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The Problem and Challenges to Development Lahendong Geothermal Education Park

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ABSTRACT

Development of Lahendong Geothermal Education Park as an area for tourist destination and study about geothermal has been repeatedly presented in various national and international scientific forums and even in informal discussions and exhibitions on geothermal. It is known that the Lahendong geothermal field is located in the city of Tomohon North Sulawesi Province. Today it has a production capacity of approximately 80 MW, capable of supplying approximately 40 percent of the electrical energy in the province. The problem faced by geothermal development in North Sulawesi or even in Indonesia is a deficiency of skilled employers capable to work professionally. Many parties have been committed to building the park, but the fact to implement the commitment that has been made is not enough just to give a statement, but it is a start and working on it is a really difficult thing. Geothermal potential in Tomohon has been proven, supported by a convenient location, so the area is ideal for a Park and to become a geothermal educational and information center, in Indonesia, but unfortunately this dream is far from reality to come true. Therefore the purpose of this research is to study and learn to know the specific details problems and obstacles as well as to make a recommendation for the development of this park. The study shows that it is not easy to realize the dream without a clear strategy and the support of all stakeholders and anyone who is concerned about the development of geothermal in Indonesia, even though the stakeholders have expressed willingness to provide care in building the park. It is expected that in today's conference there can be obtained input from participants about a reliable strategy that will be pursued so the dream of the establishment of an education and tourist park in Lahendong Geothermal can be realized.

1. INTRODUCTION

The Government of Indonesia has issued Presidential Regulation No. 5 of 2006 on National Energy Policy which establishes the use of geothermal energy in 2025 around 5%, or about 9,000 MWe but until now only 1,052 MWe have been installed, so it still takes effort to accelerate the development of geothermal energy in Indonesia because the electricity demands continues to increase from year to year. In connection with it, to support the development of geothermal energy that skilled workers needed, and now is the right time to prepare the people to understand about "what is geothermal?" In addition, the necessary cooperation to informed the public about the benefits and role of geothermal to help overcome the energy crisis in Indonesia, as well as conducted training for middle-skilled workers to support the geothermal industry in this country.

To overcome this, the government and the people of North Sulawesi feel the need to build a park on Geothermal Education at Lahendong as a story telling that can build the interest and enthusiasm of the children and younger generation to know and love the earth sciences as a populist science. So that later on, the children and or young generation who are professional and skillfully emerged to manage the geothermal so that the ideals in 2025 if Indonesia electrical energy supplied by geothermal resources of at least 5 per cent can be achieved.

Until now, the efforts of all parties has been carried out, either by the government, legislative, academics, developers, businesses and mining geothermal field general, electricity, other community areas such as tourism business operators, local community or the public in general, but the results are is not yet significant. It is proven by the establishment of North Sulawesi Geo Park in which the Lahendong Geothermal Education Park becomes interesting so that the purpose of this study is to find the root of the cause of the problem and a solution that can solve the problem that will awakened the strategy to encourage and speed up the development and help the LHE Park development become a reality.

The research method used is descriptive analysis by conducting a deep interview to some key informants, and conduct surveys to other respondents by mentioning their opinions through a list of questions that have been prepared, then the data is analyzed.

2. FIELD OVERVIEW

2.1 General

It is known that the geothermal potential is spread almost throughout the Indonesian territory except the islands of Kalimantan (Borneo), Papua and some other islands. In fact, data shows that 40 percent of the world geothermal potential is located in Indonesia. So why should the Lahendong Geothermal Education Park be built in Tomohon? A wise expression, that although it has been a long time but always keep striking to say, one million steps must be preceded by a single step, we have to start somewhere (R. Korompis p: 104). Then why not in Tomohon at Lahendong build a park for geothermal education and tourism destination?

