

DEVELOPMENT AND MANAGEMENT POWER PLANT MICRO HYDRO
(PLTMH) IN THE AREA WITH THE TERRITORY WITH
COMMUNITY EMPOWERMENT METHOD

Fauzan Murdapa¹⁾, Suharno²⁾, Yanuar Burhanudin³⁾, Eko Raharjo⁴⁾

- 1) Department of Geodetic Engineering, of the University of Lampung
- 2) Department of Geophysics Engineering, the University of Lampung
- 3) Department of Mechanical Engineering, the University of Lampung
- 4) Faculty of Law, the University of Lampung

ABSTRACT

Penyong Kayan Village is one of the hamlets located in the Capital District of Lampung Barat. Although located in the Capital City but all residents have not got electricity from PT PLN. For daily lighting used kerosene/diesel at a price of Rp 10.000/dm³. On the other hand, the location of the village is close to the flow of the Penyong Kayan river. By using community empowerment approach through Real Community Empowerment Learning Lecture (KKN PPM) activity has been built Micro Hydro Power Plant (PLTMH). The results of this activity are: 1) PLTMH with 10 KW power built successfully, 2) A total of 37 families have enjoyed electricity with power of 150 watts each. 3) Social capital and good natural capital has accelerated the success of PLTMH development, 4) The development of PLTMH has increased the income of the community through the saving of fuel expenditure amounting to Rp Rp 22,200,000 per year for 37 families, 5) The development of PLTMH conducted concurrently with the implementation KKN PPM proved effective to solve community problems, 6) Development of PLTMH in Penyong Kayan Village is able to increase project value significantly that is equal to 200%. To maintain the sustainability of this PLTMH, the steps taken are: 1) Established a group of PLTMH management under the name of Water Utilization Group (KPA/*Kelompok Pemanfaat Air*) TNBBS Siring Kujang, 2) Prepared Kampong regulations (*Peraturan Kampung*) on the utilization of PLTMH, 3) Technical guidance on PLTMH management.

Keywords: PLTMH, KKN PPM, Community Empowerment

PRELIMINARY

Background

Penyong Kayan hamlet is a remote hamlet lies adjacent to Bukit Barisan Selatan National Park (TNBBS), located 7 km from the Capital District of West Lampung. Access roads so far so far not electricity from PT PLN. Meanwhile, for home lighting residents use diesel fuel. On the other hand, this village is bypassed by Way Siring Kujang River and Penyong Kayan River which can be used as a source of small / micro electric energy. From the initial survey found the potential power of 16 KW is enough to be used as a source of information for all citizens of Dusun Penyong Kayan (37 KK).

The limited economic and human resources, making the community unable to build PLTMH and manage independently. Several times applying for PLTMH development assistance to the district government but always failing, so the community feels that the

government is not present when the community needs it. The longer this will result in the community not feeling as citizens of Indonesia. For this reason the program of development and management of PLTMH based on community empowerment is present when the community needs.

The Aim

Build a micro hydro power plant (PLTMH) using a local energy source (SES) with 10,000 watts of power using the community empowerment approach.

Problems

1. The economic level of the population is low.
2. Low level of education or low human resources.

Solution to problem

Using the community empowerment approach, namely:

1. Involving active community participation with the concept of mutual cooperation.
2. Involving students as motivators in mobilizing the community.
3. Using a community empowerment approach, not a project approach.
4. To maintain the sustainability of PLTMH, a group of PLTMH managers is formed.
5. To prevent the use of PLTMH conflict, Village Regulation on the utilization of PLTMH is planned.

Benefits of Activity

1. Can improve people's standard of living, quality of education and security.
2. Development of PLTMH with the concept of mutual assistance, able to maintain the preservation of culture mutual cooperation, so that will create community harmony.
3. Can increase public awareness in preserving the environment (forest) as a source of PLTMH springs.
4. Increasing the love of the homeland, because people feel the country is present when needed. PLTMH then drafted Village Regulation on the utilization of PLTMH.

METHOD OF IMPLEMENTATION

The steps of empowerment are: 1. Doing social engineering, namely: a. Doing planning programs together with the community, b. Doing mutual development, c. Arrange group of managers PLTMH, d. Develop village regulations on the utilization of PLTMH, e. PLTMH management training. 2. Perform engineering technology, namely: a. Design of turbine for 10 KW generator, b. Design of voltage control. While to measure the success rate of this activity is prepared with Indicator of Achievement as follows:

1. Quality of PLTMH System

One indicator to assess the success of research at the time of PLTMH development is an indicator of the quality of the PLTMH system (Table 1).

