Preliminary ESG Consideration for Geothermal Development in Indonesia: What Relevant Environmental, Social and Governance Aspects Need to be taken into Account?

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ABSTRACT

Indonesia's islands are abundant with geothermal energy, a sustainable and environmentally-friendly source of energy. Various research studies have supported the environmental advantages of geothermal energy and its potentials to support the global and national mission of carbon emission reduction to decelerate global warming. More specifically, geothermal energy's potentials can be harnessed in the Carbon Market Exchange, as well as to support the 17 pillars of sustainable development goals (SDGs), and the environmental, social and governance (ESG) business assessment. ESG is a parameter used to manage business operations risks, which are related to environmental and social impact management and corporate governance activities, all of which have currently become trending topics in various discourses about business development and investment.

This paper will attempt at presenting some preliminary discussions related to the potentials of geothermal energy development in Indonesia, related to the ESG aspect. This paper uses an empirical study, surveying about 250 respondents, involving both those who are familiar with the geothermal exploration and exploitation and those who are not.

Our survey result revealed that at least 32% of all respondents had already been familiar with the geothermal sector and the challenges of developing this sector in Indonesia, with only about 1.6% still unfamiliar with the term and had never heard of it. About 68.8% of the respondents understood the environmental concerns related to geothermal energy development, starting from greenhouse gas emission, biodiversity, the land borrow-to-use permit system, concerns about the stench and noise of energy projects, as well as concerns about the management of domestic waste as well as Hazardous and Toxic Waste. It is also important to take into account the implications that these projects will have on the social and corporate governance aspects.

Our survey results also revealed that on average, the respondents have the optimistic view that the development of geothermal energy in Indonesia can also contribute to the national renewable energy mix. The survey results also prove that it is highly important to factor ESG risks into the challenges related to geothermal energy development. The importance of understanding geothermal energy development from the ESG perspective then requires practitioners to boost their basic knowledge and awareness related to ESG, while at the same time requiring them to play an active role in educating relevant stakeholders so the latter can have accurate perception about clean and renewable energy management.

1. INTRODUCTION

Indonesia has abundant and diverse energy sources, from fossil fuel to renewable and environmentally-friendly sources of energy like geothermal energy. Geothermal energy has a number of environmental advantages thanks to its properties: renewable, low emission and minimum waste (Permatasari *et al*., 2014).

The discourse on the environmental sustainability aspects of industrial activities – including the management of the energy sector as well as its impacts on its social and environmental settings – has become a global focus. This concern is also listed in the 17 pillars of sustainable development goals (SDGs), which also include the global focus on the environmental, social and economic aspects of the world we live in, as part of the triple bottom line (TBL) concept (Ojutkangas, *et.al*., 2022).

With the advancements of our modern times, a number of stakeholders have developed various instruments to measure how well various business operations have implemented the SDGs concepts in different business processes. Various businesses have begun to use these instruments not only to report the results of their sustainability projects but also to assess the readiness of their ecosystem to implement these initiatives, plus to apply for various sustainability grants and awards. The financial sector has also incorporated sustainability into their operations, ensuring that their businesses impact the environment positively, empower local communities and boost local welfare – these goals achieved through good corporate governance. All these elements are summarized within the implementation of the ESG concept (Jiang, *et al*., 2022), which can be one of the most important considerations to take for corporations or business people who seek to establish a renewable energy development business, such as geothermal energy.

This paper will discuss the preliminary assessment on the potentials of geothermal energy development in Indonesia by taking into account a number of risk factors within the ESG concept. Based on the results of this survey involving 250 respondents, we have discovered that the knowledge about environmental and social management in the geothermal energy sector has not yet become mainstream and this affects the of people's perception and concern about geothermal development in Indonesia. The first step we can to understand the barriers to geothermal energy development in Indonesia are identifying the public perception about geothermal energy development as represented by our survey sample. We can use this insight

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as a jumping-off point to start exploring various potential methods we can use to manage the impact and risk factors related to geothermal energy development, as understood from the ESG lens. Hopefully, this paper can prompt Indonesia to boost its geothermal energy development capacity.

