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To cite this article: H Malau *et al* 2020 *IOP Conf. Ser.: Earth Environ. Sci.* **448** 012112

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# Knowledge of Local Communities Affected by the Development of Geothermal Energy

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**Abstract.** Geothermal, in global discourse, is approved as renewable and environmentally friendly energy. This has made rapid developments in recent years, one of which is in Indonesia. Even so, this discourse was not well explored for the local community. Thus, they do not get the correct information about this energy. This research aims to study people's perceptions about the development of geothermal energy. This research is a case study in Pauh Duo Subdistrict, Solok Selatan Regency, Indonesia, where the MuaraLaboh geothermal power plant was developed. We use descriptive quantitative methods and are supported by survey methods to get people's opinions about the development of geothermal energy. The results show the fact that people still have limited knowledge about geothermal energy. This is caused by the lack of socialization by the government or companies regarding geothermal energy.

## 1. Introduction

Indonesia, as a country surrounded by many active volcanoes (ring of fire), has great geothermal energy potential [1,2,3]. Indonesia's geothermal potential is the third-largest in the world after the United States and the Philippines. In Indonesia's dependence on fossil energy [4], the large potential that exists makes geothermal energy an attractive alternative energy to be developed [5,6,7]. But unfortunately, this potential has only been utilized by 5% of the total potential of 28,910 GW [8].

Therefore, the Indonesian government in recent years has sought to encourage the growth of geothermal energy by building new power plants. The government's strategy is to involve the private sector in exploring and producing. One of the new exploration areas is the MuaraLabuh Geothermal Power Plant located in Pauh Duo District, South Solok Regency. The MuaraLaboh power plant has a production capacity of 250 Mw. The power plant will start operating in September 2019 and be managed by PT Supreme Energy.

As a relatively new energy source developed in Indonesia, people have a limited understanding of geothermal energy. Understanding will relate to social acceptance of the community towards geothermal energy. Because development requires social acceptance so that conflict does not occur [9,10,11,12,13,14,15]. In some cases, the development of geothermal power plants in Indonesia has been rejected by local communities and even caused social movements [16]. Therefore, we in this study aim to determine the perception of local or affected communities on geothermal energy, especially the knowledge possessed by affected communities on geothermal energy. Seeing the perception of affected communities is important in development studies.



## 2. Material and Method

In this study using a descriptive quantitative approach. Descriptive research methods with quantitative approaches are used to describe or explain events or an event that is happening at present in the form of meaningful numbers [17]. The subject and location of the study were conducted on communities affected by the development of Geothermal Power Plant (PLTP) in the District of Pauh Duo, Solok Selatan Regency. We conducted data collection in October 2019. Types and sources of data in this study used primary data and secondary data. Data collection uses observation techniques and questionnaires. Questionnaires with a Likert scale model developed based on operational definitions owned by the variable through a content validity process. Measurement of variables using a questionnaire instrument using a Likert scale used to measure attitudes, opinions, and perceptions of a person or group of people about social phenomena [18]. The sampling technique is done by "Simple Random Sampling", with the Slovin formula of a population of 10,527 at an error of 10%, then obtained a sample of 99 respondents. According to Kerlinger [19], simple random sampling is a method of withdrawing from a population or universe in a certain way so that each member of the population or universe has the same opportunity to be elected or taken. Before the questionnaire is used, it first tests the validity and reliability. Data analysis techniques in this study were carried out using descriptive analysis with the help of statistical product and service solutions (SPSS) version 23.0. After all the data obtained is collected and processed, the data is grouped according to the type and type of data and added information that is supportive in explaining the results of the research.

## 3. Result and Discussion

### 3.1 Characteristics of respondents

The first research results will present the characteristics of respondents. The characteristics of the respondents aim to spell out the description of the respondent's identity according to the determined research sample. Besides, it also to describe the characteristics of respondents by providing an overview of the sample group in the study. Description Data on the characteristics of respondents was obtained by distributing questionnaires to people affected by the development of Geothermal Power Plant (PLTP) Muara Laboh, Solok Selatan Regency. Characteristics of respondents can be seen in table 1.

**Table 1.** Characteristics of respondents

Variables	Characteristics	Respondents (%)
Gender	Male	49,5
	Female	50,5
Age	<20 years old	4,0
	21-30 years old	38,4
	31-40 years old	37,4
	41-50 years old	14,1
	>50 years old	6,1
Job	Private	13,1
	Housewife	30,3
	Government Apparatus	7,1
	Entrepreneur	21,2
	Farmers / Fishermen /	27,3
	Laborers	
	Others	1,0

Variables	Characteristics	Respondents (%)
Education	Elementary School	8,1
	Middle School	24,2
	High School	55,6
	Undergraduate	4,0
	Graduate	8,1
Monthly income (Rupiah)	< 500.000	24,2
	500.001 – 1.000.000	28,3
	1.000.001 – 2.000.000	33,3
	2.00.01 – 3.000.000	11,1
	>3.000.001	3,0

From table 1 it can be seen that the respondents, when viewed from the sex, are almost evenly distributed. Based on the age group of the majority of respondents aged 20-40 years, while the age below 20 years is the smallest age group represented. Housewives are the occupational group that represents the most respondents, which is 30.3%, while the smallest is the government apparatus. From the educational level, the majority of respondents came from the group who completed High School, and the smallest group was the Bachelor. And the last from the income group, respondents averaged 2 million rupiahs, which is 85.9%.