Table 1. Quality Indicators of PLTMH Systems

No	Description (Indicator) / Scale	5	4	3	2	1	Score
1	Electrification Ratio		x				x
2	Power PLTMH	x					x
3	Society of PLTMH management		x				x
Total score							Σx

Score Description: Very good: > 12, Good: 10 s / d 12, Fair: 7 s / d 9,
 Less: 4 s / d 6, Bad: <4

2. Social Capital and Natural Capital

The role of social capital and natural capital in the PLTMH system is very important. For this purpose, indicators such as presented in Table 2 are presented.

Table 2. Social Community Capital in Development of PLTMH

No	Indicator / Scale	5	4	3	2	1	Score
1	Culture mutual cooperation in building the village		x				x
2	Harmonization in relations between citizens			x			x
3	Natural capital		x				x
4	Quality of community human resources	x					x
5	Active participation of Pekon apparatus	x					x
Jumlah Skor							Σx

Score Description: Very good: 21 s / d 25, Good: 16 s / d 20, Enough: 11 s / d 15
 Less: 6 to 10, Bad: 1 s / d 5

3. Economic Benefits to Society

Economic benefits gained, namely the form of savings in household expenditures due to the shift of use of diesel to PLTMH (Table 3).

Table 3. Economic Benefits of PLTMH Users

No	Description	Cost per month	One year	Unit	Total (Rp)	Description
a	Use BBM/Solar	R	Rx 12 month	37	T1	18.00 pm - 24.00 pm= 6 hours
b	Use PLTMH	P	P x 12 month	37	T2	24 hours
	Savings	H = R-P	Hx 12 month	37	TH	

With the assumption of cost / month as above T1 then in one year, people save on fuel expenses of Rp TH.

RESULT OF ACTIVITY

The result of the construction of Micro Hydro Power Plant (PLTMH) is the power of 10 KW power plant system.

DISCUSSION

To assess the success of this community empowerment, the assessment is done using indicators: 1. Successful development of PLTMH, 2. Benefits for the Environment, and 3. Project Value.

1. Successful Development of PLTMH

a. Quality of PLTMH System

The quality of PLTMH system is seen from 3 indicators, namely: electrification ratio, generated power and managerial capability in managing PLTMH is presented in Table 4.

Table 4. Quality Indicators of PLTMH Systems

No	Description (Indicator) / Scale	5	4	3	2	1	Score
1	Electrification Ratio	x					5
2	Power PLTMH		x				4
3	Society of PLTMH management			x			3
Total score							12

Score Description: Very good:> 12, Good: 10 s / d 12, Fair: 7 s / d 9

Less: 4 s / d 6, Bad: <4

The resulting system is categorized well, but there are deficiencies in the manager caused by low quality of human resources. For that required continuous coaching by various parties, such as the Government of West Lampung District or NGO.

b. Social Capital and Natural Capital in the development and management of PLTMH:

Social capital which is meant here is the quality of inter-community relations, cooperation in solving problems in society, education level, support of village government officials / Village, harmonization of inter-community relations. While the natural capital of natural resources owned by the community.

Table 5. Social Community Capital in Development of PLTMH

No	Indicator / Scale	5	4	3	2	1	Score
1	Culture mutual cooperation in building the village	x					5
2	Harmonization in relations between citizens	x					5
3	Natural capital	x					5
4	Quality of community human resources			x			3
5	Active participation of Way Empulau Ulu Villagers	x					5
Total score							23

Score Description: Very good: 21 s / d 25, Good: 16 s / d 20, Enough: 11 s / d 15
 Less: 6 to 10, Bad: 1 s / d 5

Judging from social capital, residents of penyong kayan village is very good with score 23. It is also proved that in PLTMH development the community actively participate, so that activities can be completed quickly that is for 2 months. However, because the quality of human resources with low education, so that guidance in the management of PLTMH must be done continuously, this is the responsibility of the West Lampung District Government.

c. Economic Benefits to Society.

This PLTMH has directly provided economic benefits for the user community, that is, savings in spending on home lighting and possible utilization for economic value business activities (coffee heater, business of making the frame, chicken egg hatching and so on). The value of economic benefits as presented in Table 6.

Table 6. Economic Benefits of PLTMH

No	Description	Cost/month (Rp)	One yr	U nit	Total (Rp)	Description
a	Use of 2 lt / week diesel oil (price Rp 10.000/ltr)	80.000	960.000	37	35.520.000	Jam 18.00 s/d 06.00
b	PLTMH for lighting	30.000	360.000	37	13.320.000	24 jam
	Savings	50.000	600.000	37	22.200.000	

Assuming the cost / month as shown in Table 6, whereas the people who use the PLTMH amounted to 37 families, then within one year, the community saves fuel expenses of Rp22,200,000.