1.1. Overview of Geothermal Development in Indonesia

The Indonesian government has included the development and use of geothermal energy in its agenda to help this country's energy sector transition into a more renewable mix. Currently, Indonesia's geothermal energy reserves stands at 23.7 Giga-Watts (GW), turning it into one of the biggest geothermal reserves in the world. Meanwhile, the total energy generated by geothermal power plants in Indonesia currently amounts to only 2.276 MW, which makes up only about 9.6% of the total geothermal reserve potential in Indonesia (ESDM, 2022). Indonesia already has a number of geothermal development sites in a number of locations across the country, as shown by Figure 1.

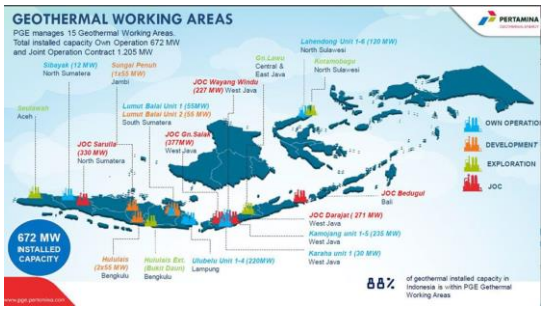

Figure 1: A Map Showing the Distribution of Geothermal Power Plants in Indonesia (PGE Indonesia, 2022)

Later on, a few challenges began to arise with regards to the development of geothermal energy in Indonesia (Nur, S., *et.al*., 2023). These challenges include: (1) how the geothermal energy development project could potentially impact its social surroundings; (2) the government's feed-in-tariff policy (which will not be discussed in this paper); as well as (3) the technical risks associated with geothermal exploration and exploitation activities (which will not be discussed in this paper). This paper will focus on the challenges and potentials related to geothermal energy project development in Indonesia, from the ESG risk factor perspective.

It is important to discuss these issues in order for us to support the development of geothermal energy projects and make these projects sound more lucrative, and at the same time also decreasing the risk factors associated with these projects' ESG aspects (HSBC, 2021). We intend to identify the major risk, from this paper we can at least identify the major risk factors of geothermal project development seen from the ESG perspective and what can we do in order to support the future growth of geothermal projects in Indonesia.

2. UNDERSTANDING THE ENVIRONMENTAL, SOCIAL AND GOVERNANCE (ESG) RISK FACTORS

ESG is a framework which helps stakeholders understands how an organization manages the environmental, social and corporate governance risks and opportunities from their business operations. Businesses often apply the ESG paradigm to assess the feasibility of their investments, involving all relevant stakeholders, not only the investors but also customers, suppliers, even employees. The whole point of the ESG concept is to support the optimization of a business operations' sustainability. The ESG's definition of organizational or business sustainability goes beyond just environmental aspects. You can grasp the holistic aspect of the ESG concept by looking at the Figure 2:

Figure 2: The ESG framework as an important consideration in geothermal energy development (FTSE Russell, 2020)

This paper's main target readers are the relevant stakeholders, such as worker-professional and local; local community; government; etc., who work in the geothermal energy sector as an environmentally-friendly and sustainable source of energy. We hope that the feedback we receive from this survey can show us a general picture on the public's level of concern about the challenges related to geothermal energy development, related to the ESG concept. We also hope that this preliminary research study can initiate actions to moderate these challenges to support the government's target of renewable energy mix.

2.1. Assessment Process and Methodology

2.1.1. Assessment Process

As we have already mentioned above, this paper is an introductory text which seeks to provide an inventory of challenges related to the development of geothermal energy in Indonesia studied from the ESG point of view. We ground this assessment on our analysis of responses to the questionnaires which we have distributed to our 250 respondents who come from various backgrounds: starting from energy sector experts to students and the lay people who are not familiar with the geothermal sector at all yet they use electricity in their everyday activities. This is what the survey questionnaire looks like:

Figure 3: Questionnaire Assessing Challenges Related to Geothermal Energy Development Based on the ESG Perspective (delivered in Bahasa Indonesia)

The 250 participants were selected by online, by communicating through group of mailbox in our daily activities. From about 1,000 persons contacted or informed, only a quarter of them whom are willing to respond. We believe that the respondent having the same concern as we

are. All of the 250 respondent were answering all the questions as assessed in this paper.

