Mursanti & Tumiwa, 2019).

In 2022, Ministry of Finance stated that the cost of electricity provision by the State Electricity Company (PLN) is entirely sourced from state capital participation. The high investment cost of expanding rural electricity networks could jeopardize PLN's financial health in the long run, with a large and continuous subsidy burden to be borne by the government (Mursanti & Tumiwa, 2019). Therefore, the involvement of the private sector is needed to achieve the electrification target ratio. However, the geographic conditions and low electricity consumption in remote areas are a consideration for PLN and the private sector in providing rural electricity (Mekhilef et al., 2012). Hence, one source of financing to accelerate rural electrification is through the Village Fund (Mursanti & Tumiwa, 2019).

The Village Fund was launched in 2015, and its priority use is regulated by the Ministry of Village PDDT based on the SDG village program. Although the Village Fund is not directly intended to increase rural electrification in Indonesia, it can be a catalyst for improving the electrification ratio through the provision of supporting infrastructure that supports the expansion of the electricity network. The Village Fund has an impact on the development of physical infrastructure that plays a backbone role, such as roads, bridges, tunnels, water supply, and electric telecommunication grids (Akbar & Sihaloho, 2019); (Rivera Putra, 2019). A study in China showed a positive correlation between the development of road infrastructure and electrification. Investments in transportation infrastructure are made to facilitate access to electrification for all communities in the area and promote integrated economic development (KIM, 2007). This connectivity will make it easier for the future expansion of the electricity network by both PLN and private

investors who want to enter the market, due to the availability of basic infrastructure, which is an input infrastructure required in improving the electrification ratio in an area (Peters et al., 2011). With adequate access, it will facilitate and reduce the cost of expanding the electricity network, taking into account more efficient transportation costs (Bahaj et al., 2019).

This study is interesting to examine considering that electricity is one of the basic needs of society and also serves as an economic resource necessary to support business activities. The advantage of this study is that, until now, there has been no research analyzing how the Village Fund is used for infrastructure development that ultimately supports the expansion of rural electricity networks in Indonesia. By using data from 64,127 villages in Indonesia from 2018 to 2020 sourced from the Ministry of Finance, the Ministry of Villages, Disadvantaged Regions, and Transmigration, and the Central Bureau of Statistics (BPS), it is hoped that this study can provide academic contributions, namely empirical studies on the influence of the Village Fund in accelerating the provision of electricity in rural areas in Indonesia through infrastructure development.

Method

The data used in this research is a combination of several data sources formed into a panel of 64,127 villages in Indonesia from 2018 to 2020. The data obtained is sourced from the Village Potential Census (PODES) by the Central Statistics Agency (BPS), the Ministry of Village, Development of Disadvantaged Regions, and Transmigration, and the Directorate General of Fiscal Balance of the Ministry of Finance. This research also used quantitative descriptive approach with a panel data regression method with a fixed effect model because each village had different characteristics, and unobserved time-invariant factors, such as the level of geographic difficulty, could be captured through the fixed effect. In addition, a time fixed effect was also added because observations throughout 2018 to 2020 may be influenced by certain trends or conditions, such as macroeconomic trends, political regimes, and the pandemic period, that may change over time. Therefore, adding a time fixed effect was expected to control these factors to remain constant throughout the observation period, reducing bias in estimating the relationship in the entire sample. The regression equation, or model, used in this study is as follows:

$$RE_{it} = \alpha + \beta_1 \ln DD_{it} + \beta_2 dDisadvantagesarea_{it} + \beta_3 ddAsphalt_{it} + \beta_4 Fourwheeldrive_{it} + \beta_5 dQualityofroads_{it} + \beta_6 Districtdistance_{it} + \beta_7 dTraffic_{it} + \beta_8 \ln Population_{it} + \beta_9 Poverty_{it} + \lambda_i + \theta_t + \epsilon_{it}$$

The data used in this research is a combination of several data sources formed into a panel of 64,127 villages in Indonesia from 2018 to 2020. The data obtained is sourced from the Village Potential Census (PODES) by the Central Statistics Agency (BPS), the Ministry of Village, Development of Disadvantaged Regions, and Transmigration, and the Directorate General of Fiscal Balance of the Ministry of Finance. The use of panel data aims to provide a more comprehensive analysis so that the research results can be broader and generalized. The determination of the observation unit in this study is based on the Ministry of Finance data on villages that consistently received the Village Fund during the research period, where the number of recipient villages was 74,953 in 2018, then 74,950 in 2019, and 74,949 in 2020. This is because during the observation period, there were villages that changed their administrative status from villages to urban villages or vice versa. Furthermore, the selected village data was combined with PODES BPS and the Ministry of Village, Development of Disadvantaged Regions (PDTT) data using the BPS relationship code, and there were some village codes that did not match, resulting in 64,127 villages meeting the criteria for this study. Based on 192,381 observations during the period from 2018 to 2020, it can be seen that the distance between districts among

villages has a considerable range of differences, where there are villages that have very short distances to the district, such as in Megati Village in Bali and Bilalang IV Village in North Sulawesi, which are only 1 km away from the district, while there are villages that have very long distances to the district, such as Wanggambi Village in Papua, which is 150 km away from the district, and Selaw Village in Papua which is 135 km away from the district.