2. Other Benefits of PLTMH for Society and the Environment.

Much of the benefits of PLTMH in addition to those described above, including: environmental, educational and research benefits (Table 7).

Table 7. Other Benefits For MHP Development

No	Benefit	Description
a	Environment	<ul style="list-style-type: none"> ✓ Communities are forced to maintain the sustainability of water resources. ✓ Community will be easy to invite to jointly do tree planting movement in forest area ✓ The threat of landslide will be reduced and even prevented. ✓ In the long run there will be a decrease in the temperature of the micro area. This is done en masse then will participate in efforts to decrease global temperature.
b	Education	<ul style="list-style-type: none"> ✓ In the long term it can improve the quality of education for school-aged children. ✓ As a place of education for school-aged children or for society, that nature taught us that our natural environment is our natural friend.
C	Research	<ul style="list-style-type: none"> ✓ Can be used as a place of research for researchers about: Renewable energy, environmental and social engineering.

3. Value of Projects Generated

Using a community empowerment development model by involving Community Service Program Community Empowerment Learning (KKN PPM) students actively through KKN PPM grant, it can increase the project value from Rp 95,000,000 to Rp 190,215,000 with details of State Budget of Rp 95,000,000, community contribution Rp 63,765,000 , partner contribution Rp 2.500.000 and Lampung University assistance Rp 28.950.000. A considerable value for the community and a widespread impact on society.

CONCLUSIONS AND RECOMMENDATIONS

1. Conclusion

From the results of research activities under the title "Development and Management of Micro Hydro Power Plant (PLTMH) in Disadvantaged Areas With Community Empowerment Method", some conclusions can be drawn:

- a. The construction of PLTMH with 10,000,000 Watt power in Penyong Kayan Village, was successful and 37 people have been enjoying electricity with each power of 150 Watt.
- b. Social capital and good natural capital in Penyong Kayan Village has accelerated the success of PLTMH development.

- c. Economically the development of PLTMH has increased the income of the community through the savings of fuel expenses amounting to Rp 22,200,000 per year for 37 families.
- d. The development of PLTMH in Penyong Kayan Village by using this community empowerment model can increase the value of the project significantly that is equal to 200%, that is from Rp 95.000.000 grant fund to Rp 190.215.000.

2. Suggestions

- a. This applied research-based development program needs to be expanded and multiplied by its quota, given that the program can solve real community problems.
- b. Need to be developed in remote areas, outermost, leading or underdeveloped areas with larger funds.
- c. Given the success of the empowerment program, it is necessary media to spread this success, both scientific and scientific media popular. Therefore, Kemeristek Dikti is expected to facilitate it.

REFERENCES

- Hartoyo, Fauzan Murdapa, Dwi Haryono, dan R. Sigit Krisbintoro, 2012., “*Urgensi Kepemimpinan, Modal Sosial dan Kerja Kolektif Dalam Pemberdayaan Desa Mandiri.*” *Jurnal Masyarakat, Kebudayaan dan Politik*, Volume 25 No. 3 (2012)
- Hartoyo, Fauzan Murdapa dan Dwi Haryono., 2014.,” *Pengembangan Desa Mandiri Energi Melalui Integrasi antara Masalah dan Aset Lokal*”, Universitas Lampung, Bandar Lampung.
- Murdapa, F., Yulianto, S. Sulastuti, dan R. Sigit K., 2010.,” *Pemanfaatan Air Terjun untuk Pembangkit Listrik Tenaga Air (PLTMH) di Desa Pesawaran Indah, Kecamatan Padang Cermin, Kabupaten Pesawaran*”, Prosiding Seminar Dies Natalis Universitas Lampung ke 45, Bandar Lampung.
- Murdapa, F. dan Dwi Haryono., 2014.,”*Desa Mandiri Energi Berbasis PLTMH dan Biogas*”, Universitas Lampung, Bandar Lampung.
- Murdapa, F., Dwi Haryono, Sugeng PH, Yulianto R dan Sigit K., 2016., ”*Model Pemberdayaan Desa Mandiri Energi Dalam Rangka Meningkatkan Pendapatan Masyarakat Melalui Penguatan Lembaga Koperasi Desa*”, Prosiding Seminar Nasional Pendidikan Vokasi Indonesia Tahun 2016: Inovasi Teknologi dan Pembangunan Sumberdaya Manusia Berdaya Saing Memasuki Era MEA. Universitas Halu Oleo Kendari.