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The Role of Socio-cultural Relations in Forming Community Perceptions of Geothermal Energy Existence in Lahendong, North Sulawesi, Indonesia

Fitria Yusrifa^{1,*}, Siti Murtiningsih², and Pri Utami³

¹ Magister of National Resilience Study Program, Graduate School, Universitas Gadjah Mada, Indonesia

² Department of Western Philosophy, Faculty of Philosophy, Universitas Gadjah Mada, Indonesia

³ Geothermal Research Centre and Geological Engineering Dept, Faculty of Engineering, Universitas Gadjah Mada, Indonesia

*e-mail: fitriayusrifa@mail.ugm.ac.id

Abstract

Lahendong Village of the Tomohon Municipal is one of the geothermal energy-producing areas in North Sulawesi, Indonesia. Geothermal energy has been a part of Lahendong people's daily life for hundreds of years. The existence of geothermal manifestations and the natural wealth contained therein support the life of the Lahendong people. Through the cultural records of the Lahendong community, geothermal energy is not only defined as the energy that drives power plants but also part of the socio-cultural and historical relations of the Lahendong community since the beginning of the Lahendong Village. This study aims to explore, identify, and analyze how the role of socio-cultural relations forms the community's perception of geothermal energy development in Lahendong. This study used qualitative data collection techniques involving observation of local life, in-depth interviews with the local respondents, and a literature review. The interpretation of the data followed the Hermeneutics-Philosophical method. The results of this study show that the community has local knowledge about geothermal energy through Maengket culture, which combines regional dances and songs. The socio-cultural relations of the Lahendong people have a big role in shaping people's attitudes towards geothermal development. The Lahendong community adheres to the principle of giving in, living in harmony, and minimizing conflict. On the one hand, it is the basis for socio-cultural relations that are full of the value of unity. This cannot be separated from the existence of cultural values that are adhered to through the Mapalus system, namely *Sitou Timou Tomou Tou* and *Torang Samua Basudara* which are based on humanist values in life as individual and social beings. The Lahendong people believe that by respecting other people, and treating others like relations, conflicts will be minimized, including in efforts to develop geothermal energy.

Keywords

geothermal, Lahendong, socio-cultural relations, *Sitou Timou Tomou Tou*

1 Introduction

Lahendong Village is located in Tomohon Selatan sub-district, Tomohon City, North Sulawesi, Indonesia. The name "Lahendong" is taken from the Tombulu language, Lumahendong, as the name of the giant tree that grew up in the forest near Lahendong village hundreds of years ago. People living in Lahendong are dominated by the Tombulu sub-ethnic as a part of the Minahasa ethnic (Yusrifa, 2023; Yusrifa & Murtiningsih, 2023). People believed the ancestors of Lahendong were from Sarongsong (Graafland, 1991), owned agricultural land around the Lahendong forest, and then decided to build settlements around the land they owned. The monument with an inscription that consists of the names of Hukum Tua or Village

Heads stands in the centre of the village and mentions Legi Kapele as the first Hukum Tua in Lahendong in 1812-1828.



Fig. 1 Map of Lahendong Village (Source: RBI map with adjustments from researchers)

The Lahendong area is surrounded by mountains and volcanic lakes, namely Mount Lengkoan, Mount Lokon, Mount Empu, Mount Tampusu, Lake Tondano, and Lake Linow. The topographic conditions of the Lahendong area make Lahendong rich in potential geothermal manifestations (Sumintadireja, Sudarman, & Zaini, 2001; Yusrifa, 2023). The government through PT Pertamina Geothermal Energy (PGE) Lahendong is developing this area as the Lahendong Geothermal Field as a form of utilizing geothermal energy in the Lahendong area (Utami et al., 2011). Currently, there are six Geothermal Power Plant units operating commercially in the Lahendong Geothermal Working Area (WKP). The geothermal power plant unit at the Lahendong WKP has been operating since 2001. The total installed capacity for the six geothermal power plant units in the Lahendong area is 120 MW (Pertamina Geothermal Energy, 2022). This capacity is expected to be able to support the electricity needs of the entire community in North Sulawesi, considering that geothermal energy is a natural resource that can only be processed and utilized in its place of origin. Geothermal energy in Lahendong Village is also used for tourism and direct use, such as hot springs (Yusrifa, 2023). The use of geothermal energy as hot springs also supports the economy of Lahendong residents through the tourism sector.