As geographically, the city of Tomohon is positioned at 1° 15' North latitude and 124° 50' East Longitude, is plain cool and lush as it is situated at an altitude of approximately 700-800 meters above sea level (asl) and is surrounded by three active volcanoes

namely Gunung Lokon (1,689 m), Mount Mahawu (1,311 m) and Mount Masarang. The data indicate that the geothermal potential in Tomohon city and surrounding areas are abundantly, so the government and the community should work together to make Tomohon City as a tourist destination by relying on the available potential resources such as geothermal besides used to meet the energy needs are also utilized for tourism purposes. To date in 2013, the eastern part of Indonesia there is no place that produces electrical energy from geothermal apart from Lahendong in Tomohon with installed capacity of 4 x 20 MW.

Data shows that the field of human resource management needs of geothermal in Indonesia has not been balanced by the availability of experts and medium-skilled workers there, while the energy needs from renewable sources such as geothermal increased. Various attempts have been made either by opening formal education programs at various universities such as Bandung Techonogy University (ITB), Indonesia University (UI), Gadjah Mada University (UGM), and other study centers. It is still a hope to interest young people in learning earth sciences but it is still not significant compared to the ease of other studies. To resolve the problem, one needs stimulate the children's interest, young people or the general public about the curiosity to geothermal which can be reached through informal education as early as possible that can be accessed easily, professionally managed as a nature-based public education or community based edutourism and ecotourism.

2.2. Geothermal Potential in Lahendong and Surrounding

Lahendong field is placed at about 750 m above sea level, within the beautiful volcanic landscape of Minahasa. It is located between two active volcanoes, that is Lokon (9 km to the North) and Soputan (20 km to the South). Lake Tondano as the remnant one of the world's largest calderas (Newhall and Dzurisin, 1988) is located at 10 km to the east of the field (Figure 1).

