**Village Fund Management to Support Green Development through Micro-Hydro Power Plants in Underdeveloped Rural Areas**

**(Case Study in West Sulawesi and Jambi, Indonesia)**

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**Abstract**

The world development challenges have been designed in the framework of SDGs 2030 that was supported by the United Nations as a global effort to attain 169 targets, such as natural resources management for sustainable rural development. This article aims: 1) to identify the implementation of Village Fund by local communities to contribute on the green development through micro-hydro power plants in the study site, 2) to analyze the community participation on green development to strengthen energy self-sufficient villages based on social capital of the community. The method in this research used the qualitative approach which was used in order to obtain a comprehensive understanding of all phenomena that occurred in the study site. The result of the discussion found that the implementation of green development through micro-hydro power plants was supported by the Village Fund that has contributed for local community prosperity. This study concludes that the adherence of the community to traditional institutions and local wisdom are needed to be preserved as the basis of community collectivity to conserve natural resources. New opportunities of local economic activities on integrated agriculture could promote socio-economic development in the era of Covid-19 pandemic through strengthening of farmer groups and community development.

**Keywords:** Green development, village fund, natural resources management, social capital, Covid-19 pandemic.

**Introduction**

Poverty is a fundamental problem in world development, especially in Indonesia as one of developing country. Poverty is defined as a person's inability to meet his basic needs due to inability to access or control economic resources[[1]](#footnote-1). The inequality of socio-economic development is one of the causes of poverty in Indonesia, generally in rural communities. Law No. 6/2014 concerning Village as the basic national policy to reduce poverty in rural level[[2]](#footnote-2) which are the important aspect of the government's policy agenda to reduce poverty and equitable development between rural and urban communities, and provide opportunities for the participation of stakeholders in the development of rural communities.

Rural development policy is an effort of community development in managing their own villages, conducting development based on local initiatives and creativity, including development in underdeveloped rural areas[[3]](#footnote-3). Village governments and communities are given autonomy in financial management to conduct local development and community empowerment programs. The capacity of the community and village government becomes a challenge for the success of planning and implementation through the Village Fund that will contribute for local communities.

Furthermore, the budget allocation of the Village Fund from in 2019 was IDR 70 trillion.[[4]](#footnote-4) When compared to the previous period, the village funds in 2018 & 2017 were IDR 60 trillion, while the village funds in 2016 & 2015 were IDR 46.7 trillion and IDR 20.7 trillion. The Village Fund program has been implemented since 2015 to improve the local economy and village communities’ welfare and the government targets that the Village Fund allocation always increase every year. Based on the evaluation result for 3 (three) years of the Village Fund implementation from 2015-2017 showed that the Village Fund has been proven to have produced varieties of facilities and/or infrastructure that are beneficial to the communities. In addition, villages also have the opportunity to develop the local community's economy, through training and marketing of community crafts, developing livestock and fisheries businesses, and developing tourist areas through Village-Owned Enterprises (called: BUMDes).

Generally, underdeveloped rural areas in Indonesia do not have access to electricity from the State Electricity Company. In Indonesia there are 2,424 villages that have not been electrified, and most of these villages are located in underdeveloped rural areas due to the electricity network unable to reach their homes[[5]](#footnote-5), such as Masoso village in Mamasa District, West Sulawesi Province and Tanjung Alam village in Merangin District, Jambi Province. They built the micro-hydro power plants (called: Turbine) in order to fulfill and increase the electricity service for the local community that sourced from the river in their village.[[6]](#footnote-6) Therefore, this study was conducted in 2 (two) villages in Masoso village and Tanjung Alam village that are located in the upper land and characterized by hills (mountain), river, and forest that are primary resources for generating the turbine to fulfill the electricity. The landscapes of both villages represent the dynamic relation between the community and natural resources in socio-cultural and gender contexts. The development of turbines in Masoso and Tanjung Alam were conducted by the community’s effort and initiative since 10 (ten) years ago, because they want to relish the electricity like other regions. Nowadays, both villages independently utilize the Village Fund in supporting their initiative to be a self-sufficient energy village, especially in electricity.