The government is targeting the development of geothermal energy in the next decade, namely from 2020 to 2030 to reach 8,007.7 MW. With an installed capacity of 2,130.7 MW, around 177 geothermal development projects are needed with a total capacity of approximately 5,877 MW (Nurwahyudin & Harmoko, 2020). This means that the development of geothermal energy continues to be improved to ensure the availability of an evenly distributed energy supply nationally. However, the existence of various policies that cover the operational development and utilization of geothermal energy does not simply free efforts to develop this energy from conflict. Several conflicts often arise from the development of geothermal energy, including conflicts over land and its economic value (Marry, Armawi, Hadna, & Pitoyo, 2017). If this kind of conflict cannot be resolved optimally, the development of geothermal energy has the potential to become a threat to the parties involved, as well as give birth to new conflicts in society. Thus, the vision of energy independence, security and security will be difficult to achieve. There is a need for cooperation and synergistic relationships between various parties, including local governments and communities living in geothermal energy development areas. Various synergy efforts can be built, one of which is through community empowerment programs that raise awareness of the importance of geothermal energy in the pillars of regional development.

Ethnic identity in Minahasa is closely related to the endless cycle of life, shared ancestors, history, and locality (Lolangion, 2021; Parengkuan, 2006; Weichart, 2004; Yusrifa, 2020b). Culture and social systems in Minahasa are the underlying markers of tribal identity (Yusrifa, 2020b). As part of the large Minahasa ethnic group, the Lahendong people whose roots are from the Tombulu sub-ethnicity live side by side with traditions and religion. The social relations represent a life full of collective values (Yusrifa, 2023). Moral problems as environmental issues have been closely related to human behaviour. This cannot be separated

from the interrelated relationship between humans and the environment (Palupi & Sawitri, 2017). Continuous interaction between humans and the environment will influence human behaviour towards the environment.

Human attitudes and behaviour will also determine the good and bad conditions of an environment. In the socio-economic-cultural component, community perception is considered an important parameter because it is a derivative impact of various changes that occur (Adiwibowo, Hadi, Saptari, & Artini, 2002). Recognizing the importance of community perception and involvement in development is an essential thing to reflect on how developments in science and technology have an impact locally and nationally (Dirgantara, 2018; Djumaty, 2015; Suroso et al., 2020), including efforts to develop geothermal energy in the regions. This study aims to analyze how the role of socio-cultural relations forms the Lahendong community's perception of geothermal energy development.

2 Methods

This research uses data collection methods in a qualitative approach through participant observation and in-depth interviews. There were 31 selected informants from residents with various categories of age, gender, occupation, religion, educational background, length of stay, and location of residence as the source of primary data (Table 1). The in-depth interview and observation were collected on January 24th – March 4th, 2022, and July 25th – September 30th 2022 in Lahendong Village.

Table 1 Categories of Informants in Research

Age (in years old)	20-30	31-40	41-50	51-60	>61				
Gender	Male	Female							
Occupation	Farmer	Construction workers	Private employee	Government employee	Housewife	Student	Medical personnel	UE	
Religion	Islam	Protestant	Catholic						
Educational Background	ES	JHS	SHS	UP					
Length of Stay	≤10 years	≥10 years							
Location of Residence	L.1	L.2	L.3	L.4	L.5	L.6	L.7		

The classification of informants is intended, so that researchers can later obtain a comparative illustration of the perceptions and feelings of each category, by the socio-cultural relations that exist between each source. Interview questions from researchers to informants for this type of interview are flexible and can be changed in each interview conducted. Questions are also adapted to the needs or conditions during the interview. The questions that will be asked to informants include several aspects of socio-cultural relations in responding to the efforts of geothermal energy development. The questions asked during the interview are open-ended questions, including several related keywords. Open questions can trigger more complex answers from informants, which opens opportunities for obtaining more in-depth information. Researchers use a phenomenological approach in the interview process because researchers do not have estimates about what is considered important in the interview.

The data were processed through verbatim interview transcription. The interview results were quoted as part of research data classification and data reduction. Next, the data that is considered to represent the research question will be analyzed using a philosophical hermeneutic approach to find the hidden meaning of the keywords conveyed by the informants and to answer the research question. Another analytical method used was to see common threads from the information of 31 informants regarding the perceptions and attitudes taken in resolving problems related to the existence of geothermal energy. The conclusions are taken from the analysis of Lahendong society's perception, behaviour, and attitude through geothermal energy existence.