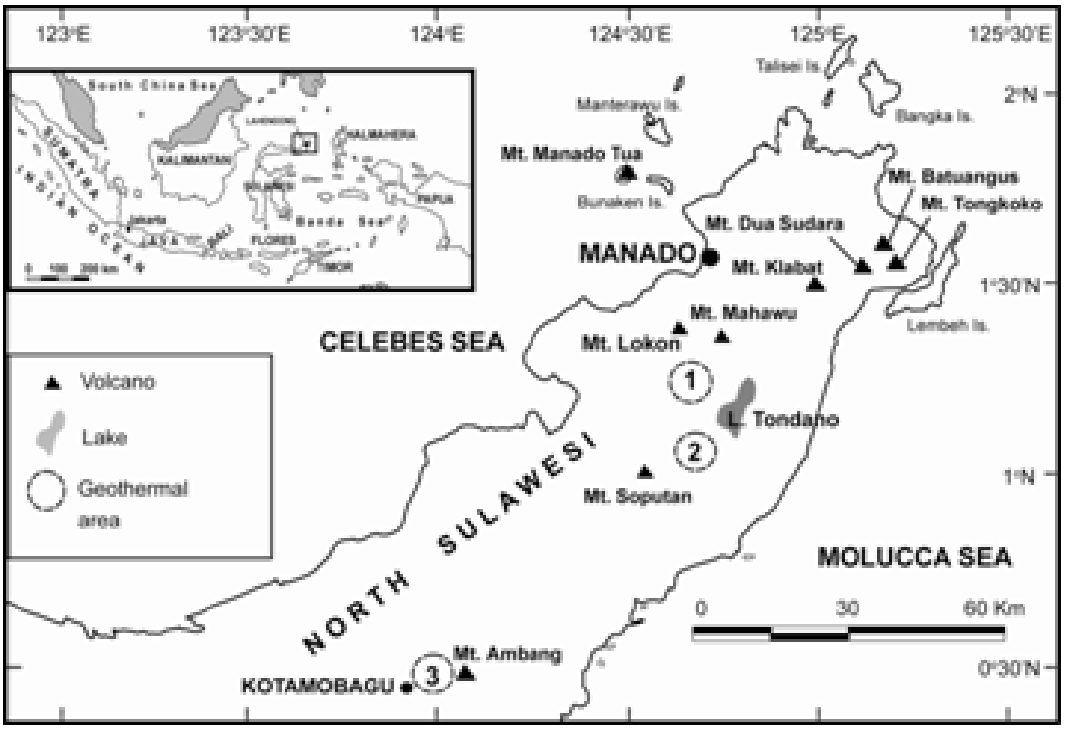

Figure 1: Location of the Lahendong geothermal system (1); and the Tompaso (2); and Kotamobagu (3) prospects with respect to major Quaternary volcanoes in North Sulawesi (Minahasa). (Utami, et all. 2011).

The geothermal resource at Lahendong has been developed by PT. Pertamina Geothermal Energy (PGE), and the electricity generation has been made by the State Electricity Enterprise (PLN). The field currently produces 80 MWe and now is being prepared to increasing the electricity production up to 100 MWe.

The situation map of the field is given in Figure 2. The field hosts patches of thermal manifestation, including a large mud pool in Lahendong valley, fumaroles and steam-heated features around Lake Linow, and hot springs and altered ground in Leilem, Pangolombian and Kasuratan villages.

Several neutral-pH, alkali chloride hot springs emerge at Tempang village (12 km south of Lahendong). The thermal manifestations at Lahendong and Linow have been more popular tourist destinations in comparison to those in other villages.

The first known published description of the thermal manifestation in North Sulawesi was made by a British naturalist, Alfred Rusel Wallace who visited Sulawesi in 1859 (Wallace, 1890), the year Charles Darwin published " On the Origin of Species". These include mud pools, steaming grounds, and hot springs emerged in the several spots between Tompaso and Langowan villages.

At Leilem village near Tomohon, the locals set up wooden sauna rooms above a cluster of small hot springs on the bank of the Leilem River. Each room is equipped with a shower of cool water piped from a neutral pH cold spring from a nearby hill.

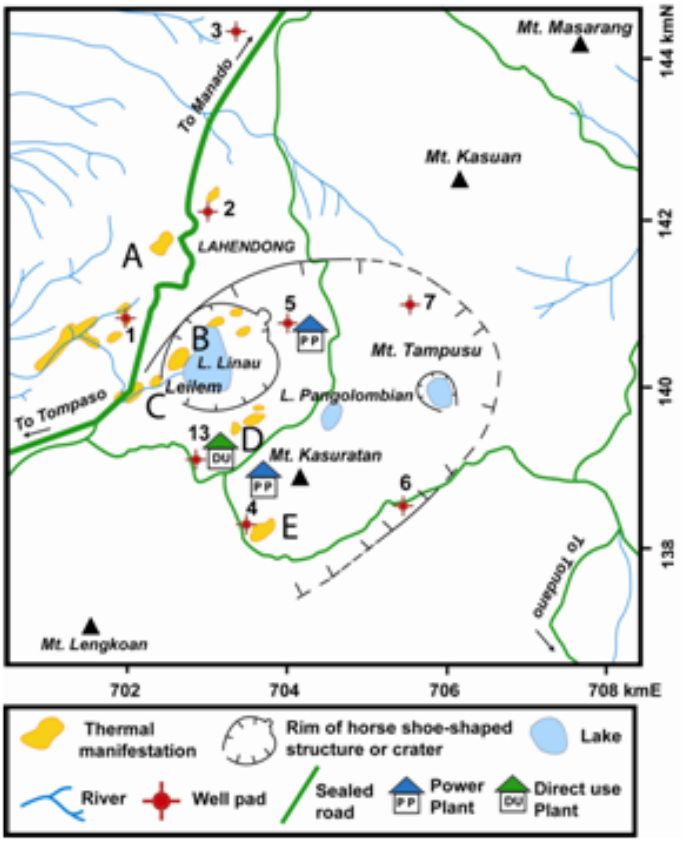

Figure 2: Situation map of the Lahendong geothermal field (Utami et al, 2011).