Based on explanations above, this study is focused on community development studies regarding natural resources management through micro-hydro power plants in study sites. This study aims: 1) to identify the implementation of Village Fund by local communities to contribute on the green development through micro-hydro power plants in the study sites; 2) to analyze the community participation on green development to strengthen energy self-sufficient villages based on social capital of the community. The biggest challenge of sustainable rural development to achieve national development and SDGs 2030 are how these policies are implemented at field level. By analyzing and investigating the problem, this article can contribute for national development improvement and recommendations through involvement of community as well as to enforce the implementation Law No. 6/2014 nationally by focusing on green development. This will be beneficial not only for Indonesia, but also for the world in achieving economic recovery amid the pandemic of Covid-19.

Method used in this study was a qualitative approach. This method was used in order to obtain a comprehensive understanding of all phenomena occurring in the study site. Qualitative methods used 5 (five) approaches, i.e. local wisdom identification, local economy activity, social mapping, identification of economic opportunities for social entrepreneurship, and the case of micro-hydro power plants program that affect the community (cohesion, mutual cooperation, vulnerability and conflict between communities). This study is conducted by a case study due to it involves an intensive and detailed analysis.[[7]](#footnote-7) In the process of research, the researchers built interactions with local government, local leaders, and the community to obtain relevant information about Village Fund management and natural resources management. The informant who was involved i.e.: head of village, head of customary, public figures, women and vulnerable groups, farmer groups, households, manager ofmicro-hydro power plants (turbines). The selected informants are those who are directly involved in the field, they work together with researchers and provide relevant information related to the development of rural communities.

**The Village Fund Management to Contribute on Green Development**

The Village Fund program is a new framework of Indonesia’s development as an effort to improve prosperity in rural areas that are rich in natural resources. However, the existing conditions showed that natural resources have no positive impact and correlation with the community’s welfare. Moreover, there are unfair accusations that accuse the community as the actor of deforestation, unsustainable land conversion, and land use practices threaten the country’s ability to sustain economic growth and reduce poverty[[8]](#footnote-8). Therefore, the Village Fund management needed to improve local natural resources in low-carbon growth strategies, and spur local initiative through emerging opportunities in renewable energy, such as development of micro-hydro power plants to support local electricity for communities. Green Prosperity Project (GPP) that was conducted by Millennium Challenge Account-Indonesia discusses that GPP has objectives to reduce intensity of carbon emissions and to catalyze sustainable development at the local level by developing, financing, and implementing green growth[[9]](#footnote-9). However, the implementation of GPP is dominated by industrial approach, although the local community will be receiving benefits for their livelihood. Furthermore, some authors believe that the potential solution to address the problem of the impact on the world’s environment is to reduce the level of various socio-economic activities in the use of resources[[10]](#footnote-10).

The implementation of the Village Fund program for all villages has not yet contributed to equal distribution of the welfare of the local community. Data from the Ministry of Village states that based on the *Indeks Desa Membangun* (IDM)[[11]](#footnote-11), there are only 1.22 percent of villages in Indonesia that have categorized independent villages, 12.59 percent (developed villages), 55.45 percent (developing villages). Meanwhile, there are still villages that have categorized underdeveloped villages (25.58%), and very underdeveloped villages (5.16%) which are generally located in rural areas. Those villages generally have territories that still adhere with their customary law and local wisdom, and the community's livelihood patterns still rely on their local culture in relation to the natural resources. According to the Law No. 6/2014 that villages are recognized as a Customary Village. The definition of Customary Village is villages that still have strong customary law[[12]](#footnote-12), and they have various names, for example: *Banua, Banjar, Gampong, Kampung, Pekon, Kampuang*. These traditional villages are spread across Sumatra, Bali, Banten, Sulawesi, Papua and others. However, in the context of rural development, the influence of customary institutions in the village governance is relatively limited, and the information about the Village Fund program in underdeveloped rural areas on green development in Indonesia is limited and/or rarely.