3 Socio-cultural Relations in Lahendong Village as The Philosophy of Life

3.1 *Mapalus* as The Social and Cultural Systems in Lahendong Village

In general, several traditions are held collectively by the Lahendong people without differentiating from which neighbourhood (*Lingkungan*) the residents come from (Yusrifa, 2023). The traditions named *Pengucapan Syukur* which is held once a year and a social gathering which is held every day according to the date followed by the residents are two examples of Lahendong traditions. Meanwhile, the activities carried out in each neighbourhood are social activities at wedding ceremonies; *Kolom* worship; *Mapalus* or cooperation; and neighbourhood meetings. The Lahendong community as part of the Minahasa ethnic group holds the belief that religion (Protestant and Catholic) is a solid fundamental for carrying out all forms of activities in a neighbourhood area. In Lahendong's traditions, the role of the church cannot be ruled out, especially in dividing the roles and duties of the parties involved, from the preparation stage to the event that takes place. The church also plays an important role in decision-making in Lahendong village, which is related to the socio-cultural relations of the local community. Even though Protestant and Catholic Christianity originated in Europe and were brought by missionaries to Minahasa as a revealed religion, many cultural values have been adapted to church teachings, making them more compatible to be practised in people's daily lives. One of the cultural values inherited from generation to generation is the *Mapalus* value system. This value system is also applied in community work in the church.



Fig. 2 The church involved in the social activities in Lahendong (Source: Research Documentation)

Mapalus is the embodiment of the Minahasa philosophy, *Sitou Timou Tomou Tou*. *Sitou* means 'person'; *Timou* means 'life'; *Tomou* means 'to turn on'; and *Tou* means 'other people'. *Sitou Timou Tomou Tou* means 'humans are born to humanize other humans or people live to give life to other people' (Mansi, 2007; Pangalila & Mantiri, 2020; Salaki, 2014; Yusrifa, 2023; Yusuf & Hasan, 2020). As part of efforts to humanize other humans, *Mapalus* emphasizes community life activities by prioritizing the value of cooperation which is inherent in every person living in Minahasa. There are five principles contained in *Mapalus*, namely the religious principle, the principle of kinship, the principle of deliberation and consensus, the principle of joint work, and the principle of unity and oneness (Salaki, 2014; Turang, Soemarno, Suman, & Mandang, 2014; Yusrifa, 2020a). In the past *Mapalus* was realized in the form of groupings of agricultural work, as well as village development and other collective activities. In the present, the form of *Mapalus* is more diverse and adapted to the needs of the times.

In the past, Mapalus, for example, worked on my garden, several friends did it without being paid, it was Mapalus. Later, the next time I moved to another friend, which used to mean Mapalus, was not paid, so I only paid using my labour (Interview with MS, February 22nd, 2022).

One of the *Mapalus* implementations in Lahendong is public cooperation activities, both in joy and sorrow and activities related to development programs in *Lingkungan*. *Mapalus* can also be interpreted as unpaid or voluntary work activities. Because community service is included in collective work activities without any coercion from anyone and payment, this activity is included in one example of *Mapalus*.

For community service, sometimes I participate, and sometimes I don't because I must work. I'm reluctant to do any community service, I must get permission. In Lahendong, the amount of the contribution is not determined. But the minimum is IDR 50,000. To replace the wages of workers who take part in community service work here (Interview with CHMS, February 26th, 2022).

Mapalus in Lahendong Village has experienced a shift in meaning nowadays. This is due to a shift in societal values and perspectives from traditional society to modern society. Public perceptions regarding wages have changed over time. In the traditional *Mapalus* system, the farmer groups involved do not expect wages as compensation for the labour they have exerted. Farmers generally receive compensation in the form of labour at other times, when the farm owner at any time needs help from the farmers who have been helped. This shift in value was also triggered by the reduction in productive agricultural land in Lahendong due to the expansion of land for housing as people who originally worked as farmers began to change their profession from farmers to construction workers. However, there are still several groups of farmers who use the traditional *Mapalus* system for farming and gardening activities. Generally, the farming community groups that still use the *Mapalus Tani* system are farmers who are still related. The *Mapalus Tani* group not only does work such as farming but also makes large portions of dishes, such as Nasi Jaha for *Pengucapan Syukur* or Thanksgiving tradition.