2.3. Cultural and Educative Significance of the Park

Indonesian culture is rich in story-telling tradition, so it is not a surprise that those living near thermal areas lovingly pass on the legends behind these thermal wonders to new generations and visitors. In North Sulawesi there is a legend of Toar (The Sun) and Lumimu'ut (The Sweating Rock). The ancestors of Minahasan people believed that they began their life in a thermal area in Tompaso.

The story of their life is depicted in Bukit Kasih recreational park in the Tompaso thermal area. It was belived that the occurrence of the twin mud volcanoes at Lahendong thermal valley (10 km North of Tompaso) was proof of the couple's everlasting love. A mud volcano is a hydrothermal mud buildup around an ejecting vent. Mud volcanoes commonly develop in the relatively drier parts of the large mud pool at the Lahendong valley. When two vents are located side by side, the "twin" mud volcano is formed.

Development of a geothermal field brings high technology into the area. The view of the operating facilities in the steam field, the power plant, and other plant utilities is indeed captivating. However, lay people (locals and visitor alike) may wonder: What is going on? How can the hot fluid from a great depth turn into electricity? Will the exploitation of geothermal resource harm our environment? Can we utilize the hot steam and hot water for other purpose? A public learning facility such as a geothermal education park is necessary in order to satisfy such curiosity.

3. THE INTENT AND PURPOSE OF THE DEVELOPMENT OF THE PARK

3.1. The Aims and Objectives of the Park.

We propose a geothermal education park concept that allows visitors to enjoy the atmosphere of a geothermal area, but at the same time:

a) Learn about the science of geothermal phenomena and appreciate the indigenous folklores and wisdom behind them. In this way the park encourages people, especially the young, to learn the science of the natural thermal heritage without ignoring its cultural significance.
b) Learn and appreciate the role of geothermal energy in fulfilling humanity's need of clean, renewable and sustainable energy. The park will show that the development of indigenous energy can help increase the prosperity of the community, and hence help eliminate resistance to the process of geothermal resource development.

The above concept of a park development is readily applicable for Lahendong since several park elements are already available, and the existing roads connecting the trails from the thermal areas to the area of steam production and utilization are in relatively good condition. As well, there is already public participation in the management and maintenance of the eco-tourism objects. These include the thermal wonders.

3.2. Current Situation

Since 2007, a building intended as a tourism information center was erected by the government of Tomohon City overlooking Lake Linow in Figure 3, which pointing is the Geothermal Information Center Building that has not been functioning. With minor repair, it would be a perfect gallery and geothermal information center. Items and collections can be displayed here.