The discussion about green development has been written by many researchers, both Indonesian and non-Indonesian authors. The analysis of “green” theoretical and concepts has contributed to a discussion of the international concern between sustainable rural development and ecological aspects. The Village Fund program can be oriented on environmental sustainability to support rural development. However, based on empirical data in Central Java, the Village Fund program allocation by the government is still limited in cases of physical development (infrastructure sector) and far from environmental sustainability programs[[13]](#footnote-13), Therefore, there is no relation between the Village Fund program and green development in rural communities comprehensively.

Generally, customary villages in Indonesia are classified as underdeveloped villages (see **Table 1**), and they faced with the fact that they are still limited in managing their natural resources through the Village Fund program to strengthen social, economic and ecological resilience. Masoso and Tanjung Alam are administratively located in Mamasa and Merangin districts. Ecologically, Mamasa and Merangin locations are characterized by forests, mountains, rivers. The forest area in Mamasa can be categorized as protected forest (*hutan lindung*) and limited production forest (*hutan produksi terbatas*), while position of Merangin at the headwater and adjacent with *Kerinci Seblat* National Parks that caused most of the community member to work as farmer in the garden. Both communities at study site become farmer in the garden are not their choice, but “necessity” because of they need to adapt with the natural condition. The wealth of natural resources that are extent at their rural areas on the other hand are still limited in human resources, agricultural activities are still maintained in accordance with the context of local wisdom. Local people have limited access to improve economic development was also affected by the infrastructure facilities at the villages. Both communities produce paddy field product for household’s subsistence, while productive commodities such as coffee were sold to fulfill the other living needs (education, house and health).

Table 1

The Development Village Index 2019

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Village** | **Social**  **Defense**  **Index** | **Economic**  **Defense**  **Index** | **Environment**  **Defense**  **Index** | **Development**  **Village**  **Index** | **Status** |
| **Masoso** | 0.69 | 0.27 | 0.33 | 0.43 | **Very Underdeveloped** |
| **Tanjung Alam** | 0.74 | 0.31 | 0.67 | 0.57 | **Underdeveloped** |

*Source*: Ministry of Village (2020)

Furthermore, the community in Tanjung Alam used traditional techniques in planting paddy. Local government recommendation to planting the paddy field twice a year was difficult to accept by the community because of their tradition, as stated by Vice Traditional Leader of Tanjung Alam Village below:

“*...it is difficult for us to accept the government’s recommendation to plant the paddy field twice a year. Local rice genotype that we used is already suitable with the condition in this village. Our paddy field is for family’s subsistence needs, and not for sale. We only sell the rice to our neighbors who really need it, but it is very scarce. We used to lend the rice, not to sell them...*” (Supardi, 60 years) [[14]](#footnote-14).

Furthermore, both communities in the study site do not use the wage system in preparing and cultivating their land, but they use the *arisan tenaga kerja* system. In the rice planting season *dukun padi* has an important role. There was restriction for the community to plant their rice before the *dukun padi* told them to do, and this tradition still retain until today. The community also used a traditional knife called *ani-ani* to harvest their rice during harvest season. They were restricted to threshing the rice all at once since it is in contrary to traditional values in the study site. Therefore, people’s adherence is needed to preserve natural resources in villages.

Traditional values are embedded systems in the community to protect values of social relationships at various levels, social structure and its relation to natural resources, and it will affect the various levels of the community. Local knowledge in Masoso and Tanjung Alam can be understood as a system of local knowledge that has been acknowledged, practiced and become a tradition in the community in the management of natural resources and human life (social and economic systems). Although both villages were categorized as underdeveloped rural areas, but they are still strengthening the local wisdom which is recognized regulatory mechanism based on the custom values agreed upon by community members. Local knowledge in both villages were also transformed into a form of institutional or social capital based on community development institutions, such as turbine management for electricity services for residents in both villages.