Fig. 3 Some residents of Lahendong did the *Mapalus Tani* activities (Source: Research Documentation)

Apart from community service, the manifestation of *Mapalus* in Lahendong Subdistrict is in activities carried out in the *kolom* and *Lingkungan*, as was carried out by the residents of Lingkungan IV on February 14th, 2022. Residents of Lingkungan IV carried out the "Pentahbisan Pos Kamling Lingkungan IV" with a system of cooperation and division of tasks according to everyone's abilities. The community also enjoyed dishes brought from each resident's home together. The majority of Lahendong people are Christians, both Protestant Christians and Catholic Christians. Christian teachings are the basis for people to live their lives, in addition to traditions that are passed down from generation to generation even though they have changed in several aspects. Apart from carrying out "*Arisan Tanggal*", the habit of gathering or carrying out activities together is also reflected in worship activities, such as *kolom* and *ibadah salinan* which are held regularly every week.

There are 18 groups of *Kolom* in Lahendong Village and 3 rayons (1 rayon consists of 6 *kolom*). In one *kolom* group, there are 22-27 families. Each family consists of 3-5 people. So, one *kolom* generally consists of 70 people. Lahendong people who are Christians are required to join the *kolom* group and carry out routine worship, as well as take part in activities and programs carried out by the *kolom* group. *Kolom* worship can also be differentiated based on gender or church group, such as *kaum bapa* worship and *kaum ibu* worship.

Meanwhile, *ibadah salinan* is a mixture of worship between the two groups, namely *kaum ibu* and *kaum bapa*. During the pandemic, *kolom* worship and *salinan* worship continue to be carried out by following the health protocol rules set by the government. The activities carried out in the *kolom* are not only routine worship activities, but also social gathering activities or giving contributions whose nominal value can vary from one *kolom* to another, as well as assisting families affected by COVID-19 or those who need financial assistance. All activities that take place in this *kolom* group are under the direction of the church and accompanied by special servants on duty. Lahendong people who are dominated by the Minahasa ethnic group believe that working together and living in harmony with their neighbours reflects unity that must be maintained until the end of life.

3.2 Torang Samua Basudara as an Embodiment of Socio-cultural Relation in Lahendong

Clifford Geertz defines culture as a document of action that is universal and contains a deep context (Riady, 2021). This understanding also illustrates that humans act as symbolic creatures, by underlining the reality that communication carried out by humans is close to the use of symbols. The meaning contained in these symbols guides humans to create cultural networks. Thus, culture in society becomes something that is not only explained but the meaning can also be explored. Humans can pass on the meaning contained in these symbols to the next generation through rituals or traditions. The meaning contained has the potential to change over time.

Lahendong people live based on togetherness. This value of togetherness has even been manifested in the early history of Lahendong village, which has its roots in the term *Lumahendong*, which means "Hold on tight, all of you!" (Yusrifa, 2023). The environment also shapes people's cultural perspectives, and the historical reality of how Lahendong was born and developed cannot be ignored. The presence of geothermal potential is a gift for the people of Lahendong, which even existed before this village existed, giving rise to different meanings by the community. Socio-cultural relations also shape the community's perspective on the existence of geothermal energy in Lahendong.

Social relations can be interpreted as an interaction process carried out by individuals, families, groups, and society to fulfil life's needs. To be able to understand the interaction process, each individual needs to be aware of how the relationship is established (Yusrifa & Murtiningsih, 2023). Apart from meeting the needs of related individuals, social interaction can grow because of the similarities in the conflicts faced, giving rise to similar feelings, perceptions, and attitudes within one community group (Boyd & Walter, 2012; Khairulyadi, Ikramatoun, & Nisa, 2022). Based on findings in the field, the Lahendong community is dominated by the Tombulu sub-ethnicity which is part of the Minahasa ethnicity. This sub-ethnicity has been inhabited by Lahendong since its inception as a village. Kinship relations are described as very close to each other and gave birth to descendants who have lived in Lahendong from the early 19th century until the present. The community also realizes that the social relationships that exist between each individual are due to shared ancestors. This perception is also manifested in the existence of traditions and social activities that bring together several families in one kinship bond, such as social gatherings and family gatherings. In fact, in mourning activities and celebration parties, all relatives are involved, including neighbours who live in the same *Lingkungan*.

The people who live in Lahendong come from the same lineage, with the same ancestors, the Sarongsong people who originally carried out farming activities in the area around Lake Linow. To maintain the strength of the kinship ties that exist, the Lahendong people in the past carried out the practice of endogamous marriage or a marriage between ethnicities, clans, tribes, or kinship in the same *Lingkungan*. In the past, the number of humans was not as large as now, which also allowed this marriage system to occur. Because of the close kinship relationships between individuals living in Lahendong, people are becoming more aware of the importance of living in harmony and avoiding conflict. Several residents are non-Christian, but the Christian residents can accept them and still live in harmony.