The online questionnaire which we have distributed to our respondents focuses on a number of issues, such as: their level of experience and knowledge on the geothermal sector, basic knowledge about the potential impacts of a geothermal energy development project, as well as their recommendations on how to improve geothermal energy development projects, taking into account ESG-related risks.

2.1.2. Methodology

The method we use in assessing and analysing this issue follows the flowchart below:

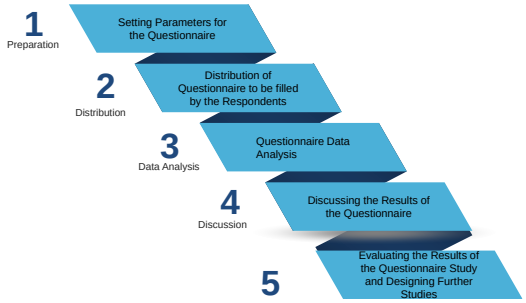

Figure 4: Working Flow as Methodology for Questionnaire Analysis

3. RESULTS & DISCUSSION

We present and discuss the results from the questionnaire from the perspective of the ESG framework.

3.1. Educational Level

We also take into account the respondents' level of formal education. The results show that 42.7% of our respondents have Bachelor's Degree (Strata-1), 33.3% of them have Master's Degree (Strata-2) and 13.8% of them have a Doctorate Degree (Strata-3). While ½ in the Figure 5 informing that there were more of answer from respondent, hence it is a minor classification in this result.

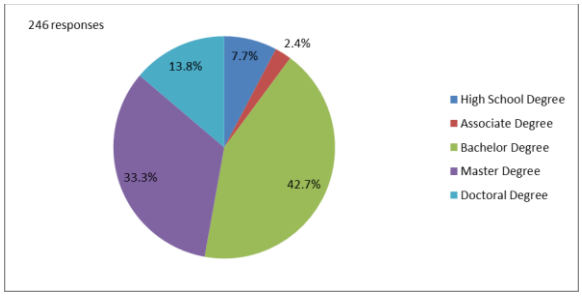

Figure 5: Respondents' Educational Level

3.2. Gender

Gender becomes a very important factor when it comes to sustainable development, as Gender Equality is the fifth goal of the SDGs. Gender equality is also defined by equal access to opportunities and therefore, we take this factor into account for our questionnaire study. This is also has connection with ESG concept where SDGs points is also considered part of the S and G in the ESG. Meanwhile, the gender composition of our study is described below:

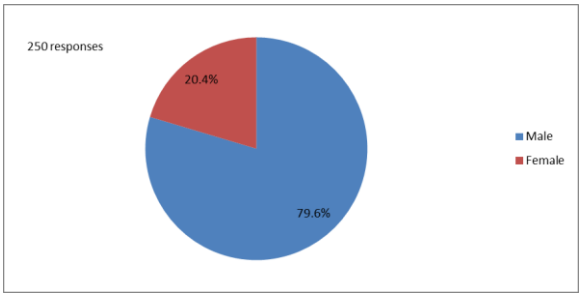

Figure 6: Respondents' Gender

From Picture 6 we can see that our respondents are 79.6 percent men and 20.4 percent women. From the statistics, we can see that the majority of this study's respondents are male.