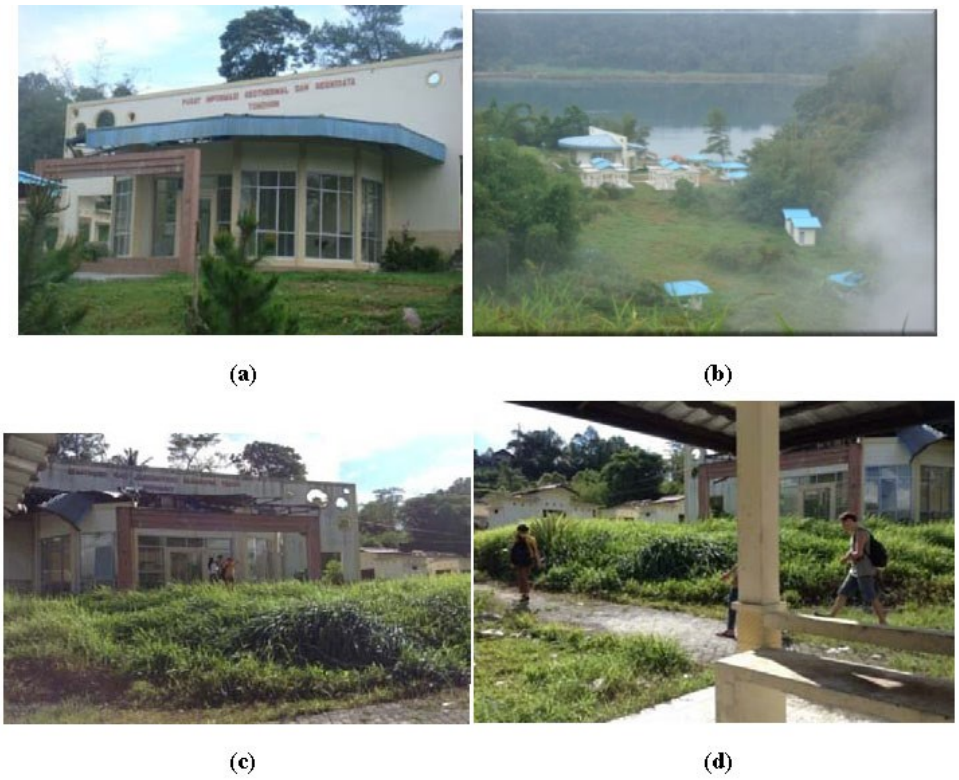

Figure 3. (a) & (b) Buildings at Linow Lake (view Year 2007); (c) & (d) Buidings at Linow Lake (view Year 2014)

Lake Linow with its fumaroles, altered ground, mud pots, and gas discharge on its banks would be an ideal first site for public educational interest. The development of Lake Linow as an eco-tourism spot by a local private company since 2009 is beneficial for the proposed geothermal education park as it provides well maintained public facilities including a café, parking ground, rest rooms, and walking tracks (currently limited on the Eastern bank of the lake).

The Lahendong thermal valley (about 2 km north of the Linow thermal area), although less developed compared to the Linow thermal area, is regularly maintained by a family who live nearby. The proposed public learning facility will undoubtedly give added value to the eco-tourism in the area.

The above pictures (Figure 3 (c) & (d)) were taken in April 2014. The state of the building at the same location and the area is very different, the same which the existing facilities which is still not functioning as expected.

In the Month of May 2014 a Focus Group Discussion was conducted in the area around Lake Linow in Lahendong, which was attended by several geothermal experts, academician, developers and other businessman. This group discussed the various topics that caused obstacles for the development of the education park. This can be seen in Figure 4. This discussion was followed by a survey with a few questions and opinions were asked of the respondents.

Figure 4. Focus Group Discussion for Development of Geothermal Education Park at Lahendong.

4. RESULTS AND DISCUSSION

Public comments or opinion were obtained from focus group discussions and a field survey with the following results:

4.1. Focus Group Discussions

This examination was attended by geothermal experts, academics, government, community leaders, business operators and geothermal tourism businesses as well as students. This discussion resulted in an agreement as follows:

a) Need to establish institutions that will manage Lahendong Geothermal Education Park include a working team, led by the City of Tomohon in cooperation with all relevant institutions in North Sulawesi.
b) Indonesian Geothermal Association (API) and Gadjah Mada University (UGM) will be a companion, appointing Pri Utami Ph.D. Head of Research Geothermal as a team leader.
c) Working Team will prepare a blueprint of the Centre for Education and Development in Tourism Geothermal Lahendong, Tomohon.

4.2. Field survey

A Field Survey to collect the opinions via questionnaires given to the government, community leaders, the community around the project site and the students who are not participants of the focus group discussion.

4.2.1. Identify the Response and Community Support of Geothermal Development Education Park in North Sulawesi, Indonesia

In order for the Geothermal Education Park development at the Lahendong area in Tomohon, North Sulawesi, it is necessary to analyze the problems that may arise in the context of preparations for the construction and implementation of the Geothermal Education Park. In identifying the problem we then conducted a survey to the community needs to know the factors, response, and public opinion against the development plan of Geothermal Education Park.