Up to now, regarding daily interactions, it's good, everything is good, in these relationships in society there are no differences between groups, because here there are also several groups, there are Catholics, there are Pentecostals, there are GMIM, there are Muslims, there are Hindus, even though he doesn't regularly live here. There are no cons (Interview with YL, August 06th, 2022).

The strong belief in prioritizing solidarity is also supported by the "*Torang Samua Basudara*" philosophy of life. This philosophy of life is one of the views of life of the Minahasa tribe which prioritizes harmony or harmony between humans because all humans are brothers (Lombok, 2014; Pangalila & Mantiri, 2020; Yusrifa, 2020b). All kinds of conflicts that arise must be resolved immediately, and not allowed to drag on, because it is feared that it will damage the bonds of brotherhood that have existed. Minahasa society in general also views that humans need the help of other people, from birth to death, and it is even believed that the Minahasa human life cycle continues after the human dies. The existence of other entities, such as nature and other humans in an individual's life plays a large role in human life. Christian teachings also invite the Lahendong people to love others and avoid conflict, by always practising the value of love in any case. The Lahendong people adhere to the principle of "*baku jaga perasaan*" which makes relationships between individuals more harmonious. Most people avoid fighting with other people because it will cause difficulties for the parties involved in the future. The presence of sociocultural aspects in conflict resolution is a characteristic of a society that still adheres to the principle of deliberation and consensus.

4 The Role of Socio-Cultural Relations Shaping the Perception of The Geothermal Energy Existence in Lahendong

Geothermal energy has been a part of Lahendong people's daily lives for hundreds of years. The existence of geothermal manifestations and the natural riches contained in them support the lives of the Lahendong people, especially residents who use electricity to complete work daily. In cultural records in Lahendong, geothermal is not simply defined as the energy that drives power plants. The community also has local knowledge about geothermal energy through *Maengket* culture, which combines regional dances and songs. In the information provided by one of the informants in the *Maengket* poem, there is a mention of the activity of bathing in hot water after farming. This indicates that people have considered geothermal energy as part of daily life since the past.

In the value system of traditional society, natural entities are something that cannot be ignored. Humans, nature and God become one unit at the level of Indonesian cosmology, even though they are packaged in different languages. The understanding of the universe for groups of people can differ from one another, depending on how the universe is interpreted by the local knowledge of that community. Lahendong is one of the locations for geothermal energy development in North Sulawesi because it has regional conditions that are rich in geothermal potential. The existence of several volcanoes around Lahendong strengthens Lahendong's position as a fertile area and has the potential to be developed as a geothermal working area. The people who live in Lahendong also know that Lahendong has great potential even before the village was founded.

Geothermal energy development is quite essential in terms of energy security because it can guarantee the availability of energy in remote areas, especially electrical energy. Indonesia, as a country that has a renewable energy potential of up to 59,000 MW, with a total geothermal energy potential of 29,000 MW and bioenergy of around 30,000 MW, needs to focus on developing energy that is environmentally friendly and can also be developed in the region where the energy potential originates (Marry et al., 2017). So far, geothermal development has several advantages, including 1) geothermal energy is a form of green energy or does not produce waste gas, which, when compared to other energies, produces emissions below 1% with a very low CO₂ content; 2) geothermal energy is sustainable energy, as long as the ecosystem or environment above the geothermal potential is well maintained; 3) geothermal heat is indigenous, which means it can only be processed locally, so regional development is needed to spur rapid growth in the economic sector; 4) there is a production bonus that can be used as additional Regional Original Income (*Pendapatan Asli Daerah/PAD*) where the geothermal site is developed.

Geothermal energy as a new renewable energy developed in Indonesia has legal protection to guarantee implementation related to its development and management. Regarding geothermal energy management in Indonesia, Government Regulation Number 79 of 2014 Article 19 explains that national energy management is aligned with sustainable national development, preserving natural resources, conserving energy resources, and controlling environmental pollution. National energy management activities are also required to pay attention to health, work safety and social impact factors while maintaining environmental functions. In energy supply and energy utilization activities, all parties involved, including central, regional and stakeholder governments, are obliged to carry out prevention, mitigation, reduction and recovery of impacts and compensation with the principle of justice for all parties exposed to the impacts. Apart from that, it is also mandatory to minimize waste production, reuse waste in the production process or utilize waste in other forms, as well as extract elements that still have benefits contained in waste, while still considering social, environmental, and economic aspects. In the final step, it is stated that when utilizing energy, priority must be given to the use of environmentally friendly technology. This emphasizes that the government through Government Regulation Number 79 of 2014 guarantees the safety and continuity of life of the community as well as environmental sustainability in the supply and use of energy.