The implementation of micro-hydro power plants to support green development has been studied by Bracken, *et al.* (2014) that examine the ways in which micro-hydro is engaged by people and organizations as a means of contributing to the UK's policy ambition for renewable energy[[15]](#footnote-15). Turbine institutions in Masoso and Tanjung Alam have responsibility in terms of water resources management for the turbine sustainability and all residents obtain electrical service (see **Figure 1**). The ownership/control of micro-hydro power plants is conducted through community-based approach due to efficient and reliable form of clean source of renewable energy in the village[[16]](#footnote-16). All communities have benefits from the turbine due to it can support various agricultural activities, such as home equipment production machine, chicken egg hatcher machine, machines to produce cake, coffee miller machine, coffee processing machine and patchouli distillation machine. Furthermore, the success of turbine systems depends on social factors and technical aspects, such as community capacity building, operation and maintenance, and involvement of stakeholders[[17]](#footnote-17).



Figure 1

Turbines in Masoso and Tanjung Alam

**Community participation on to strengthen energy self-sufficient villages**

Based on existing data, all residents in both villages have no access to electricity from the State Electricity Company, thus the presence of electricity is important to fulfill their livelihood[[18]](#footnote-18) . With the existence of a self-sufficient energy on electricity, all citizens understand the importance and benefit of water for turbines. The reduced water flow implies a decrease in the water which then affects the turbine. The preserved natural resources require communities to conserve the forests to maintain the availability of water particularly for economic resources. Electricity in Tanjung Alam is very important to support *Telaga Biru* ecotourism which is located around customary forests, and the village government has designated *Telaga Biru* as an economic opportunity for the local communities[[19]](#footnote-19). Therefore, turbine management collectively reveals that cohesiveness between people and nature can live and be preserved synergistically for mutual benefit, but should be followed by promoting local wisdom due to the adherence of the community to traditional institutions and local wisdom need to be preserved as the basis of community collectivity.

Based on the explanation above, the developments of micro-hydro power plants that have been run in the two study sites so far have potential ecologically sustainable impact. Generally the community thought that turbines have a positive impact on the community life in the three study sites (see **Table 2**). In Tanjung Alam, the turbine power is relatively small, only 50 kilowatts (kW) and only produced 30 kW, thus the electricity can be used for home lighting or TV, where the electricity dues for each households are IDR 15,000 (20 watt or one lamp) and IDR 20.000 (60 watt or 3 lamps). New families that still build their house and hut in the garden have no access to electricity due to lack of electrical installation network to their homes. Furthermore, the turbine maintenance in both villages are needed to improve community participation in the form of payment of the electricity dues, and the village government was allocated the Village Fund to support electrical sustainability and improvement of the electrical services for all communities. Therefore, the turbine management pattern has been conducted by community-based turbines management which is supported by local leaders, especially village government.

Table 2

The Institutional Pattern of Turbine Management in the Study Site

| **Institution** | **Village** | |
| --- | --- | --- |
| **Masoso** | **Tanjung Alam** |
| Establishment | Since 2009 managed by Turbine Organization | Since 2011 managed by Village Government |
| Management | Chairman, Secretary, Treasurer | Chairman, Secretary, Treasurer, and Operator |
| Program | PNPM Green 2009 | Local Government 2011 |
| Water sources | *Masoso* River (Turbine | Headwaters of *Masurai* Mountain |
| Services | Turbine 30 kW, Start from 3 PM – 7 AM, and Sunday 24 hours | Turbine 50 kW, Start 3 PM – 8 AM, and Friday 24 hours |
| Control over forest and water management | Based on local knowledge and leadership | |
| Development Micro-Hydro Power Plants | Ecologically very potential to be developed as it is still supported by a sustainable forest resources | |

*Source: Researchers (2020)*

The importance of village government roles is needed to support turbine management. The Village Fund that was allocated by the central government in two villages reaches IDR 800 million in 2017-2019 (see **Figure 2**). Actually, communities in Masoso and Tanjung Alam have high expectations on electricity services in their area since the electricity is very important to support the household activity and were expected to support public facilities and improve small scale industry productivity. However, there are still some obstacles in the management and utilization of turbines, such as the broken turbine and dynamo affected to a significant additional cost for reparation. Village government and turbine management make reparation to resolve technical damage through funding that obtained from monthly dues from the community and partially from Village Fund Allocation.