The survey was conducted on the general population in North Sulawesi with the presentation of 55% were Tomohon city dwellers and 45% of respondents came from outside the town of Tomohon. Respondents who participated generally aged 15 to 25 years (76%). Only 13% of respondents were over the age of 45 years, and the other of whom aged. The most common profession of the respondents was students (76%), civil servants and bureaucrats (18%). Selection of respondents were dominant in the productive age was associated with one of the goals of the Geothermal Education Park as the media developed by the government to attract people (especially young people) in studying and developing geothermal research.

Based on the results of the survey, respondents generally as much as 98% have visited the geothermal manifestations and 60% of respondents agreed in the development of geothermal manifestations region as a tourist area (one of the goals of the Geothermal Education Park). Although the presentation of the results of the survey showed that only 38% understood about geothermal (geothermal) and only 21% had ever visited the Geothermal Power Plant (Thermal Power Earth) at Lahendong, but 91% of respondents stated the importance of community support for geothermal power plants as one of the producers of Lahendong electricity in North Sulawesi.

One issue to note, that the people's understanding of the effects of geothermal utilization (primarily in electricity generation process) on the surrounding environment, although generally support of geothermal power plants , but the results of the survey showed that many people do not fully understand . To a survey of the issue of the possibility of utilization of geothermal disturbing the environment, only 31% of the respondents disagree. Furthermore, 27% of respondents agreed and 42% of respondents said neutral. This showed that people in general do not fully understand the process of utilization of geothermal energy that is environmentally friendly.

The Geothermal Education Park may be the solution as a medium of socialization in the form of education for the community in understanding the process of utilization of geothermal energy. The government's plan to develop the Geothermal Education Park is supported by 98% of respondents who represent the general public. This is also reinforced by the enthusiastic community indicated by 97% of respondents said that the need to study the process of geothermal utilization for power generation, as well as direct utilization eg for agricultural sector.

4.2.2. Problem Identification for the Geothermal Development Education Park

Problems in the Geothermal Education Park were identified for the construction preparation phase and implementation phase. For the preparation stages of development, a survey was conducted to find out the problems that may arise in the development of the Geothermal Education Park. The survey results are shown in Figure 5.

The results showed 51% of respondents stated that problems that may arise is the role of government is less than the maximum, 40% expressed a lack of community support, 5% stated areas of inadequate capacity, and 4% stated that there were other factors. The statement of the 51% of respondents was correlated with a public opinion survey on the government's capacity as organizer of Geothermal Education Park, where only 5% of respondents stated very adequate, 36% stated adequately, and 31% stated they were quite adequate, while 27% said inadequate.

A survey also conducted to identify the key factors that affect the implementation and sustainability of the Geothermal Education Park. Public opinions on this survey are shown in Figure 6. The opinion that the government's consistency in empowering the educational park is becoming the most important factor highlighted by 40% of respondents. This suggests that the role of the government that holds the function of regulation and infrastructure of the Geothermal Education Park becomes an important factor in the public spotlight and capacity for the implementation and sustainability of the park's education.