Results and Discussion

Indonesia, as an archipelagic country, faces challenges in achieving even development across all regions or areas in Indonesia, especially in underdeveloped, front, and outer areas (3T). In an effort to achieve even development, one of the measures taken by the government is to continue to increase the electrification ratio until it reaches 100%. The acceleration of electrification is certainly a hope for rural communities that currently do not have access to electricity. Quoted Ministry of Energy and Mineral Resources, The Village Electrification Ratio continues to increase and has reached 99.65% as of December 2021, while the total number of villages without electricity is 293. The increase in electrification in Indonesia is ongoing, but achieving a 100% electrification ratio poses its own challenges because the areas that are not yet electrified are mostly regions with difficult geographical conditions to access, and the budget for electricity provision is limited. Therefore, there is a need for infrastructure development or improvement, such as roads, to provide easy access for the expansion of the electricity network, including through village fund financing.

Based on the results of the fixed effect estimation, it is known that the village fund (Dana Desa) is significantly positively correlated with the village electrification ratio during the period from 2018 to 2020. Every one percent increase in the Village Fund (lnDD) will increase the electrification ratio in each village by 0.98 percent at a significance level of 5 percent. These estimation results indicate a significant influence that is likely due to the presence of observed and unobserved conditions or characteristics that could not be accommodated in this study due to data limitations.

The estimation results show that the village fund is positively correlated with the increase in the village electrification ratio. Although the Village Fund is not directly allocated to improve village electrification in Indonesia, it can serve as a catalyst to increase the electrification ratio through the provision of supporting infrastructure that supports the expansion of the electricity network (Mursanti & Tumiwa, 2019). The Village Fund has an impact on the development of physical infrastructure that serves as the backbone, such as roads, bridges, tunnels, water supply, and electric telecommunication grids (Akbar & Sihaloho, 2019); (Rivera Putra, 2019), where there is a positive correlation between the development of road infrastructure and electrification in China. Investment in transportation infrastructure is made to facilitate access to electrification for all communities in all areas and promote integrated economic development (KIM, 2007).

Based on the research, it shows that village funds do not have any significant influence on electrification ratios on Java Island. However, outside Java Island, village funds show a positive and significant correlation, where a 1% increase in village funds will increase the village electrification ratio by 2.93%. The estimated value is quite large, and it is suspected that there are observed and unobserved conditions or characteristics that cannot be accommodated in this study.

As for the difference in estimation results between Java Island and outside Java Island, it is due to the better development of regencies/cities in Java compared to those outside Java, both in terms of social and economic aspects (Victara Tinambunan et al.,

2019). Likewise, the achievement of electrification ratios on Java Island before the observation period was already quite good compared to those outside Java Island, so during the observation period, the increase in electrification ratios was not significant. Because development and the economy on Java Island are relatively good, village funds on Java Island can be allocated to other sectors such as health, education, agriculture, and advancing village cooperatives. Investment in Java Island is focused on labor and telecommunications infrastructure (Kurniawan & Ihsan, 2021). On the other hand, areas outside Java Island tend to have inadequate infrastructure quality, so village funds in those areas are more used to meet basic needs such as road construction that can encourage village electrification. In addition, low electricity demand and network distribution constraints pose challenges in expanding the electricity network (Mursanti & Tumiwa, 2019).

The relationship between the village fund (Dana Desa) and the electrification ratio in villages based on their geographical location, namely coastal and non-coastal areas shows that the Village Fund has no influence on the electrification ratio in non-coastal areas, while in coastal areas, it shows a positive and significant correlation, where every 1% increase in the Village Fund will increase the village electrification ratio by 0.91%. The estimated value obtained is quite large, and it is suspected that there are observed and unobserved conditions or characteristics that cannot be accommodated in this study.

The difference in estimation results between coastal and non-coastal areas is due to the difficult accessibility of coastal areas, resulting in a lower electrification ratio in coastal areas compared to non-coastal areas. The location of an area relative to the city center is a benefit in itself, where the closer it is to the business/city center, the more opportunities and ease of electrification expansion (Peters et al., 2011). Geographic factors are a consideration for electrification expansion. Coastal and offshore areas, especially islands, make it impossible to provide electricity from the national grid due to geological difficulties (Taye et al., 2020). In addition, the different conditions of an area determine the infrastructure conditions it possesses, including road access.

Of all those findings mentioned above, we can draw a conclusion that village funds significantly have an impact on increasing village electrification in rural area especially on coastal area (remote). On the other hand, on the non-coastal such as urban area it shows no significant impact. Despite the fact that village funds are dedicated to improving the welfare of rural communities, improving the quality of human life, and alleviating poverty throughout Indonesia through various programs run by the government.

Conclusion

The study shows that greater village electricity in Indonesia is positively and significantly correlated with village funds. This is due to the funding's indirect improvement of electrification through the development of transportation infrastructure, which in turn improves regional connections. The state-owned energy company (PLN) and private investors both gain from the enlarged electricity network that results from this. Due to the underdeveloped electrification in coastal areas and outside of Java, the effect is more evident. According to village features, infrastructure development should be prioritized, especially outside of Java and in coastal areas. The study's drawback, though, is that it only takes a few variables into account and indicating the need for additional research that includes information on government policies, rural electrification programs, and the engagement of numerous organizations and stakeholders.

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