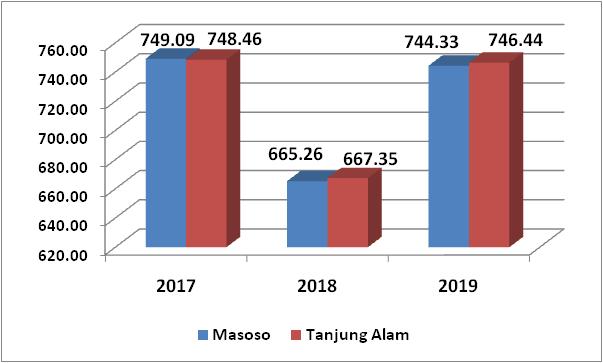


Figure 2

Village Fund Allocation in Masoso and Tanjung Alam

(Source: Ministry of Village, 2020)

Furthermore, the Ministry of Village regulation stated that the Village Fund can be managed for the sustainable development of natural resources in the village[[20]](#footnote-20). Both in Masoso and Tanjung Alam, their turbines have contributed to livelihood opportunities of the local community. Although still limited access to electricity, their turbines have been contributed for community lives. They are realized that the electricity is the main issues faced by communities in underdeveloped rural areas, thus they have initiative and creativity by involvement of community participation and village government that can build and maintain their turbines through monthly dues and the Village Fund allocation, where these allocations are prioritized for the turbine maintenance and the sustainability of water discharge. Therefore, people in both villages have a strong commitment to preserve their catchment areas by protecting natural resources, including forest, mountain/hills, and rivers.

In Masoso, local people have strengthened local wisdom to preserve their natural resources by carrying out the term: *tak malo mulelleng kayu lan tondok kediari pariane*. This means that all trees at forest should not be cut down before rice harvest, because the rice plants need water up to harvest. The term is also recognized and practiced inherently in society. Local people in Tanjung Alam, they not only have strengthened local wisdom through preserving natural resources, but also preserve *belukar lasa*, that is communal land around the village which has benefits until today for local communities. Ownership status of *belukar lasa* is owned by customary institutions and can be used for the community village needs, such as annual crops (*palawija*).

Community's efforts that have developed turbines in both villages are aimed to preserve environmental, social and economic aspects through a green development approach. For these reasons, natural resources management and protection of water sources should be the main priority in the context of rural development programs. Communities in both villages have a unique socio-cultural that can contribute to ecological management and sustainability of water sources to build local communities and natural ecosystems that have a good effect on self-sufficient village energy. However, those efforts need support from local leaders and village governments related to the economic and social development of the community with the turbine management through the allocation of Village Fund.

Furthermore, the benefits of Village Fund in both villages have already been appropriated with local communities. Based on Law No. 6/2014 and the Ministerial Regulation 14/2020 concerning Village Fund Priorities stated that utilization of natural resources in villages can use appropriate technology, such as micro-hydro power plants (turbines). This means that turbines in both villages were appropriate with the needs of the community due to it can solve electricity problems adequately. Their turbine does not damage environments, but it can be easily utilized and maintained by the community, and produces added value from economic and environmental aspects. Therefore, the encouragement of the village government and local leaders in allocating Village Fund for turbine management is a concrete action to preserve energy resilience in sustainable rural development.