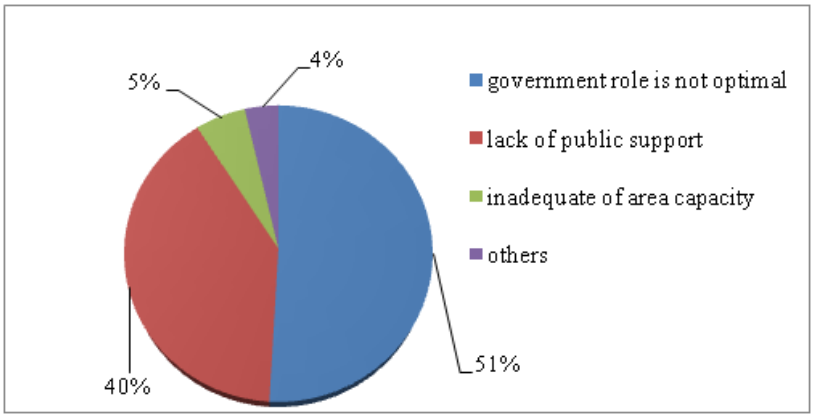

Figure 5. Possibility Problems on Development of Geothermal Education Park

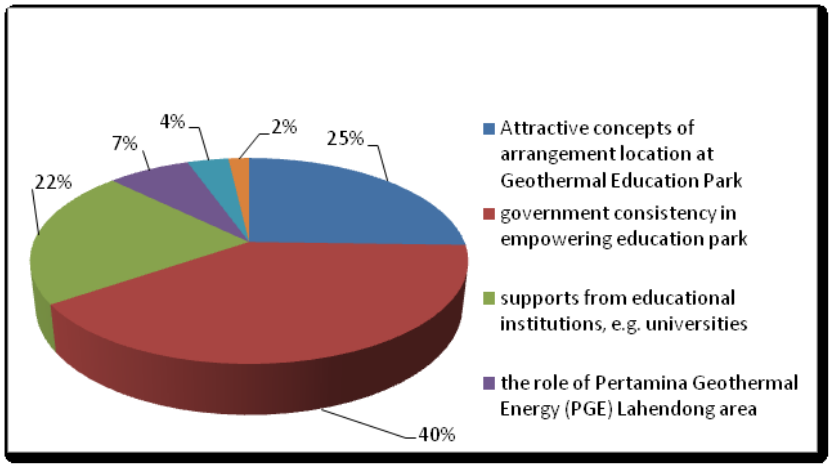

Figure 6. Geothermal Education Park Sustainability Factors

The result through a field survey or focus group discussion proves that the root of problems / causes is there is resistance to specific details in the construction and development of Lahendong Geothermal Education Park, among others, as:

a) The government, local government and stakeholders have never sat down together, and now need to discuss the development of Lahendong Geothermal Education Park, although the Tomohon city government has built the building, the Central Government through the Ministry of Culture and Tourism has built huts stops for tourists and BPPT has lent land for the construction site. About 51% of respondents (Figure 5) stated that and also was revealed in focus group discussion.
b) The existence of the Park is unknown evenly among both stakeholders but also the community in or around the location and not far from the location. Even though, 98% of them have visited the geothermal manifestations and 60% of the respondents agreed in the development of geothermal manifestations region as a tourist area (one of the goals of the Geothermal Education Park), but only 38% who understand about geothermal (geothermal) and only 21% had ever visited the Geothermal Power Plant in Lahendong or other place.
c) As shown in Figure 6, that the attractiveness concept of arrangement of Geothermal Education Park, consistency of government role, universities and professionals involvement are key factors to building a road map as a reference preparation of strategies, programs and activities of the project, for sustainability to develop the Park.

CONCLUSION

1. Inhibition of Educational Development Geothermal Parks Lahendong due to the lack of intense coordination between all stakeholders.
2. Lack of understanding of the substance of GEP by some stakeholders and the general public, makes that development not a priority.
3. The Development of Lahendong Geothermal Eduaction Park that functioned as a source of information and education geothermal has not been going well, since the road map as an reference preparation of strategic, programs and activities have not become a priority yet.

RECOMMENDATIONS

1. Necessary forms with the government, provincial government, municipalities / districts government, professionals and also Indonesian Geothermal Association that will manage and coordinate all the ideas in constructing GEP.

2. There are needs to make a capacity building for managers at all levels of government and NGOs so they are able to formulate needed strategies.
3. The road map, drawn up according to the needs of society, have to be communicated to the public so that the intent, purpose and benefits of Lahendong Geothermal Educationa Park development can be achieved.

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