PROCEEDINGS, 48th Workshop on Geothermal Reservoir Engineering
Stanford University, Stanford, California, February 6-8, 2023
SGP-TR-224

Challenges in Getting Public Acceptance on Geothermal Project in Indonesia

Ferdino R. Fadhillah[1,2,3], M. Rizqi Al Asyari[1,2], Adika Bagaskara[1,2], Dies Valley Vie Vanda[1,2], Daniel W. Adityatama[1,2], Dorman Purba[2], Respati KATMOYO[2], Ajarani DJANDAM[2], Linda GURNING[2]

[1]Geoenergi Solusi Indonesia (GEOENERGIS), Cibis Nine 11th floor, Jakarta, Indonesia
[2]ENERKA Bhumi Pratama, Cibis Nine 11th floor , Jakarta Selatan, Indonesia
[3]ITB School of Business and Management, Graha Irama 12th floor, Jakarta, Indonesia

E-mail address: ferdino.rf@geoenergis.com; rfferdino@gmail.com

Keywords: geothermal, social acceptance, social license, drilling, community unrest, exploration, rejection, public consultation, safeguard, ESIA, Indonesia

ABSTRACT

Geothermal project development can only be reached when most affected stakeholders support the project. This may include the geothermal developer, local community, local government, central government or policy makers, the offtake purchaser, and mass media. It is widely known that it is not easy in Indonesia to get support from local communities, which in turn creates delays in executing the geothermal project. Public acceptance is practically a requirement for the promotion and successful implementation of geothermal power development projects. Achieving social acceptance requires trust between the developers and the local communities. While failure to gain trust from the public risk the developer to costly conflicts and time delays, which may also affect the implementation of geothermal project in other places in Indonesia.

To gain social acceptance, local communities first need to understand and agree with the implementation of the project. This study aims to map various rejection to geothermal project by local communities in Indonesia. The mapping is conducted through literature review to obtain the data related community concerns and fear of the project impacts. The mapping result is then discussed with several experts in geothermal to determine the essential factor of rejection.

This study is expected to raise awareness of the importance of implementing proper actions in gaining public trust in the geothermal project and encourage the development of geothermal as sustainable energy executed through the implementation of sustainable business practices, whether in exploration or development phase. Finally, this study offers the preliminary option for engaging the local community in the geothermal project area.

1. INTRODUCTION

Indonesia has enormous potential of geothermal energy since this country is located at the Pacific Ocean ring of fire. Through their installed capacity, which reaches 2,286.05 MW (EBTKE, 2022), this country has become the 2nd rank of top geothermal producer worldwide based on the installed capacity. Despite possessing enormous resources, Indonesia only utilized 8% of total resources due to several challenges from the technical and non-technical aspects. The government of Indonesia (GoI) has set a new target for geothermal energy utilization to reach 5,799 MW in 2030, as shown in Figure 1 (PLN, 2021).

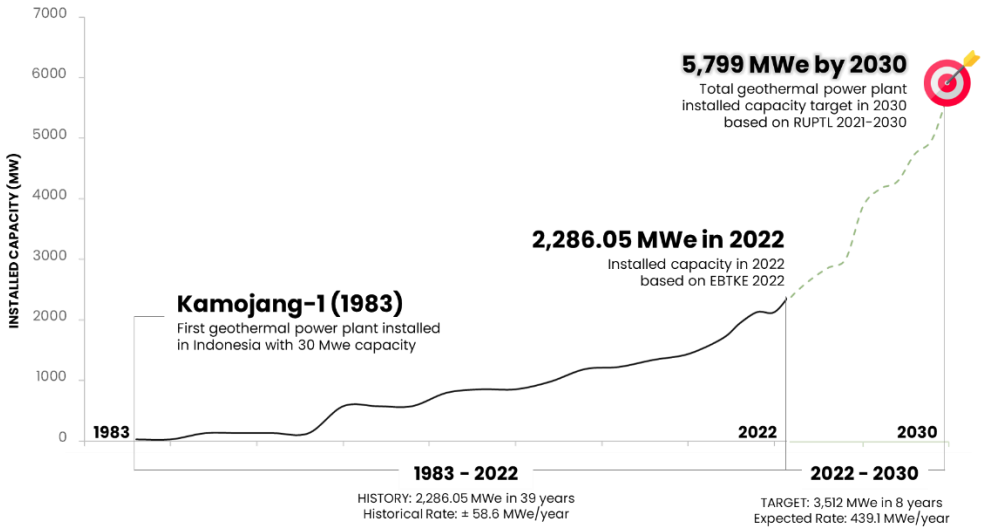

Figure 1: History and Targets of Geothermal Energy Development in Indonesia (updated from EBTKE, 2022; PLN 2021; Purba et al, 2020)

1.1 Geothermal Project Challenges in Indonesia

Several challenges in the geothermal project derive from the lag of current utilization and the challenging target in 2030. Geothermal as reliable and sustainable energy to become baseload energy is well known as a high-risk project with long phases to reach the commercial operation date (COD). However, this reliability has several challenges that might be faced and need to be solved by the company and government. Setiawan (2014) proposed the limiting factor of geothermal development that can be divided into three categories as explained in Table 1 below:

Table 1: Typical geothermal challenges in Indonesia

Categories	Challenges	Remarks
Upstream challenges	High resource risk and complex uncertainty	Limiting factors in the upstream development stage cover the activity of geothermal exploration. The first limiting factor in the upstream stage is the lack of available reserve data for the auction process, resulting in unattractive investment. Many investors are concerned about the data and report quality, which does not briefly explain geothermal resource's extraction and development strategy and only focus on the geoscience aspect without social and environmental considerations (Asian Development Bank, 2015 in Fan & Nam, 2018). It commonly needs long phases to develop geothermal energy, from 5 – 10 years until the commercial operation to mitigate the risk.
	High upfront/initial construction cost	The second limiting factor on the upstream side is high investment in the initial period, where the exploration phase is estimated to cost about 12 to 28 million USD, with an average of 7.6 million USD per exploration well (Purba et al., 2021b; Purwanto, 2019)
	Overlap with conservation/protected forests	The third problem is the location of geothermal working areas that overlap with production forests, conservation areas, and protected forests. Meijaard et al. (2019) found that there is a total of 13,025 MW of electricity potential from geothermal prospects in Indonesia, which are located in the protected forest (5,736 MW), production forest (2,416 MW), and conservation areas (4,873 MW)
	High relief terrain	Geothermal systems in Indonesia are mainly found along high-relief volcanic arcs and can be detected by surface manifestations that release water or steam at boiling temperatures at ground level (Hochstein & Sudarman, 2015). Due to the unique characteristics of volcanic locations where heat, rocks, and liquids interact dynamically, organically, and actively, Utami (2010) describes the various obstacles encountered when executing civil works in geothermal zones in Indonesia.
	Land acquisition issues	In general, the local community uses the flat area in Indonesia's volcanic area for agriculture or housing. Providing the acquisition cost for a family's livelihood in rural Indonesia is often tricky, especially if the land is their only asset. One mitigation strategy is allowing enough time for the landowner to move from one source of livelihood to another. Negotiation is frequently tough if the property buyer (geothermal developer or local government) demands a strict timeline for the landowner to leave the land they have worked on for years (Purba, 2021b).
	Poor existing infrastructure condition	The challenge of equipment inter-island mobilization in Indonesia is heavily influenced by infrastructure circumstances such as road access, transportation modes, and high-voltage electrical networks that would be utilized to drain electricity generated by PLTP. Furthermore, Indonesia's geothermal prospects are often located in high terrain forest areas that are distant from primary road access, both provincial and district highways. It makes mobilization of drilling equipment problematic. The existing infrastructure generally needs to be upgraded before equipment mobilization (Purba, 2021b).
Downstream challenges	Offtake market	The main factor limiting the downstream side of the geothermal development stage in Indonesia is the geothermal electricity market. According to Widiatmoro and Nusiaputra (2020), geothermal energy is considered environmentally friendly and has good security of supply and accessibility, but it is less affordable compared to other forms of energy. Moreover, in several area in Indonesia was already oversupplied and has limited grid system to absorb the generated electricity from geothermal energy.