### 3.2 Local community knowledge of geothermal energy

Following the objectives of our study who want to know the perception of local communities about geothermal energy. So in the first part, we ask respondents about their knowledge of geothermal energy in general. In contrast to energy sourced from fossils and water, which is relatively familiar with the community. Geothermal energy is new energy so that the public's knowledge of this energy is limited. Our question begins with, do you know about the existence of geothermal energy in the area where you live? The majority of respondents said that they knew about the existence of geothermal energy, which amounted to 77.8%. While respondents who said they did not know and did not know were 21.2%. So, it can be said that the Pauh Duo people already know that their area has geothermal potential. However, this knowledge does not indicate that the community knows about geothermal well.

That is reflected in our next question. Although people know about geothermal energy, the majority of respondents do not know that geothermal energy is renewable energy. It is seen from the percentage who say that they do not know geothermal energy as renewable energy by 18.2% and 48.5% do not know. Meanwhile, respondents who stated that geothermal energy as renewable energy was only 33.3%.

Then we ask further with open-ended questions about what they think when they hear about geothermal energy. Most said they did not know what geothermal energy was, confirming a previous question that around 30% of respondents could not imagine their perception of geothermal energy. The second perception imagined by respondents about geothermal energy is the energy used by developed countries (27.3%). While those who say that geothermal energy as environmentally friendly energy is only 16.2%. This explains that some people do not have information about geothermal energy so they cannot perceive it.

**Table 2.** Local community knowledge about geothermal energy

Indicator	Characteristics	Respondents (%)
Knowledge about the existence of geothermal energy in the area you live	Do not know	9,1
	A little	12,1
	Know	77,8
	Very know	1,0
Knowledge of geothermal energy as a renewable energy	Do not know	18,2
	A little	48,5
	Know	33,3
	Very know	0
Knowledge of geothermal energy as ...	Energy used by developed countries	27,3
	Modern energy	14,1
	Green energy	16,2
	Energy does not come from fossils	3,0
	Renewable energy	5,1
	Non-destructive energy	0
	Do not know	32,3
	Others	2,0
	So as not to depend on fossil energy	12,1
	So that the environment is cleaner from pollution	19,2
Benefits of geothermal energy	No need to damage nature	2,0
	In order to be enjoyed by all citizens	22,2
	So that Indonesia can advance and not miss	6,1
	So that the electricity supply is met	26,3
	There is no benefit	12,1
	Others	0

Furthermore, when respondents were asked with an open question about the benefits of geothermal, their answers said that geothermal energy is to meet national electricity supply (26.3%) and so that electricity can be enjoyed by all citizens (22.2 %). Whereas those stating that geothermal energy is sustainable and environmentally friendly energy is only represented by respondents' answers that geothermal energy development makes the environment cleaner from pollution (19.2%), so it does not depend on fossil energy (12.1), and so that no need to damage nature (2%). This informs that, local communities still have limited knowledge about the benefits of geothermal energy as environmentally friendly energy. Whereas in the global discourse, geothermal energy is considered as environmentally friendly and sustainable energy [20, 21].

### 3.3 Local community knowledge about muaralaboh geothermal power plant

The second part that we are doing in this research is knowing about what local people know about geothermal power plants in their area, in this case, the MuaraLaboh power plant. We asked respondents about 3 things namely; energy capacity, area of land used, and perceived benefits. On the question of energy capacity, the majority of respondents did not know about energy capacity in the MuaraLaboh geothermal power plant (more than 70%). Likewise, with knowledge of the area to be used as a power plant exploration area, most respondents also did not know that, even more than 90%.

Besides the community also has low knowledge about the benefits that will be generated from the MuaraLaboh Geothermal Power Plant. This was seen when we asked respondents about their knowledge of the benefits of this power plant for the country, the majority said that they did not know the benefits (58.6%). Likewise, when we asked their knowledge about the benefits of the MuaraLaboh geothermal power plant for their village, most said that they did not know the benefits that would result from the power plant. And finally, we asked about their knowledge of the benefits they would get from this power plant when it was operational, most also stated that they also did not know it (39.4%). So it appears that local communities do not know the benefits of the existence of the MuaraLaboh geothermal power plant. Lack of community knowledge about benefits may become a problem in the future, one of which is a conflict between the company and the community.