Through the information of several informants, local knowledge was discovered about how the village was formed. The term "volcano eruption" was found in the statements of several informants, which indicated that the local knowledge of the Lahendong community regarding geothermal heat was closely related to the existence of volcanoes. Apart from the origins of the village, the people of Lahendong also have local knowledge regarding the origins of Lake Linow, as a manifestation of geothermal energy. Several informants provided information that Lake Linow was the former crater of a volcano that erupted in the past. Other local knowledge that also enriches the view of geothermal energy is about drilling activities that take place underground where community housing is built. Although no research states that drilling activities also take place below the Lahendong land surface, this local knowledge needs to be collected as part of the public's perception of geothermal energy.

Livelihoods as farmers are closely related to the *Mapalus* value system. With the decline in the farming profession due to the decrease in the amount of productive agricultural land due to the emergence of several hot springs, the *Mapalus Tani* value system can no longer survive in its initial condition. The shift in society's perspective, from initially relying on remuneration in the form of labour to remuneration in the

form of material (money or goods), has resulted in *Mapalus Tani's* value system experiencing a shift in meaning. This means that the existence of socio-cultural conflict is closely related to natural phenomena that occur around where a community group lives. For people who rely on natural wealth to support life, the loss of some natural resources means that the value system they adhere to also disappears, although it can also change form or transform according to the conditions of the times.

At the beginning of exploration activities, a geothermal well was drilled in the centre of the village (currently located in Lingkungan IV Lahendong). Religious institutions such as churches were involved in this exploration phase, considering that in the 80s people still adhered to traditional customs combined with Christian religious rituals. According to the informant, well drilling stopped in the 2000s. The reason was that wells released excessive amounts of toxic gas and damaged drilling equipment, which even might endanger the lives of local people.

The transmigration discourse also appeared to avoid undesirable things happening, such as gas leaks and hot mud overflows that might occur. Several outreach activities related to geothermal development have been carried out by PT Pertamina Geothermal Energy through the local village or sub-district governments to minimize the spread of provocative issues, as well as provide education to residents so they can recognize phenomena surrounding geothermal energy. However, not all communities are invited to take part in related outreach. Thus, the problem of gas leaks cannot be avoided and causes fear among the public.

One form of geothermal heat in Lahendong Village is a hot spring. Several active hot springs are located in Lingkungan II, III, V, and VII of Lahendong Village. However, only one hot spring was found on the border of Lingkungan II and III when field observations were carried out. Residents still use the hot springs to bathe, although the number of residents who use the hot springs is not as many as at the Leilem Hot Springs or the Lahendong Pine Forest Tourism Park. This is due to the difficulty of accessing bathing in the middle of the forest, especially since the rocky and muddy terrain is dominated by slippery terrain when the rainy season arrives. The existence of geothermal manifestations in Lahendong is still far from applicable safety standards. The absence of danger signs or information boards illustrates that hot springs as the geothermal manifestations around Lahendong residential areas have not been managed optimally.

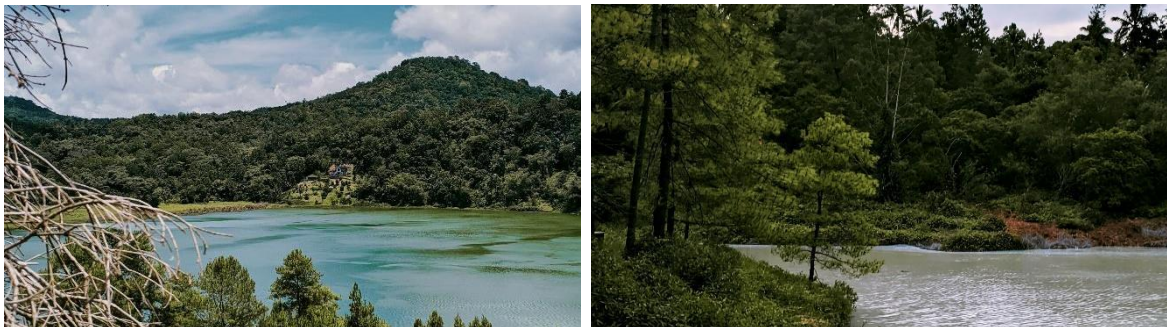


Fig. 4 Linow Lake and Lahendong Pine Forest are two forms of direct use of geothermal energy in the tourism sector in Lahendong, North Sulawesi (Source: Researcher Documentation)