3.3. Island of Domicile

This information is necessary to provide a picture on the geographical locations of the survey's respondents. The results are as follows:

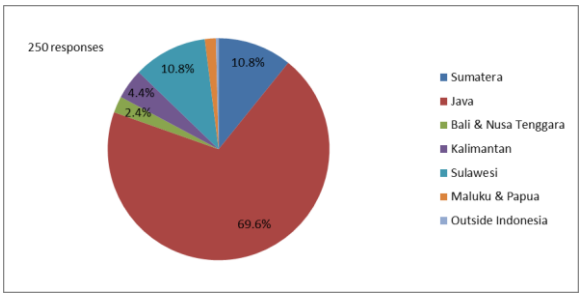

Figure 7: Where our Respondents Live

From Picture 7, we gather that on average, our respondents stay in the Java island (69.6%) and 10.8% of them stay in Sulawesi, 10.8% stay in Sumatra, while others are scattered across other islands in Indonesia. However, on average, our respondents stay in Java but work in other parts of Indonesia; this is true especially for those who work in the geothermal, oil and gas and mining sectors. Since they were working on scheduled basis, sometimes as they work in the geothermal field, it is obviously has geothermal energy; but in their area of living, most of them living in the city without geothermal energy potential. This is also considered that the respondent mainly a professional in geothermal or having knowledge in geothermal sector, but are not local community in surrounding of geothermal area.

3.4. Age Range

The age distribution is also quite varied, ranging from under 20 years old (5.2%) to over 50 years old (29.2%), which is quite dominant in this survey. The distribution is shown below.

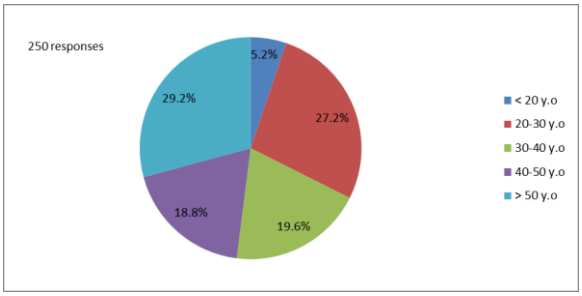

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Figure 8: Distribution of Respondents' Age Range

Based on the results of the questionnaires distributed, it is known that the dominant respondents are in the age range above 50 years, with work experience in the geothermal, oil & gas, and mining sectors above 30 years. In addition, the average respondent is a practitioner, academician, government instrument, and some others work as students in the field of geothermal. From the basis of this questionnaire, it is known that the average respondent has a fairly good level of knowledge in the field of geothermal and its development.

3.5. The Availability of Potential Geothermal Sources in Places of Domicile

About 54% of our respondents state there are no geothermal energy development projects in their place of domicile, despite that about 32% of them have heard about this sector. In addition to that, about 68.8% of our respondents also grasp the environmental aspect of geothermal energy development. The results are presented below:

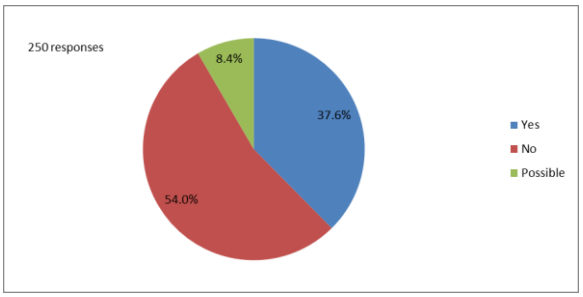


Figure 9: The Availability of Potential Geothermal Sources in Places of Domicile

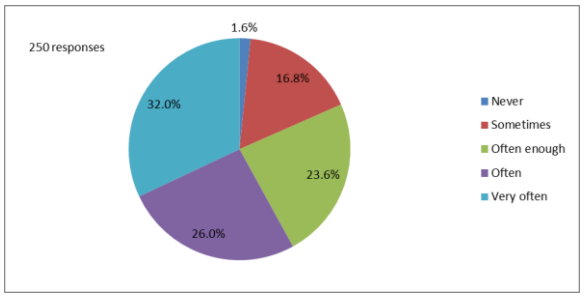


Figure 10: Exposure to Information Regarding the Geothermal Sector in Indonesia

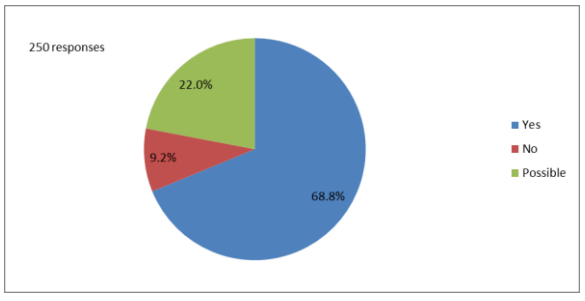


Figure 11: Level of Knowledge Regarding the Environmental Aspects of Geothermal Development

Based on Image 9-11, we can grasp that the majority of our respondents have a relatively decent level of knowledge and experience regarding geothermal energy development, including its environmental aspects.

3.6. Essential Environmental Aspects

In terms of environmental aspects, there are several issues mentioned by the respondents related to the development of the geothermal sector, including the following.

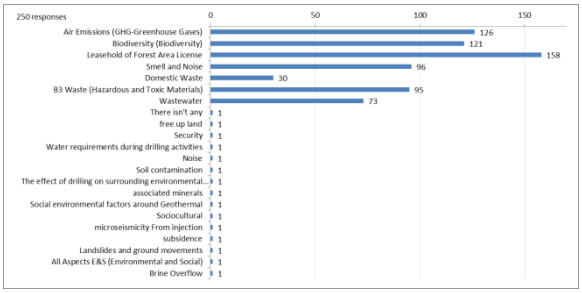


Figure 12: List of Important Environmental Aspects Based on Survey Results

Basically the respondent were given some key option to ESG concern, but there is also an "other" option for them to determine their insight and opinion regarding to certain question.

Based on Image 12, we come to know that about half of the respondents mentioned greenhouse gas emission, biodiversity and the Leasehold of Forest Area License as three most important aspects for geothermal energy development projects to pay attention to. The issue of waste and noise have become important environmental aspects to consider in geothermal energy development projects.

3.7. Important Social Aspects

We also have to take into consideration the following concerns about the social impact of geothermal energy development projects:

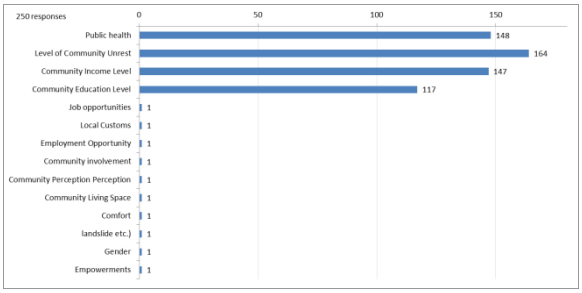


Figure 13: Social Impacts of Geothermal Energy Development Projects in Indonesia

From Figure 13, we can see that on average, our respondents share the same view regarding the social impacts of geothermal energy development projects, which include: public health, level of income, level of anxiety and level of education. Therefore, this paper also focuses on the public perception on geothermal energy development projects, including the barriers these projects face based on the ESG aspect.

A number of respondents are also aware of the interconnections between environmental and social impacts of such energy projects. The same activity can possibly create interrelated primary and secondary impacts. It is

important to see how we can comprehensively intervene on these impacts.

3.8. The Corporate Governance Aspects

In the focus of the questionnaire discussion, environmental and social aspects were emphasized. However, in the discussion section related to barriers to geothermal energy development, it is known that aspects of corporate governance and human resources are the focus of respondents in seeing the challenges of geothermal development in Indonesia. This is very related to, and in accordance with, the global context related to ESG aspects as one of the risks in investment and decision-making in a business development model.