Categories	Challenges	Remarks
	Single buyer	The first problem downstream is that there is only a single buyer for geothermal electricity in Indonesia: PT PLN (Persero). Lesmana et al. (2020) and Ministry of Energy and Mineral Resources Decree No. 37/2018 PT PLN (Persero) acted as the single buyer of electricity generated from geothermal power plants. Furthermore, the tariff of geothermal electricity is also regulated by the government by Ministry Decree No. 169.K/HK.02/MEM.M/2021, where the price depends on the location of geothermal prospects and is reviewed again by a price matrix based on exploration and development results (Widiatmoro & Nusiaputra, 2020). This regulation is resulting the weak bargaining process between the developer companies and PT PLN (Persero) in Indonesia's geothermal electricity business. Another problem on the downstream side is that geothermal power is not cost competitive with hydro or coal-fired energy generation, at least in the western Indonesia region (Purwanto, 2019).
Additional challenges	Local personnel competencies	Based on (Purba et al, 2021c; Umam et al, 2018), there is a lack of adequate competency in developing geothermal project since some current geothermal practitioners come from oil and gas industry that need several training and workshops before involved in geothermal project.
	Lack of public understanding on geothermal energy	The public's lack of understanding of the importance of geothermal projects frequently leads to rejection, resulting in delays in geothermal development initiatives. This circumstance is most common when geothermal projects are still in the discovery stage and local governments, development corporations, and local communities still recognize each other and have not yet created trust between each side—social dynamic condition and public acceptance issues that can be stopper of geothermal project.

There are many barriers or limitations that slow down the process of geothermal development in Indonesia. The limitations not only came from technical issues, but also affected by non-technical issues such as: local communities' rejection, high cost of land indemnification, high electricity price, complex process of permits and license, and unbalanced economic cost and benefit that no interest investors (Wahjosoedibjo & Hasan, 2018). One of the renowned cases is in Mount Lawu, there are any community's rejection because of lack of understanding of geothermal energy that supported by misinformation related to negative impact of geothermal project. As the results, the project was stopped until nowadays and government pull out this area from geothermal development roadmap.

1.2 Geothermal Project Impact and Community Concern

As a multicultural nation, Indonesia has unique social characteristics that are identical to certain areas. This condition led to challenges that need to be faced by geothermal businesses since different regions might have different approaches, and all geothermal activities must adapt to respective cultures. The local community's role as the most direct stakeholder is essential in the community response faced by the geothermal project. The local community response may generate by the project impact and community perception. The project impact and community concern in geothermal project phases are explained below:

1. Preliminary and 3G survey

   According to ESMAP (2012), this phase usually includes field activity such as field mapping, geological-geochemistry samples collection, geophysics equipment stationing, and geohazard identification. The preliminary infrastructure survey is conducted by observing access road conditions. Furthermore, the LiDAR survey also may conduct to obtain detailed topographic conditions using Unmanned Aerial Vehicle (UAV). The field team could conduct the informal interview with the community to gather general views and responses to the geothermal project during this phase.

   The local community has been involved in the project's early phase as guides and field assistants. Local communities have better understanding of their area, which would be helpful for the survey team. Furthermore, the locals also could facilitate accommodation, transportation, and supplies for the team during survey activities. The activities affect the community since the field team would trespass the local land to obtain field data. The manifestation fluid sampling could disturb local daily activities since it may associate with water resources, local tourism, and scarce places that would determine the public response in the following project activities. The natural public perception has not built strongly since the stakeholder still monitors and recognize each other tendency. In this stage, the general perspective of geothermal resources is good as clean, friendly, and green energy (Cataldi, 2000). While during the fact finding mission, our expert emphasized the area that has not influenced by third party would be more welcome to the project activity rather than the area that has influenced by opinion from the third party.

2. Infrastructure preparation and drilling

The infrastructure preparation usually follows the detailed infrastructure survey and geotechnical investigation in certain areas to prepare supporting drilling infrastructures such as well pad, access road, staging area, and basecamp (Purba et al., 2021). The infrastructure preparation also performs the land acquisition process where the project owner is willing to buy the local land that would be used as drilling infrastructure. The land acquisition led to changes of local occupation since most locals worked as farmers and planters on their land before the project owner acquired it to be prepared for drilling infrastructure (Purba et al., 2021). The community concern could arise related to the loss of their occupation as their primary economic income and assumed the project has low benefit to the community since no sustainable occupation option. Drilling infrastructure involves mass land clearing activities and deforestation to prepare the access road, well pad, and basecamp area. This condition would trigger the concern of the community related to fear of wild animals' entrance to villages and endangering the ecosystem (Ibrohim, Prasetyo, & Rekinagara, 2019). The large-scale civil work that includes heavy equipment mobilization and massive soil material needs to be executed to develop and improve the infrastructure. Those activities impact the community since it induces soil contamination on water flow lines, dirty roads, and dust.

While on the drilling activities, public concern is related to using extensive local water sources for drilling operations. The community feared that activity would induce contamination and loss of water sources for the local community. Furthermore, the community is concerned about drilling risks such as H_2S gas and blowout events (Adityatama, Purba, & Kristianto, 2018). This phase involves large workers consisting of local and non-local workers. It raises local concerns about the different cultures and social values between local and non-local workers in daily interaction.

3. Construction phase
The construction phase is performed to prepare the steam gathering system such as pipelines, separators, and power plant after the feasibility study from the exploration and development phase (ESMAP, 2012). The construction phase would have similar activity and impact with infrastructure preparation to the local but larger magnitude. During this phase, the public perception of the environmental aspect also would be similar to the infrastructure preparation stages. Issues related to social conditions also may arise since the construction worker would hire workforce not only from the local community. This condition could raise the local community's perception that foreign workforce would replace their position and alter those area's social values. The differences related to social interaction, stratification, and matter also may trigger negative perceptions from locals of the project owner.

4. Production phase
This phase is the final phase of the geothermal project that started the electricity generation (ESMAP, 2012). Generally, in this phase should maintain their electricity generation by doing proper field management and still require major activities like drilling make-up well and workover/well intervention for existing well. This kind of activity might be having similar community concern and perception like in earlier drilling activity in exploration and development phase. The production phase also has additional public concern about environmental impacts such as sound pollution, water contamination from geothermal fluid, and induced earthquakes and landslides. The social perception issue is also related to the local community's response to foreign workers.

Based on discussion in previous section, social challenges that might be faced by geothermal developers can be summarized as Table 2:

Table 2: Social challenges summary in each stage of geothermal project.