Apart from hot springs around residential areas, geothermal tourism destinations that are also being developed are the Lahendong Pine Forest Tourism Park (under the authority of the Tomohon City Tourism Office, the Lahendong Village Government, and the Tumatangtang Village Government), and Linow Lake (under the management of the Foundation Lokon). Even though the management of these two government-owned and private tourism destinations has complied with a set of safety regulations, in practice, many hidden conflicts are still found, such as the distribution of ticket fee profits, land ownership, and the social impact of the distribution of local labour. Based on the findings regarding the various potential geothermal manifestations in Lahendong, it can be observed that the existence of various geothermal manifestations in Lahendong, on the one hand, is a gift that is grateful for the local community, but on the other hand, it is considered a threat, because it has an impact on environmental sustainability.

The existence of geothermal manifestations in the form of hot springs and Lake Linow which can be used as a tourist destination contributes to Local Original Income (PAD) for Tomohon City, as well as creating employment opportunities for residents of the Lahendong sub-district and its surroundings. The distribution of labour from local residents in the tourism sector is also part of the agreement between the Lahendong Sub District government and private tourism management parties to ensure the empowerment of local communities. It is hoped that the community will feel the benefits of the geothermal potential in Lahendong. Apart from the distribution of labour, various assistance from CSR tourism managers was also distributed to the community and the Lahendong sub-district government in the form of cash and materials

for the construction of the sub-district hall in Lahendong worth approximately IDR.100,000,000.00. Meanwhile, cash assistance to Lahendong residents is given during the Christmas celebration on December 25-26th every year.

As far as observations have been made, the indirect use of geothermal energy in electrical energy in Lahendong Village can be observed from the availability of electricity supply evenly in the community. Several residents also stated that the use of geothermal energy in electricity provides many blessings for people's lives. One of the positive sides of the indirect use of geothermal energy in electricity in Lahendong Village is that people no longer experience power outages due to a lack of electricity supply. If there is a power outage, it can be ascertained that it is caused by weather factors or technical errors. Regarding the price of electricity distributed to the community, there is no visible difference between the electricity price that Lahendong residents must pay and residents from other areas outside the geothermal development area. This illustrates that Lahendong residents do not receive special treatment, even though the name of the geothermal field is 'Lahendong' and exploration is carried out around the Lahendong sub-district. Apart from that, street lighting still uses power from non-subsidized residents' homes and several solar panels installed in several areas.

The price of electricity is the same. It should have been given its dispensation. That's how it should be. Yes, maybe yes, because a lot of it is taken from here, so for people in Lahendong and surrounding areas who are subject to PGE, there should be a dispensation in electricity prices (Interview with AB, February 25th, 2022).

If there's a problem with the street lighting in front of here, it's already starting to break down, so at night it turns off for a few minutes. The solar panels are sourced directly from electricity poles, not taken from residents (Interview with BDS, March 02nd 2022).

Several informants said that geothermal heat which is then processed into electricity comes from underground where the Lahendong people live. Several issues related to geothermal heat arose at the beginning of the drilling of the Lahendong 1 (LHD I) well. One of them concerns the existence of pipes that are fed by geothermal sources which are then managed to become electricity at the Lahendong PLTP, which is in Tondangow Village. Even though it does not significantly affect public acceptance of the existence of various potential geothermal energy sources, this has raised fears, especially for people who have never participated in any socialization regarding geothermal energy.

Indirect use of geothermal energy as a source of electricity, although it helps residents carry out their daily activities, on the other hand, poses some threats. One of them is the impact caused by the existence of a Geothermal Power Plant in the Lahendong Geothermal Working Area. Even though geothermal energy is clean energy that produces minimal waste, some residents through research interviews complained about disturbances, both in terms of the quality of rice fields which were suspected of being contaminated with geothermal waste in the area around Lake Linow. The issue of dumping geothermal power plant waste into residents' rice fields in the area around Lake Linow emerged in the early 2000s. Waste pollution which is thought to be due to geothermal processing means that residents' land can no longer produce rice and other food crops. The solution taken by PT Pertamina Geothermal Energy is to provide compensation to affected landowners, after discussions with the community and local government.