**Table 3.** Local community knowledge about muara laboh geothermal power plant

Indicator	Characteristics	Respondents (%)
Knowledge of the energy capacity of the Muara Labuh Geothermal Power Plant	Do not know	70,7
	A little	7,1
	Know	20,2
	Very know	2,0
Knowledge of the area of land used in the construction of the Muara Labuh Geothermal Power Plant	Do not know	91,9
	A little	1,0
	Know	6,1
	Very know	1,0
Knowledge of the benefits of the Muara Laboh Geothermal Power Plant nationally	Do not know	58,6
	A little	15,2
	Know	25,3
	Very know	1,0
Knowledge of the local benefits (Nagari) of the Muara Laboh Geothermal Power Plant	Do not know	63,6
	A little	11,1
	Know	24,2
	Very know	1
Knowledge of the direct benefits that will be felt from the Muara Laboh Geothermal Power Plant	Do not know	39,4
	A little	38,4
	Know	16,2
	Very know	6,1

The lack of public knowledge makes us then question whether there is socialization carried out by the government or companies. First, we ask about whether the community has ever received information from PT Supreme Energy as a company that was given the concession to explore. Most of the results stated that they had never received information from PT Supreme Energy. Likewise, when we asked about the socialization given by the government, both the central and regional governments. The majority of the people also said that they had never received information from the government. This indicates that community involvement in the development planning process is still very low. Even though most of the people agreed (71.7%) with the construction of power plants, this could save potential conflicts in the future when the community felt the impact that was considered detrimental to them.

**Table 4.** Community Perceptions about Geothermal Development Socialization

Indicator	Characteristics	Respondents (%)
The socialization of geothermal energy by PT Supreme Energy Muara Labuh	Never	55,6
	Rarely	29,3
	Often	14,1
	Very often	1,0
Government's socialization of geothermal energy	Never	80,8
	Rarely	11,1
	Often	8,1
	Very often	0
Opinions about the development of geothermal energy in the Pauh Duo District. Solok Selatan	Never	8,1
	Rarely	17,2
	Often	71,7
	Very often	3,0

#### 4. Conclusion

This research indicates that local communities as affected communities still have limited knowledge about geothermal energy. For them, the existence of geothermal energy has not been considered as renewable and sustainable energy. Even though the global level of geothermal energy is considered as alternative energy that can be used for the future and reduce dependence on fossil energy that is considered damaging to the environment. However, such narratives have not been well delivered to the public, regardless of whether the discourse is right or wrong. Local or affected communities also stated that there would be no benefit they would get from exploitation carried out on geothermal energy in their area. Besides, community involvement in the planning process is also low, as seen from only a small portion of the community who know about the socialization carried out by the company or the government. So, this will certainly be a concern about the rejection that will occur in the future by the community and has the potential to become a conflict.

#### References

- [1] Radja V T 1986 *J. Geo* **15** 597-600
- [2] Mogg R J 2001 *J. Refocus* **2** 12-17
- [3] Di Pippo R 2016 *J. Prin, App, Case Studies and Env. Impact* **4** 403-426
- [4] Dutu R 2016 *J.En. Pol.* **98** 513-519
- [5] Manalu P 1988 *J. Geo* **17** 415-420.
- [6] Hochstein M P and Moore J N 2008 *J. Geo* **37** 217-219
- [7] Maulidia M, Dargusch P, Ashworth P and Ardiansyah F 2019 *J. Re. and Sust. En. Rev.* **101** 231-247
- [8] Pambudi N A 2018 *J. Re and Sust En Rev.* **81** 2893-2901
- [9] Payera S V 2018 *J. Geo.* **72** 138-144
- [10] Kubota H, Hondo H, Hienuki S and Kaieda H 2013 *J. En. Pol.* **61** 1079-1087
- [11] Manzela A et al. 2018 *J. Geo.* **72** 232-248
- [12] Pellizzone A et al. 2015 *J. En. Pol.* **85** 1-11
- [13] Pellizzone A et al 2017 *J. En. Pol.* **101** 561-570
- [14] Borzoni M, Rizzi F and Frey M 2014 *J. Ren. En.* **69** 60-73
- [15] Romanach L, Carr-Cornish S and Muriuki G 2015 *J. Ren and Sust. En. Rev* **42** 1143-1150
- [16] Fajri H, Ilham Q P and Hallawa H S 2018 *E3S Web of Conferences* **74** 03003
- [17] Sugiyono 2014 *Metode Penelitian Kombinasi* (Bandung: Alfabeta)
- [18] Sudjana 1996 *Metoda Statistika* (Bandung: Penerbit Tarsito)

- [19] Kerlinger 2006 *Asas-asas Penelitian Behaviour Edisi 3 Cetakan 7* (Yogyakarta: Gadjah Mada University Press)
- [20] Bonalumi D, Bombarda P A and Invernizzi C M 2017 *Energi Procedia* **126**
- [21] Shortall R, Davidsdottir B and Axelsson G 2015 *J. Ren. and Sust. En. Rev* **44**