Geothermal project stages	Activities	Potential Impact	Community involvement	Community concern and perception
Preliminary and 3G survey	- LiDAR survey - Field mapping - Data and sample collection (geology-geochemistry) - Geophysics stationing - Early infrastructure survey and geohazard	- Small scale land clearing - Trespassing local land - Disturb local activity - Raise community curiosity	- Survey helper and local guide - Accommodation as well as transportation and supplies for site survey team	- Still on neutral perception - Assumed geothermal as clean, friendly, and green energy (Cataldi, 1999) - Field sampling can disturb local community daily activities since those activities associated with water resources, local tourism, and sacred place
Infrastructure preparation and Drilling	- Detail infrastructure and geotechnical survey - Land acquisition - Massive land clearing - Civil work and heavy equipment mobilization - Water supply gathering - Rig mob and demob - Drilling and well testing	- Deforestation - Changes of local occupation - Soil material pollution - Area disturbance - Social acculturation with foreign worker	- Rent or sell the area for drilling infrastructure construction - Help the project as non-skilled labor (security, driver, etc)	- Fear of wild animal entrance to villages and ecosystem disruption (Ibrohim et al., 2019) - Unfair land acquisition process (Adityatama et al., 2018; Purba et al.,2021) - Equipment mobilization disturb local activities - Air and noise pollution - Dirty road and dust pollution

Geothermal project stages	Activities	Potential Impact	Community involvement	Community concern and perception
				- Loss of water sources due to drilling activities (Ibrohim et al., 2019) - Loss of occupation (Ibrohim et al., 2019) - Cultural disruption - Fear of H_2S and blowout events (Adityatama et al., 2018; Yunirato,2015)
Construction Phase	- Detail infrastructure and geotechnical survey - Land acquisition - Massive land clearing - Civil work and heavy equipment mobilization - Steam Gathering System (SAGS) construction	- Deforestation - Soil material pollution - Area disturbance - Social acculturation with foreign worker	- Rent or sell the area for power plant construction - Help the project as non-skilled labor (security, driver, operator, etc)	- Air, water, and noise pollution - Dirty road and dust pollution - Loss of occupation (Ibrohim et al., 2019) - Foreign workforce affecting public perception (replacement of current position and alter those area's social values / cultural disruption)
Production Phase	- Electricity generation - Make up well drilling - Workover - Heavy equipment mobilization	- Social acculturation with foreign worker - Changes of local occupation - Sound pollution - Water contamination from geothermal fluid -	- Direct use for local factory - Accommodation provider (housing, transportation, and supplies) - Help the project both as non-skilled labor and skilled labors (operators, field engineers, etc)	- Loss of occupation (Ibrohim et al., 2019) - Induced earthquakes and landslides (Qorizki et al, 2021; Luthfi, 2021; Anggreta *et al.*, 2022) - replacement of current position and alter those area's social values / cultural disruption (Ibrohim et al., 2019)

1.3 Research objective and method

This study aims to provide awareness related to social issues in the geothermal project in Indonesia by providing the analysis related to the question below:

1. What is the impact of public acceptance issues in geothermal working areas?
2. What is the fundamental cause of social rejection of the geothermal project in Indonesia? Are there any similar issues in several fields?
3. What approach that author propose to gain the social acceptance issues in Indonesia?

The authors conducted literature study to compile and analyze published public rejection of the geothermal project in Indonesia. The result would be discussed with several social experts in geothermal through interviews and questionnaires to get insight and perspective to construct preliminary framework for achieving social acceptance of geothermal development projects. Figure 2 shows the research workflow.

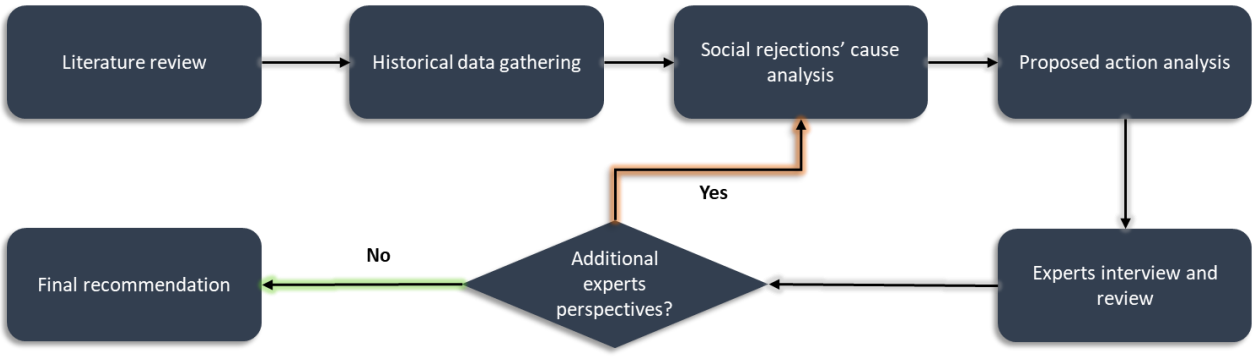

Figure 2: Research Workflow.

2. SOCIAL REJECTION IN GEOTHERMAL PROJECT

2.1 Impact of Social Rejection

The social rejection results from failure to get community acceptance of the project, forming a corporate-society conflict that may evolve into a corporate-society-state. The corporate-society aims to win their interest related to the economic and beneficial of the project, while the state would act as judge for the conflict (Prayogo, 2010). The large-scale social conflict related to natural resources has taken around 40% of major world conflicts including the Aceh and Papua conflict (UNEP, 2009). On a smaller scale, social conflict could negatively impact projects and corporate from reputation and financial perspectives. Those negative impacts began when the local community started the rejection on significant scales, such as demonstrations, blockage, and mass movements that stopped all project activity. The stop from the community may lead to temporary closure and cause delay or project cancellation. Error! Reference source not found. shows several negative impacts of social rejection on the project.

Table 3: The general negative impact of social rejection on project

Category	Detail
Reputation	The corporate / project owner would get negative perspective related to their capability to handle the project. The bad reputation would lead stakeholders' (inventor, government, society) to distrust and prevention to corporate / project owners from future business opportunities (Giurco, McLellan, Franks, Nansai, & Prior, 2014)
Finance	The social response could directly impact project and corporate financial performance since any operation disruption would directly affect the project. Guircio et al. (2014) and Frank et al. (2014) emphasize that social rejection would derive high additional cost and delay.

Adityatama, Purba, & Kristianto (2018) has estimated the cost of social issue and rejection in the geothermal project. The long delay in geothermal projects is usually not derived from technical problems but from non-technical issues such as road closure, demonstration, and other social rejection forms. The additional cost due to delay during the construction and drilling stages is significantly higher than in other stages in geothermal projects. Therefore, it should be avoided or mitigated proactively from the planning phase. **Error! Reference source not found.** shows the cost estimation of project delay in geothermal.

Table 4: The cost estimation of geothermal project delay (modified from Adityatama, Purba, and Kristianto, 2018).

Delay on Activity/Phase	Cost Impact	Estimated cost per day
Project socialization and public consultation	Standby workforce	USD 3.000 – USD 10.000
3-G survey (geology, geochemistry, and geophysics)	Standby workforce and 3-G survey equipment	USD 3.000 – USD 10.000
Land acquisition	Standby workforce	USD 3.000 – USD 10.000
Access road and well pad construction	Standby workforce and heavy equipment	USD 10.000 – USD 25.000
Exploration drilling	Standby workforce, heavy equipment, and rig	USD 25.000 – USD 100.000

2.2 Social rejection in Indonesia Geothermal Project

Several social issues in Indonesia's geothermal area as shown in Table 5. The most social problem occurred by public concern related to the geothermal project's environmental, economic, and cultural impact on their area. Several of the events are explained below:

1. Mount Lawu

Mount Lawu is a geothermal exploration area developed by PT Pertamina Geothermal Energy with an area of 60,030 Ha that covers 5 regions; Karanganyar, Sragen, Wonogiri, Ngawi, and Magetan. Based on EBTKE (2017), the probable reserves of Mount Lawu are 195 MWe. The geothermal energy generation development plan failed to commence due to several reasons, one of which is the attitude of the Karanganyar community towards the project (Figure 4).