The survey results are shown below:

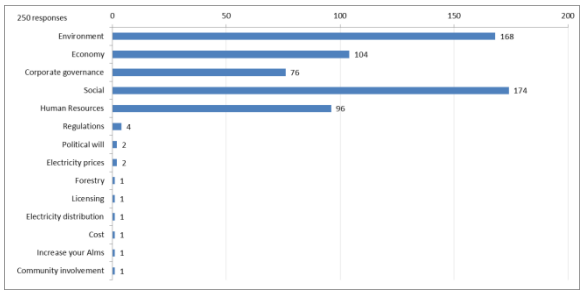


Figure 14: Barriers to Geothermal Energy Development According to the Respondents

3.9. Areas Of Priority

3.9.1. First priority

The questionnaire respondents have chosen a number of priority areas to pay attention to in geothermal energy development projects and ranked them in order of urgency. The results are the following:

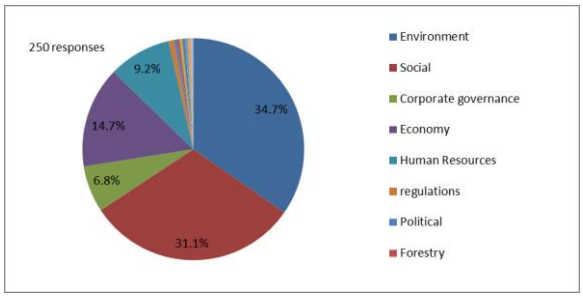


Figure 15: First Priority According to Respondents

3.9.2. Second Priority

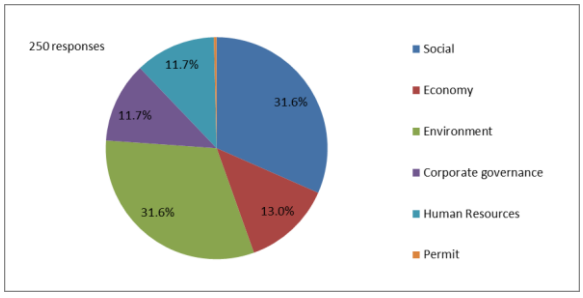
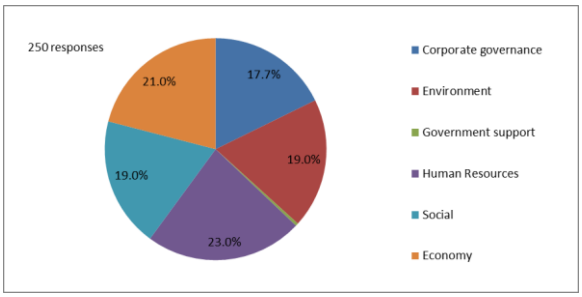


Figure 16: Second Priority According to Respondents

3.9.3. Third Priority



Picture 17: Third Priority According to Respondents

If you look at Images 15 to 17, you can see that the respondents perceive that we should prioritize the assessment of corporate environmental, social and economic challenges in geothermal energy development projects. The priorities align with the three elements of sustainability principles: the environment, the social and the economy. It turns out the stakeholders who come from various backgrounds also identify these three things as their primary focus, because they will determine the success of geothermal energy development projects. Other aspects might later become the priority of such projects and can be discussed in upcoming papers.

3.10. Discussions

This paper is initially based on SDGs concepts and ideas, which have been translated into a wide range of frameworks, such as the Triple Bottom Line, the ESG, Life Cycle Assessment and many others. Even though the paper mainly discussed about the ESG Consideration, thus it is much related one to another to the concept of SDGs, LCA, etc., overall with the same concern towards sustainability. On the other hand, when we look at the renewable energy mix in Indonesia, the geothermal energy sector development has the most complex set of challenges. This paper has already addressed some of these challenges.

Through our data collection using an online questionnaire filled by 250 respondents from various professions: from energy sector academics and practitioners to the educated public, we have gathered an initial finding on public perception about the geothermal energy sector development in Indonesia. Results from these questionnaires also show that although most respondents have high formal education in various disciplines, not all of them have detailed knowledge about geothermal energy when it comes to its procurement, business operations, current challenges and many more. The discussion section of the questionnaire specifically addresses the challenges of implementing such projects while adhering to the components of SDGs, which are connected to ESGs and other sustainability concepts.