The government has a commitment to provide the Village Fund for infrastructure development, including micro-hydro power plants. This funding scheme is expected to help build and manage electricity power plants for villages that need self-sufficient energy. Maintenance is one of the contributions of Village Fund in both villages for the development turbines, such as financial support for generators and electricity distribution network to households, and the Village Fund allocation can be directed for micro-hydro power plants development[[21]](#footnote-21). However, financial support for micro-hydro power plants is not only from Village Funds, but also for self-sufficient funding of communities, including monthly dues for electricity. Therefore, the key success of micro-hydro power plants management in both villages are partnership between local communities and village government, where community participation is always related to community involvement in green development.

Furthermore, the development of micro-hydro power plants is directed to increase community commitment to maintaining natural resources in study sites. Traditional values are embedded systems in the community to protect values of social relationships at various levels, social structure and its relation to natural resources, and it will affect the various levels of the community. Local communities have strengthened local wisdom to preserve their natural resources by obeying customary law. In Mamasa, trees in the protected forests are forbidden to be cut down, but there is licensing from forestry services that local communities may grow coffee in protected forests but should not be burned, and the required shade trees such as Lamtoro, Dadap, and Gamal. Based on facts, degradation and destruction of the natural resources, such as deforestation, land and forest fires, land use change, cannot be solved without conducting natural resource governance at the local level[[22]](#footnote-22), and needed the involvement of divergent experts to pay attention on ecological sustainability[[23]](#footnote-23).

Communities in both villages should prepare various challenges in the future through collaboration with stakeholders in supporting green development. Local stakeholders consist of individuals and institutional groups located in the village, such as the village government and turbine management. This collaboration between community and stakeholders is very important to support the development of socio-economic activities, such public facilities and small scale industry productivity. In both villages, the benefit of turbines is limited for household activities, and there is no electricity in the clinic, school, mosque, and village office or even in the village hall. For these reasons, if the community will improve the turbine development and natural resources management, it is very important to build cooperation with various parties, including: 1) the government plays a role in encouraging access to services through rural development programs based on community participation, 2) Village-owned enterprises (Badan Usaha Milik Desa) as a forum increasing regional economic development ([[24]](#footnote-24)Sumarni et al., 2020) through various collaborative institutions with various parties, 3) Regional stakeholders are local government agencies, universities, and non-governmental organizations. (NGOs), 4) National stakeholders are the Ministry of Villages, Development of Underdeveloped Regions and Transmigration, the Ministry of Home Affairs, the Ministry of National Development Planning or the National Development Planning Agency.

**Conclusion**

Green development through micro-hydro power plants has been conducted by communities in Masoso and Tanjung Alam as the development efforts through participatory approaches. The importance of Village Fund to support green development is needed in the form of a breakthrough to be self-sufficient energy villages. Although both villages are categorized as underdeveloped rural areas, but local communities have initiative and creativity developed turbines for obtaining electricity. The presence of turbines in both villages has encouraged local economic development, although still limited due to several challenges, such as low turbine capacity. Therefore, the innovation of appropriate technology on turbines is the main agenda to resolve various socio-economic challenges at study sites.

The implementation of green development through micro-hydro power plants was supported by funding cooperation, namely community dues and the Village Fund for turbine maintenance. This funding scheme could help communities to build and manage electricity power plants that are allocated for financial support to maintain generators and electricity distribution networks, and this pattern is an effort to become a self-sufficient energy village. Furthermore, local communities have strengthened the commitment in preserving natural resources to protect water continuity as the priority sources in the development of micro-hydro power plants. By the presence of electricity, local communities in both villages can increase in various socio-economic opportunities, especially during the Covid-19 pandemic, the electricity has become an important aspects for local communities to be able doing various activities at their home, such as students can learning from home, farmers can work in production activities, public health services, household duties for women's groups because they often have a bigger domestic roles. In addition, electricity in Tanjung Alam is very important to support *Telaga Biru* ecotourism which is located around customary forests that have been designated by the village government. Community adherence to customary institutions and local wisdom is an important aspect that must be preserved as the basis for community togetherness to conserve natural resources. Therefore, the encouragement of the village government and local leaders in natural resources management is a concrete action to preserve energy resilience in the context of sustainable rural development.

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