Figure 4: Local communities gathered in front of Karanganyar's DPRD office to refuse exploration and exploitation of geothermal in Mt. Lawu (JIBI; Solopos.com, March 2017).

Pambudi (2019) emphasizes that the geothermal prospect area's citizen has minimal understanding of geothermal energy, which triggers the rejection and misinformation related to the geothermal project. Local communities believe Mt. Lawu is a sacred place that should not be disturbed and damaged by external activities, including geothermal exploration and exploitation. The environmental perception arises from the public concern that geothermal fluid could pollute the surrounding area and contaminate the aquifer from geothermal drilling activity and pipelines. The community perceives the land crack event in their area as result of aquifer water loss and pipeline network. The local community also has concerns related to the project's benefit to the local community due to fear that outsourcing duration would be terminated after the infrastructure preparation and construction phase. However, communities pursue the government and developers to resolve the problems in other geothermal areas to guarantee that Mt. Lawu would be commenced with better planning (Ibrohim, 2019).

2. Tampomas

Tampomas geothermal field, located 42 km northeastern the Bandung basin, West Java, Indonesia, is a volcanic mountain range formed due to the subduction activity between the Eurasian and Indian-Australian plates. Tampomas geothermal field is located in the northern part of Bandung Basin, one of Indonesia's highest geothermal potential areas (Rahayudin, 2020). It has 50 Mwe probable reserves and was developed by PT Wijaya Karja Jabar Power (EBTKE, 2017).

Figure 5: Geothermal development rejection banners in some of the Tampomas areas made by the local community.

Several residents in Buahdua and Conggeang Subdistricts, Sumedang Regency, West Java, rejected the government's plan to develop geothermal energy on Mount Tampomas. Local stakeholders perceive that geothermal exploration negatively impacts the ecosystem and endangers the community of Mount Tampomas. Communities show the rejection by placing rejection banners along the road and strategic places around the Tampomas area (Figure 5). Local stakeholders demand the apparent socialization and communication from the government and developers as good-willing for geothermal exploration and development in Tampomas area (Kompas.com, 2021)

3. Tangkuban Perahu

Tangkuban Perahu geothermal field, located in West Java, Indonesia developed by PT. Tangkuban Perahu Geothermal Power. It has 90 Mwe probable reserves (EBTKE, 2017). The development of the Tangkuban Parahu Geothermal Working Area started with the IUP (Geothermal Mining Permit) issued in 2009 by the Governor of West Java Province. Exploration drilling activities were forced to stop due to resistance from the surrounding community regarding the drilling location near the local housing. The local communities have concerned that drilling activity would affect the aquifer. The fear of blowout risk and the Lapindo disaster also derive the community rejection (Yuniarto, 2015).

Table 5: Community issues in Indonesia based on several references.

No.	Field	Location	Time of Issue	Community concern	Sources
1	Mount Lawu (PT Pertamina Geothermal Energy)	Central Java - East Java	January 2018	**Cultural:** Disturbance to sacred place due to project activities. **Environmental:** Disruption of ecosystem preservation due to infrastructure preparation; Water sources scarcity. **Economic:** The low benefit to the community from geothermal projects.	(Ibrohim et al., 2019); (ThinkGeoEnergy, 2021)
2	Baturaden (PT Sejahtera Alam Energy)	Central Java	November 2016 - October 2017	**Environmental:** Disruption to forest ecosystem and water source contamination; Man-induce natural disasters (floods and landslides) **Economic:** Disrupt the occupation of the surrounding community; Threat the natural tourism attractions	(Qorizki et al., 2021); (Kompas, 2018)
3	Mount Talang (PT Hitay Daya Energy)	West Sumatra	November 2017	**Environmental:** Water sources scarcity and contamination; Earthquake induced by drilling activity; The potential failure of GPP development. **Economic:** Limiting the local agricultural potential.	(Anggreta et al., 2022); (Luthfi, 2021)
4	Mount Rajabasa (PT Supreme Energy)	Lampung	May 2013	**Cultural:** Disturbance to historical place (forts) **Environmental:** Water source scarcity and contamination **Economic:** Erase the occupation of the surrounding community	(Tempo, 2013)
5	Tangkuban Perahu (PT Tangkuban Perahu Geothermal Power)	West Java	November 2013	**Environmental:** Water source scarcity and contamination; Man-induce natural disasters (floods and landslides)	(Yuniarto, 2015); (Detik.com, 2013)
6	Kaldera Danau Banten (PT Sintesa Banten Geothermal)	Banten	March 2020	**Environmental:** Disruption of ecosystem preservation.	(Kabarbanten, 2018)
7	Wae Sano (Government Drilling)	NTT	February 2022	**Cultural:** Disturbance to local village and traditional houses complex. **Environmental:** Risk to near village; Water source scarcity and contamination. **Economics:** Limiting the local agricultural potential.	(Foxntt, 2022)

No.	Field	Location	Time of Issue	Community concern	Sources
8	Tabanan (PT Pertamina Geothermal Energy dan Bali Energy Ltd)	Bali	August 2005	**Cultural:** Disturbance to sacred place due to project activities. **Environmental:** Water source scarcity and contamination; Disruption of ecosystem preservation.	(Detik.com, 2005)
9	Dieng (PT Geo Dipa Energi, Existing GWA)	Central Java	January 2022	**Environmental:** Risk to near village; Drilling risk to community (H2S and blow out)	(Opinijateng, 2022)
10	Mount Ciremai (PT Chevron Geothermal Indonesia)	West Java	March 2015	**Environmental:** Water source scarcity and contamination; Community's health.	(Gizawi et al., 2017); (Okezone.com, 2016)
11	Sorik Marapi (PT Sorik Marapi Geothermal Power)	North Sumatera	December 2014	**Environmental:** Disruption of ecosystem preservation; Drilling risk to community (H2S and blow out)	(Adityatama et al., 2018)
12	Sokoria (PT Sokoria Geothermal Indonesia)	East Nusa Tenggara	February 2017	**Economic:** Untransparent land acquisition mechanism.	(Adityatama et al., 2018)
13	Bittuang (Government Drilling)	South Sulawesi	January 2021	**Cultural:** Disturbance to sacred place (customary land) **Economic:** Erase the local plantation area **Environmental:** Water source scarcity	(Kareba Toraja, 2021); (Makassar channel, 2021)
14	Tampomas (PT Wijaya Karja Jabar Power)	West Java	March 2021	**Environmental:** Water source scarcity and soil fertility issue; Man-induce natural disasters (seismicity from drilling)	(Kompas, 2021)

Figure 3 shows the community concern to geothermal project that led to rejection based on Table 5. It indicates the environmental issues as the most significant aspect of geothermal project rejection that involved almost all the rejection. The environmental concern is fear of water sources such as scarcity and contamination, soil fertility, and natural disasters (floods, landslides, and earthquakes). While the economic concern related to the community anti-trust with land acquisition mechanisms, disruption to mass agricultural areas, and natural tourist attractions as local occupation. Furthermore, cultural issues are related to the fear that project activity would disturb historical-sacred places, traditional houses, and communities.