In the past, there was pollution in the upper area, but the landowner received compensation. Even though it might not match the price, for example. Because in the past the gardens for growing rice were quite large before they were exposed to waste. When exposed to waste, people automatically stop planting. It's no longer possible to use it for planting. Now it's growing, it's growing, but yeah. In the past, several families tried to plant, but only had maybe one or two harvests, because it was no longer what it used to be. The results are fertile, but the rice cannot be produced as well as before (Interview with CHSM, February 06th 2022).

The socio-cultural relations of the Lahendong community have a large role in shaping community attitudes towards geothermal development. The Lahendong people adhere to the principles of giving in, living in harmony, and minimizing conflict, on the one hand, becoming the basis for socio-cultural relations that are full of the value of unity. This cannot be separated from the existence of cultural values adhered to through the *Mapalus* system, namely *Sitou Timou Tomou Tou* and *Torang Samua Basudara* which are based on humanist values in life as an individual and social creature. The Lahendong people believe that by respecting other people and treating others like brothers, conflict will be minimized.

The concept of cultural values that bridges social and cultural relations in responding to the development of geothermal energy in Lahendong also becomes an illustration that the people of Lahendong live based on togetherness. People tend to avoid conflict to maintain social and cultural relations within their community, as well as to be able to respect their existence within that community. Individuals who can apply the implicit values of *Sitou Timou Tomou Tou* and *Torang Samua Basudara* will find it easier to interact in social environments. This can be seen in the individual's involvement in cultural and social communities which have a major impact on the individual's existence. In the geothermal energy development efforts, the attitude of agreeing but not taking much part in overseeing the various processes is also an illustration of how the Lahendong community tries to avoid conflict with geothermal developers. The Lahendong community also applies the cultural values of *Sitou Timou Tomou Tou* and *Torang Samua Basudara* in interacting with the government, both through the village government and staff, to a higher level.

Parsons' Action Theory views that action systems influence different levels of analysis, from behavioural organisms to building cultural systems (Parsons, 1951). As a community group built from the same family system, and strengthened by the essential values of *Mapalus*, *Sitou Timou Tomou Tou*, culture forms a deep perspective on things around the individual. The cultural system is at the broadest level in the hierarchical system, which of course provides the driving force for higher levels, and can control lower levels. Behavioural organisms and personality systems are the driving force for social systems and cultural systems, while cultural systems control social systems, personality systems, and behavioural organisms. The culture that supports the lives of the Lahendong people does not only originate from the entity of similar kinship relations but also from how the community maintains kinship relations through various cultural systems. The most visible thing is the existence of *Mapalus* which is still maintained, which is manifested in various forms, ranging from *Rurup*, *Mapalus Tani*, to *Arisan Rukun*. Even though it relies on collective values, in its journey, the Lahendong community relies heavily on the existence of social groups that are connected by the same lineage. This common lineage also influences the creation of the same goals for the social group in question. This then creates socio-cultural relations in Lahendong people's lives, which makes Lahendong different from other community groups, even though they come from the same ethnicity.

The development of geothermal energy, both directly and indirectly, should bring great benefits to communities in energy-producing areas. The government, through sub-district parties, continues to try to take a peaceful route in resolving disputes related to the allocation of production bonuses and the distribution of CSR assistance. Community attitudes in socio-cultural relations cannot be ignored, considering how important it is to build positive perceptions to foster a proactive attitude towards geothermal development. The role of the community is very much needed in achieving the vision of energy independence for a region. The presence of conflict in geothermal energy development efforts is a challenge, both for those responsible for geothermal energy management and the people living in geothermal development areas. Social and cultural relations in society are the fulcrum in resolving this problem, especially as the Lahendong community adheres to social, cultural, and religious norms in their daily lives.

5 Conclusions

The social and cultural relations of the Lahendong community which are supported by two great values, namely *Torang Samua Basudara* and *Sitou Timou Tomou Tou* through the *Mapalus* value system shape the community's perspective to humanize other humans and respond to the development turmoil that is present in society. The Lahendong people tend to avoid prolonged conflict, because they uphold a collective perspective through these two values, including in responding to various conflicts in the development of geothermal energy, as well as an awareness of maintaining harmony so that relations between people are good. Social life is supported by two great values of Minahasa ethnic culture; Christian teachings of love; so collective awareness supported by the existence of social groups that strengthen and remind each other has become a key to conflict resolution in Lahendong so far. Open communication between the sub-district government and the community is considered essential for resolving the problems in Lahendong.

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