From the analysis of our questionnaire survey results, we also find out that our respondents mainly narrow their concerns down on three main priority challenges to be solved to develop geothermal energy projects in Indonesia: the environmental, social and economic aspects. When we refer to the basic sustainability theory, the three aspects become the foundational components of all sustainability concepts that we have right now. This means, these three factors play a highly important role in the success of any renewable energy development businesses.

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Meanwhile, this paper originally seeks to answer the question of: which ESG aspect is of utmost importance, is it the environment, social or corporate governance when it comes to geothermal energy development? The survey results reveal that the environmental and social aspects play a highly crucial role in determining the success of energy development projects. Meanwhile, although the corporate governance aspect does show up in the questionnaire, its influence is not as dominant as that of the social and environmental aspects. But still, corporate governance plays an important role in managing the environmental and social impacts of geothermal energy development projects properly. Meanwhile, it is interesting to note that the respondents are so concerned about the economic aspects of such projects, namely the financial situation of a company or business developer, in which issues like electricity rates, operational fees, financing risks and sources of funding become issues which will influence the success of geothermal energy development projects in Indonesia. The economic aspect of this project also has to do with long-term investment schemes, in which geothermal energy projects in Indonesia can also boost national energy resilience while at the same time, protecting the environment of geothermal energy project sites.

Therefore, the ESG concept is closely related to considerations about investment, financial sustainability, environmental management, social responsibility and good corporate governance. Apart from needing economic support in terms of funding, these projects also need to take these ESG aspects into account. Therefore, the harmony between the environmental, social and economic pillars of the triple bottom line concept is inseparable from the environmental, social and corporate governance pillars of the ESG concept. We can only achieve those things when each stakeholder entity has the same perception, concern and objective in supporting the success of the geothermal energy projects. We still need to carefully formulate the actions that we have to take to achieve all these goals; the upcoming publication might focus on this more pragmatic aspect of geothermal energy development.

4. CONCLUSIONS

We draw the following conclusions from this paper's discussions:

- There are three priority aspects that become the main challenges in geothermal energy development, namely the management of environmental, social, and economic impacts of such projects. The survey results show that these three aspects play an important role in answering the challenges of geothermal development, where when viewed more deeply, the three aspects of the environment, social, and economy are the pillars of the sustainability aspect which is the basic concept of the Triple Bottom Line. This shows that the three aspects of sustainability can be the starting point for the success of any renewable energy development projects, which is also a challenge that needs to be faced as comprehensively as possible with the support of relevant stakeholders.

- These three main priorities are closely related to issues on funding and long-term investment which are essential to the success of geothermal development projects. On the other hand, the ESG aspect is one of the most important considerations taken by investors and business developers as it influences the financial sustainability of geothermal energy development projects, an issue which has also become the focus of various financial institutions around the world. In this case, the integration of TBL and ESG sustainability concepts can comprehensively support the success of geothermal energy projects.

5. RECOMMENDATIONS

Based on our analysis and conclusion, we have drawn some recommendations related to develop strategies to manage the impacts of geothermal energy development projects in Indonesia, as well as to overcome barriers and challenges facing such projects:

- We need to raise public awareness on the importance of environmental, social and economic impacts of geothermal energy development projects, especially those having to do with sustainability issues. We need to address these issues in an integrated way, in alignment with the ESG concept, to attract sustainable, long-term investment which is essential for the success of such projects.

- We will also have to explore other aspects of geothermal energy development projects which we do not discuss here, such as the human resources and corporate governance aspects.

ACKNOWLEDGEMENT

The writer would like to express her gratitude to all the individuals who have helped disseminate the questionnaire surveying the public perspective on the challenges related to developing geothermal energy projects in Indonesia. The writer would also like to thank the respondents for taking their time to contribute their valuable thoughts on this issue; their contribution is highly significant to our effort to take a first step in implementing the ESG sustainability concept in the development of geothermal energy, a renewable, clean and environmentally-friendly source of energy.

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