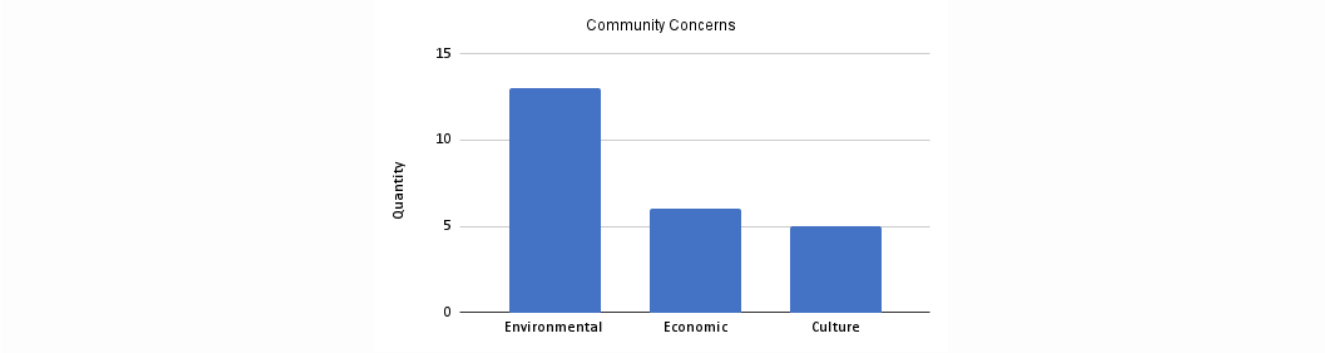

Figure 3 Community concerns to geothermal projects where each rejection may derive from more than one concern.

3. POSSIBLE CAUSE OF SOCIAL REJECTION

The social rejection of geothermal projects derives from several factors from multi-perspective view. Purwanto et al. (2021), Wallquist & Holenstein (2015), and Cataldi (1999) mention the social rejection in developing countries, including Indonesia, affected by public perception of the geothermal project, unfair benefit, and religious/cultural area disturbance. The possible detailed aspect that could trigger an issue per would be explained below:

1. Public perception

   The public perception would be derived from the economic condition, cultural & educational background, and self-interest related to the project. The response also varies among the impacted stakeholders and dynamic along the geothermal project with peak infrastructure and drilling phase where the first mass of mobilization occurred (Cataldi, 1999). Based on section 3, Indonesia's geothermal project rejection is mainly derived from public concern related to the environmental and social impact of the project. All those early public concerns and perceptions usually accumulated during the exploration drilling stages (Adityatama, Purba, & Kristianto, 2018).

   The community perception would fluctuate depending on the geothermal developer's response, action, and reputation. The corporate reputation is crucial for stakeholders to assess the capability, ability, and characteristics to fulfill stakeholder interests (Basdeo et al., 2006; Clark and Montgomery, 1998; Rindova and Fombrun, 1999). The reputation assessment is based on past corporate performance and plans that impact stakeholder. The developer's reputation results from the historical operation performance record where good operational performance would affect the excellent response from stakeholders and vice versa. The issue in a similar industry could also impact reputation. Several issues in Indonesia's geothermal area that affect the local communities, such as the H2S case on Sorik Marapi and Dieng, could drive the negative reputation and public response related to geothermal projects. Furthermore, the quality of the developer's social communication could drive the reputation assessment from the local community and the general stakeholder. Author discussion classified the public perception issue as the symptom triggered by more fundamental cause, such as:

   - Low community understanding related to geothermal project

     Adityatama et al. (2018), Umam et al. (2018), and Purba et al. (2020) emphasize that the community still has less understanding related to the overall geothermal project that would induce the project rejection. Malau et al. (2020) conducted study on the Muaralaboh geothermal area related to public knowledge of the geothermal project. The results show that most respondents still have no clear understanding of geothermal project purposes, benefits, and risks that may trigger rejection in the future (Malau et al, 2020). Ibrohim, Prasetyo, and Rekinegara (2016) emphasized that the Mt Lawu prospect area community also has less understanding of the geothermal project in their area. Low understanding of the geothermal project could cause misunderstanding due to wrong information built by community perception or spread by specific stakeholders with less goodwill toward the project. The low community understanding could be derived from the lack of education and socialization conducted by the government parties and the geothermal developer. Malau et al. (2020) and Ibrohim, Prasetyo, and Rekinegara (2016) mention that the majority community in Muaralaboh geothermal area and Mt. Lawu prospect claim that socialization from developers and government is rarely conducted. According to Purba et al. (2020) and Umam et al. (2018), the government and geothermal developers often do not realize the community's education as part of their responsibility. Purba et al. (2020) and Umam et al. (2018) emphasized that socialization and counseling sessions often executed only once with 3–6-hour duration with the expectation that the local community with various backgrounds would understand the complex geothermal project.

2. Community's loss of occupation

   The economic benefit in the project's early phase still contributes on a low level for locals. Malau et al. (2020) state that the local community in the Muralaboh geothermal area claims no local benefit from geothermal energy development. The Mt Lawu community is also concerned about this issue since the fear outsourcing from geothermal developers to the local workforce and prefer to use workforce from outside (Ibrohim, Prasetyo, and Rekinegara, 2016). It leads to rejection since all stakeholders would immediately demand the benefits and interest (Agnes, 2005). Purwanto (2021) emphasizes that the project's benefits would increase in the development and production phase, resulting from high project acceptance from society.

The insignificant economic benefit in the early phase may derive from the loss of local community occupation. The Indonesia geothermal area community is occupied as farmers and planters on their plantation or paddy. Geothermal projects involve the developer's local community land acquisition process that buys the land asset purposed to be drilling infrastructures such as well pad, access road, basecamp, warehouses, and site office (Purba et al., 2021). Although the value of the land acquisition has calculated the tangible value of land and intangible value such as loss of job and relocation, this process still diminished the main occupation of the local community. The condition worsens if the skill and capabilities acquired by the local community are still limited to work in other scopes.

3. Area disturbance on cultural site
   The geothermal project, especially in the drilling and construction phase usually would do civil work to prepare the area by modifying the terrain to support project activity such as rig and heavy vehicle mobilization, warehousing, etc. Furthermore, the project activity also involves workforce mobilization (Purba et al., 2021). This areal modification may result in public rejection because those activities would disturb any cultural and religious site near the project. This concern has proved to be the aspect of project rejection in the Mt Lawu area due to the presence of cultural sites (Ibrohim, Prasetyo, and Rekinegara, 2016).

4. DISCUSSION

4.1 Social Acceptance as Responsibility and License on Project

The corporate has primary and fundamental responsibility to protect the investment, shareholder interest, and corporate viability through profitability (Crowson, 2009). While the social aspect is the highest responsibility for a corporate to be a good citizen by engaging, empowering, and improving the surrounding communities in their project activity and operation (Carroll, 1991). Corporate performance and business sustainability are also measured by the triple bottom line model that pursues corporate to focus on not only profitability but also the environmental and social aspect of sustainable business (Jacobs & Chase, 2021). Geothermal developers as corporate should be aware of this responsibility as one of several aspects to gain social acceptance in their working area. Good social responsibility may lead to social acceptance of corporate operations through public participation and perception (Yogandari & Ibrahim, 2019). Social acceptance is vital since this aspect would support the project activity and eliminate additional risks related to community disruption. It supports the corporate to protect the investment, boost profitability, and achieve sustainability in the long run.

According to Hall et al. (2012) and Lacey, Parsons, & Moffat (2012), energy corporation must be eligible to get not only the legal license issued by government institution to regulate the standards of operation but also the Social License to Operate (SLO) that perceived by the local community. The SLO is a multidimensional agreement between affected stakeholders and corporate / project owners that reflects social acceptance by trust, confidence, and familiarity (Hall, Lacey, Carr-Conish, & Dowd, 2015; Barich, et al., 2021). The social license is gained through developing community trust by recognizing the local characteristic and providing the community with the opportunity to improve (MFAT and Jacobs, 2022). The SLO is not automatically gained after the developer receives the exploration permit from the government since the government and community often act on different interests as different stakeholders in the project. Furthermore, social acceptance is also developed by social-political acceptance, community acceptance, and market acceptance with connectivity, as shown in Error! Reference source not found. left**.** Hall et al. (2015) mention several main factors that affect social license in energy, including geothermal Error! Reference source not found. right. Unfortunately, the SLO framework and best practices in the geothermal industry are still new and emerging (Barich, et al., 2021; Hall, Lacey, Carr-Conish, & Dowd, 2015).

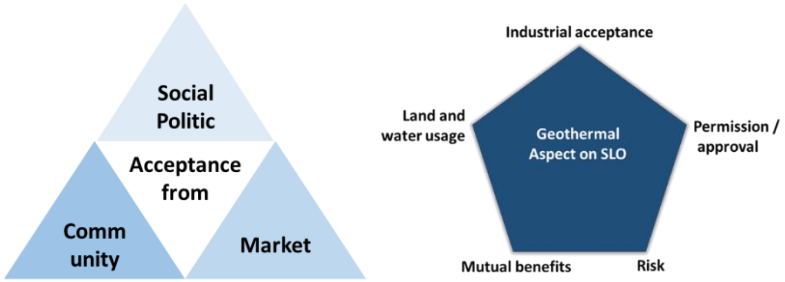

Figure 4 Left: Social acceptance aspect on Social License to Operate; Right: Aspect of geothermal social license to operate (modified from Hall, 2012).

4.2 Good Social Response to Geothermal Project

According to Barich et al. (2021), the social response is caused by three main aspects from stakeholders: legitimacy, credibility, and trust. The project acceptance by stakeholders means the stakeholders show no objection or disapproval related to project activities and assess the geothermal developer as legitimate party to perform the project. The successive acceptance phase is approval, where stakeholders support the project and are proud to engage in achievement due to the developer's credibility. The highest level is stakeholder co-ownership of projects with fewer social boundaries, and the developer has assumed as part of the community by gaining complete trust from stakeholders (Barich, et al., 2021). Figure 5 shows the framework of social license on geothermal based on Barich et al. (2021).

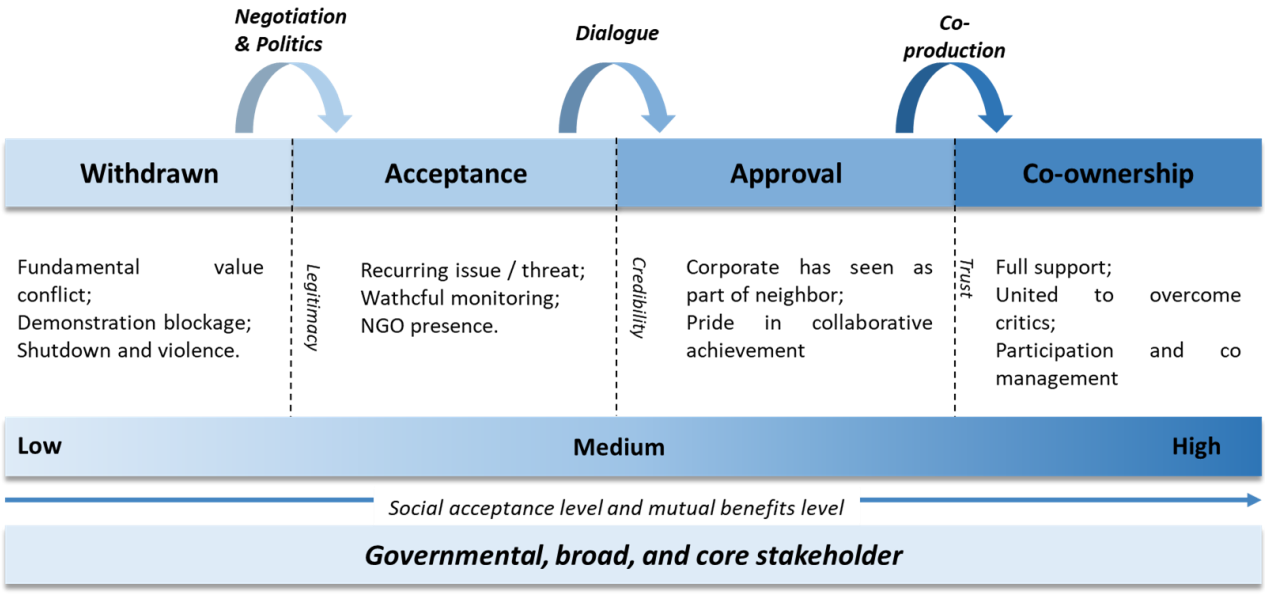

Figure 5: Social license framework in the geothermal industry (modified from Barich et al., 2021).

The author encourages the development of geothermal as sustainable energy executed through implementing sustainable business practices. Geothermal developer needs to aim at social acceptance level in the short run, then target to achieve social approval and stakeholder co-ownerships in the medium and long run. Several approaches that could be considered to obtain an excellent response from stakeholders in the geothermal project such as:

1. Community development program
   The public understanding level seems to act as critical aspect of public perception of geothermal development that led to the community response to the project. Good community development program could provide more comprehensive education and explanation to community-related geothermal energy and project implications in their area through regular socialization and hearing session. During the socialization and counseling, the government and geothermal developer must provide the precise answer to stakeholder concerns and curiosity clearly to gain legitimate perspectives from the stakeholder without pressure to accept the project. The community development program needs to be carried out immediately by the local government to provide the understanding and prepare the community related to geothermal prospects in their area. Local government involvement in the early phase is vital to reduce the social risk since the developer has faced complex risks related to the technical aspects of geothermal resources.

   Community development programs are not limited to project socialization but also prepare the local community to face their occupation changes. Purba et al. (2021) emphasize that the educational and training center could be developed to equip local human resources with the required basic skills related to the geothermal industry (civil construction, machinery, health and safety, project administration, and drilling). The skilled local workforce would benefit both the local community and the developer. It enables more local contribution to the geothermal project in the earlier phase with less risk to the developer since the local workforce has practical knowledge of the project. The campaign and training related to geothermal direct use also could be conducted since it would accelerate the understanding of the local community, provide long-term occupation, and accelerate public acceptance (Adityama, Purba, and Kristianto, 2018).

   Several action plan that could be considered to perform good community development program, such as:
   - Perform multi-level discussion and reconciliation between the government, developers, and advocacy climate NGO's to provide the common ground for all large scale stakeholder in order avoid the contra dictionary on lower level.
   - Perform knowledge and lesson learnt sharing between developer and government to avoid similar mistake on handling issue.
   - Develop the main syllabus guidelines for Indonesia geothermal project community development program that comply with the international guidelines
   - Develop clear mapping of local community stakeholders' position, interest, and concern to geothermal project.

2. Good project commitment and implementation
   Early commitment and the implementation of developer plan related to the project and community benefit are essential to monitoring strictly. The deviation or cancellation of implementation from commitment could derive the stakeholder's negative response and reduce the developer's legitimacy. The project's operational issue affecting the community should also be mitigated effectively to avoid negative reputation for the developer. Furthermore, the developer should also show respect related to local beliefs and cultural values during the project execution since several areas concern the disturbance due to project activity, as explained in section 4.

   Geothermal developers must be aware that good project implementation not only affects the particular period, but also would be recorded as historical performance that drives the company's reputation and vice versa. Professional social issue handling and

resolution are also essential to build positive reputation in industry and corporate. Purba et al. (2021) mention that professional certification for geothermal personnel needs to be performed to reduce the risk and support the excellent operation of the project.

Several action plan that could be considered to perform good project commitment and implementation, such as:
- Conduct clear and achievable expectation to the community to avoid community disappointment and negative responses.
- Perform certification and trainings for key personnel on technical and non technical aspects of project to support excellence operation implementation.
- Implement strict HSE standards for all project operations to eliminate bad project execution to people and environmental aspect.

3. Clear communication to stakeholders
Stakeholder communication is vital to constructing the community perception through delivering relevant issues related to the field event (Hartadi, 2012). The appropriate media could influence public perception, society's decision-making processes, and public awareness about the geothermal project (Yogandari and Ibrahim, 2019). According to Purba et al. (2021), geothermal developers and local government may gain community engagement through certified teams of experienced staff and the local community. This team is expected to cultivate positive interaction and open communication between geothermal developers and the local community. Clear communication is also essential aspect of gaining the trust of all stakeholders.

Several action plan that could be considered to perform clear communication to stakeholders, such as:
- Identify key stakeholders and group distribution on the project are to understand the effective communication channels.
- Provide reliable, sustainable, and clear communication channel to provide effective discussion-information provision to local communities related to the project.

Table 6 shows the correlation between the author's proposed action and analysis of the possible cause of social rejection in the geothermal project.

Table 6: The connection between proposed action and possible cause of geothermal rejection.

	Public perception		Unfair economic benefit	Area disturbance
	Lack of public understanding	Developer reputation	Loss of occupation	Landscape and social disturbance
Community development	V	V	V	
Good project planning and implementation		V		V
Clear stakeholder communication	V	V		V

5. CONCLUSION

After discussions above, several aspects can be concluded as follows:

- Social acceptance issues as non-technical issues for geothermal project and need to be solved to prevent the social risk will lead to project delay/stop that lead to cost overrun, and loss of reputation
- There are 14 geothermal working area that still facing community issues, which are: Gn. Lawu, Baturaden, Gn. Talang, Gn. Rajabasa, Kaldera Danau Banten, Wae Sano, Tabanan, Dieng, Gn. Ciremai, Sorik Marapi, Sokoria, Bittuang, and Tampomas. The main concern of community to geothermal project is environmental concern related to ecosystem disruption and water source scarcity.
- Possible cause of social rejection is typically from bad public perception in geothermal extraction, loss of local occupation, and area disturbance to cultural site.
- Corporations are responsible for gaining community acceptance and obtaining social license to operate from the community. Several actions could be considered to obtain acceptance, such as comprehensive community development program by the government and developer to raise the community's understanding. The developer's excellent project planning and implementation is recommended to shape the good reputation of geothermal industry corporates. Clear communication to all stakeholders to keep the commitment and maintain communication to local stakeholders is vital in mitigating community rejection issues.

Author realize this paper as preliminary publication related to the social issue on geothermal project that need further analysis to construct better result.

REFERENCES

Adityatama, D., Purba, D., & Kristianto, B.. INTEGRATED GEOTHERMAL DIRECT USE FACILITY AS AN ALTERNATIVE APPROACH IN COMMUNITY ENGAGEMENT AT EARLY EXPLORATION PHASE IN INDONESIA. *IIGCE*. Jakarta. (2018).

Aithal, D. P. S.:. Study on ABCD analysis technique for business models, business strategies, operating concepts and business systems. *International Journal in Management and Social Science*,(2016*)*, 4(1), pp. 98 - 115.

Anggreta, D. K., Somantri, G. R., & Purwanto, S. A.: Study of Student Community Movements Against the Development of a Geothermal Power Plant in Gunung Talang, The Journal of Society and Media, **6(1)**, (2022), 62-83

Barich, A., Stokłosa, A. W., Hildebrand, J., Elíasson, O., Medgyes, T., Quinonez, G., . . . Fernandez, I.. Social License to Operate in Geothermal Energy. *Energies*. (2021).

Cataldi, R.. Social acceptance: a sine qua non for geothermal. *Bulletin d'Hydrogiologie No 17*. (1999).

Carroll, A. B. The pyramid of corporate social responsibility: Toward the moral management of organizational stakeholders. Business Horizons. (1991).

Crowson, P. *Adding Public Value: The Limits of Corporate Responsibility.* Resource Policy. (2009).

Detik.com. Pedang Protes Eksplorasi Geothermal di KBU, 2013. *https://news.detik.com/berita-jawa-barat/d-2417972/pedang-protes-eksplorasi-geothermal-di-kbu*. Accessed at 30 June 2022. (2022).

DetikNews. Masyarakat Bali Demo Tolak Pembangunan Geotermal, 2005. *https://news.detik.com/berita/d-426454/masyarakat-bali-demo-tolak-pembangunan-geotermal*. Accessed at 2 July 2022. (2022).

EBTKE. Pengembangan Panas Bumi di Indonesia. Jakarta (2022)

ESMAP. Geothermal Handbook: Planning and Financing Power Generation. World Bank, (2012).

Franks, D., Davis, R., Bebbington, A., Ali, S., K. D., & Scurrah, M. Conflict translates environmental and social risk into business costs. *Proc. Natl.* (2014).

Giurco, D., McLellan, B., Franks, D., Nansai, K., & Prior, T. Responsible mineral and energy future. (2014).

Gizawi, A. S., Ritohardoyo, S., & Haryono, E. H.: Kajian ekologi bentanglahan dan persepsi masyarakat terhadap rencana eksplorasi panas bumi. Majalah Geografi Indonesia, **31(1)**, (2017), 1-11.

Grant, R. M.: Contemporary Strategy Analysis. Fifth ed. s.l.:John Wiley & Sons, (2005).

Hall, N., Lacey, J., Carr-Conish, S., & Dowd, A.-M. Social licence to operate: understanding how a concept has been translated into practice in energy industries. *Journal of Cleaner Production*, 303. (2015).

Ibrohim, A., Prasetyo, R. M., & Rekinagara, I. H. Understanding Social Acceptance of Geothermal Energy: A Case Study from Mt. Lawu, Indonesia. *IIGW*. Bandung: IOP Conference. (2019).

JACOBS. *Environmental and Social Safeguard.* Jakarta: JACOBS. (2022).

Jacobs, F. R., & Chase, R. B. *Operation and Supply Chain Management.* New York. (2021).

KabarBanten.com. Tolak Geothermal, Ratusan Warga Demo di KP3B, 2013. *https://kabarbanten.pikiran-rakyat.com/serang/pr-59609282/tolak-geothermal-ratusan-warga-demo-di-kp3b*. Accessed at 1 July 2022. (2022).

Karebatoraja.com. Sekelompok Warga Tolak Eksplorasi Panas Bumi di Lembang Balla, Tana Toraja,2021. *https://kareba-toraja.com/sekelompok-warga-tolak-eksplorasi-panas-bumi-di-lembang-balla-tana-toraja/*. Accessed at 3 July 2022. (2022).

Kompas.com. Pengeboran 3.400 Meter di Gunung Slamet Dihentikan Sementara, 2018. *https://properti.kompas.com/read/2018/08/02/160000321/pengeboran-3.400-meter-di-gunung-slamet-dihentikan-sementara?page=all*. Accessed at 30 June 2022. (2022).

Kompas.com. Warga Tolak Proyek Geothermal di Gunung Tampomas, Begini Respons Bupati Sumedang , 2021. *https://regional.kompas.com/read/2021/03/22/212711278/warga-tolak-proyek-geothermal-di-gunung-tampomas-begini-respons-bupati?page=all*. Accessed at 3 July 2022. (2022).

Lacey, J., Parsons, R., & Moffat, K.. Exploring the concept of a Social Licence to Operate in the Australian minerals industry: Results from interviews with industry representatives. *CSIRO*. Brisbane. (2012).

Luthfi, S, Manajemen Konflik Dalam Kegiatan Eksplorasi Investasi Pembangkit Listrik Tenaga Panas Bumi Gunung Talang-Bukit Kili Kabupaten Solok, *Doctoral Dissertation*, Universitas Andalas, Padang, Indonesia, (2021).

Makassarchannel.com. Warga Tana Toraja Tolak Eksplorasi Geotermal Bittuang, 2021. *https://makassarchannel.com/index.php/2021/02/11/warga-tana-toraja-tolak-eksplorasi-geotermal-bittuang/2/*. Accessed at 3 July 2022. (2022).

Malau, H., Fajri, H., Yuanjaya, P., Saputra, B., & Maani, K. Knowledge of Local Communities Affected by the Development of Geothermal Energy. *INCRID*. IOP Conference. (2020).

MFAT and Jacobs.: Environmental and Social Safeguards. PT SMI Geothermal Exploration Drilling Training, (2022).

Okezone.com. Ini Alasan Chevron Hengkang dari WKP Ciremai , 2016. https://economy.okezone.com/read/2016/11/13/320/1540248/ini-alasan-chevron-hengkang-dari-wkp-ciremai. Accessed at 3 July 2022. (2022).

Opinijateng.com. Demo Warga Dataran Tinggi Dieng Menolak Pengeboran Pembangkit Listrik Tenaga Panas Bumi (PLTPB), 2022. *https://opinijateng.com/2022/01/25/5269/demo-warga-dataran-tinggi-dieng-menolak-pengeboran-pembangkit-listrik-tenaga-panas-bumi-pltpb/*. Accessed at 2 July 2022. (2022).

Pallson & Olafsson.: The Geothermal Business Case, Iceland. UNU-GTP, (2019).

Pambudi, N. A., Pramudita, V. S., Biddinika, M. K., & Jalilinasrabady, S.: So Close Yet so Far–How People in the Vicinity of Potential Sites Respond to Geothermal Energy Power Generation: an Evidence from Indonesia, *Evergreen Joint Journal of Novel Carbon Resource Sciences & Green Asia Strategy*, Kyushu University, Japan, (2022).

Peterdy, K.: PESTEL Analysis. Corporate Finance Institure, (2022).

PLN. (2021). *Rencana Usaha Penyediaan Tenaga Listrik*. Jakarta: PLN, (2021)

Prayogo, D. ANATOMI KONFLIK ANTARA KORPORASI DAN KOMUNITAS LOKAL PADA INDUSTRI GEOTERMAL DI JAWA BARAT. *Makara*. (2010).

Purba, D., Adityatama, D. W., Agustino, V., Fininda, F., Alamsyah, D., & Muhammad, F. Geothermal Drilling Cost Optimization in Indonesia: A Discussion of Various Factors. *PROCEEDINGS, 45th Workshop on Geothermal Reservoir Engineering*. California: IGA, (2020).

Purba, D., Chandra, V. R., Fadhillah, F. R., Wulan, R. D., Soedarsa, A., Adityatama, D. W., & Umam, M. F. Drilling Infrastructure Construction Challenges in Geothermal Exploration Project in Eastern Indonesia. *World Geothermal Congress*. Reykjavik: WGC. (2021).

Purwanto.: Geothermal Exploration in Indonesia – Implementation, Strategy and Lesson Learned. Geomonday by PT Sarana Multi Infrastruktur and Enerka, (2021a)

Purwanto, E. H., Nazif, H., Yulianugroho, S., Primasatya, S., & Fathoni, A. Community Engagement Support on Sustainable Geothermal Operation: A Perspective on Corporate Social Responsibility Implementation in Indonesia. *World Geothermal Congress*. Reykjvikc. (2021b).

Qorizki, D., Permadi, D. B., Yuwono, T., & Rohman, R.: Should drill or shouldn't drill? Urban and rural dwellers' acceptance of geothermal power plant in Mount Slamet protection forest, Indonesia. Forest and Society, **5(2)**, (2021), 575-590.

Tempo.co. Masyarakat Adat Lampung Tolak Proyek Panas Bumi, 2013. *https://nasional.tempo.co/read/484292/masyarakat-adat-lampung-tolak-proyek-panas-bumi*. Accessed at 30 June 2022. (2022).

Think Geoenergy. PT Pertamina Conducting Review of Gunung Lawu Geothermal Project, 2021. *https://www.thinkgeoenergy.com/pt-pertamina-conducting-review-of-gunung-lawu-geothermal-project/*. Accessed at 30 June 2022. (2022).

Umam, M. F. (2018). Geothermal Human Resource Development in Indonesia: Utilizing the Advances of the Oil and Gas Industry Master Thesis. University of Auckland. Auckland.

Umam, M. F., Muhammad, F., Adityatama, D. W., & Purba, D. P. Tantangan Pengembangan Energi Panas Bumi Dalam Perannya terhadap Ketahanan Energi di Indonesia. *Swara Patra*. (2018).

UNEP. *From Conflict to Peacebuilding; The Role of Natural Resources and Environment. Nairobi: United Nation.* Nairobi: United Nation. (2009).

Voxntt.com. Aksi Tolak Geothermal Ricuh, Massa Robohkan Gerbang Kantor Bupati Manggarai Barat, 2022. *https://voxntt.com/2022/02/02/aksi-tolak-geothermal-ricuh-massa-robohkan-gerbang-kantor-bupati-manggarai-barat/85003/*. Accessed at 2 July 2022. (2022).

Wallquist, L., & Holenstein, M. Engaging the Public on Geothermal Energy. *World Geothermal Congress*. Melbourne. (2015).

World Bank. *Opportunities and Options for Governments to Promote Corporate Social Responsibility in Europe and Central Asia*. Washington D.C: World Bank. (2005).

Yuniarto,E.: Strategy of Conflict Resolution Among Society During Exploration Development Case of Tangkuban Parahu Concession Area, West Java Indonesia. *World Geothermal Congress*. Melbourne. (2015).

Yogandari, A. P., & Ibrahim, R. F. MEDIA FRAMING ON SOCIAL ACCEPTANCE OF GEOTHERMAL DEVELOPMENT . *New Zealand Geothermal Workshop*. Auckland. (2019).