CHAPTER I

INTRODUCTION

1. Background

1.1. Phenomenon

Economic growth is the primary objective of national planning to enhance people's quality of life (Maparu & Mazumder, 2017). Economic development would not be possible without advancing infrastructure both inside and between nations (Jan et al., 2012; Lee, 2011). Therefore, infrastructure investment in energy, information technology, transportation, and banking sectors should be supported to boost economic efficiency and productivity (Khan et al., 2020).

Energy infrastructure serves as a focal point for various policy goals, from economic development and national security to climate change mitigation and social inequity (Bridge et al., 2018). Energy is necessary to transport people and commodities, and power companies' operations. The national infrastructure system, which includes transportation, telecommunications, and social infrastructures such as schools and hospitals, relies on the energy sector's stability (Infracom, 2021).

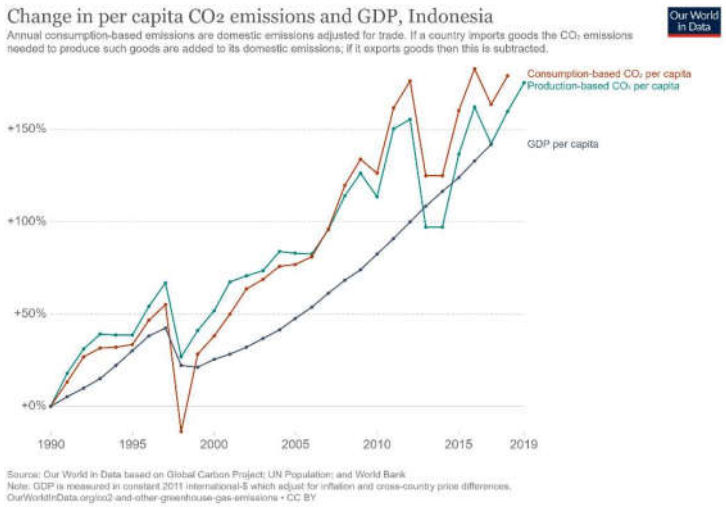
Currently, Indonesia is undergoing electricity oversupply by 30-40% as of October 2020, especially in Java and Sumatera regions. Moreover, the excess is likely to keep growing in the next 2-3 years. The first trigger is consumption/demand drop due to the Covid-19 pandemic. The other reason is power plant development promoted by the Government in the RPJMN due to the 2015 electricity deficit (Ramalan, 2020).

However, the current energy supply in Indonesia is ‘dirty' and not sustainable. As of 2020, fossil fuel is still the primary source of electricity in Indonesia by 82% portions, which are 35% crude oil and NGL, 21% coal and coal products, 22% natural gas, and 4% petroleum products. Meanwhile, renewable energy resources only cover 18%, consisting of 3% hydro, 3% geothermal, solar, wind, and 12% biomass and others (Utama, 2020).

Energy shift towards renewables is necessary to avoid economic loss and environmental destruction. Southeast Asia countries, including Indonesia, are projected to be a net importer of fossil fuel energy priced at US$300 billion/year by 2040 to fulfill the energy need. Not only that it will be monetarily costly, but it will also multiply a two-thirds rise in CO2 emissions at almost 2.4 GT. The projection came from the electricity demand trend in Southeast Asia countries that snowballing since 2000 at an average of 6% per year or 80% cumulatively. Rising income, industrialization, and urbanization are the main driver of the increasing demand (IEA, 2019). Even though Covid-19 disrupts the growing trend, the pandemic's economic implication will likely last until 2025 (Lidyana, 2021).

The relationship between environmental sustainability and economic welfare is also indicated in the economic growth trend. Environmental degradation, represented by the level of carbon emissions (Robbi et al., 2020), has been increasing rapidly since 1940 in Indonesia. The leading causes are land and forestry, energy, and agriculture, which are important economic sectors. The figure below shows the trend of relatively higher GHG emissions and Indonesia's increasing economic growth (Ritchie, 2019).

Figure 1 Economic Growth and GHG Emission



Source: Ritchie (2019)

Indonesia’s trend of economic growth is not sustainable in the long term because it relies on the non-renewable energy of fossil fuels (Farabi & Abdullah, 2020). For this type of trend, the Government is recommended to prioritize environmental sustainability over economic growth (Panayotou, 2016). Even though most ASEAN countries have a similar trend, it is not impossible to decouple

economic growth and GHG emission trend. An example is Turkey, who already dissociate the trend since 2010 (Ritchie, 2019).

Despite growing the economy, the potential loss due to carbon emissions is high. Carbon footprints that block the atmosphere drive climate change. Climate change leads to the domino effect on Earth temperature, extreme weather, and the increase of sea level that threatens the economy and overall ecological survival. In Indonesia, climate change has increased the risk of hydro-meteorological disasters by 80% (ROI, 2016). Meanwhile, the estimated national loss due to climate change is around IDR132 trillion by 2050 (USAID, 2016).

The importance of preserving the environment is also one of the fundamental messages of the Islam religion. There are several explicit mentions about the environment in the core Islamic teaching, Quran (the Holy Book) and hadith (the Prophet Muhammad's messages).

The relationship between humankind and the environment starts from the purpose of human creation. Allah SWT (the One God) is the owner and creator of all the galaxies and planets (Quran 20:6), and He trusted humans to be the khalifa (leaders, successors) of the planet Earth (Quran 6:165). Therefore, human is honored above other creations on Earth with mental capabilities (Quran 17:70).

Islam provides incentives for the human to nurture the ecosystem. Planting trees so the animals can live in their habitat is considered an act of charity (authentic hadith Bukhari). Sustaining and helping animals can erase human sins (authentic

hadith Bukhari). In conclusion, showing mercy to the creatures on Earth will be rewarded with God's mercy (authentic hadith at-Tirmidhi).

Islam also warned humans not to cause environmental degradation. Natural resources are designated sources of human livelihood (Quran 7:10), but not excessively and wastefully (Quran 7:31). Quran also warns humankind not to spread corruption/destruction on Earth (Quran 28:77). Finally, there will be accountability in the afterlife for every human action (Quran 3:30).

Green infrastructure/GI project is one of the solutions to restore, preserve and, develop natural resources (Chenoweth et al., 2018). Urban GI planning can reduce the GHG footprint and drive the shift towards a green economy (Pauleit et al., 2017). The main drivers of GI implementations consist of policy, strategy and action plans, and stakeholder interests and motivations. Meanwhile, the enabling factors of GI implementations are knowledge, cross-sectoral experts, sufficient financing, partner collaboration, comprehensive policy and planning, and public awareness and support (Naumann et al., 2011).

From the policy aspect, the Government of Indonesia/GOI has pledged with international commitments by ratifying the Paris Agreement in 2015 to limit global warming by 1.5 degrees Celcius. The ratification was followed up with a Nationally Determined Contribution/NDC to reduce greenhouse gas/GHG emissions by 29% (unconditional/business as usual/BaU) or 41% (conditional/with international support) by 2030. The emission reduction is projected for land and forestry (22,78%

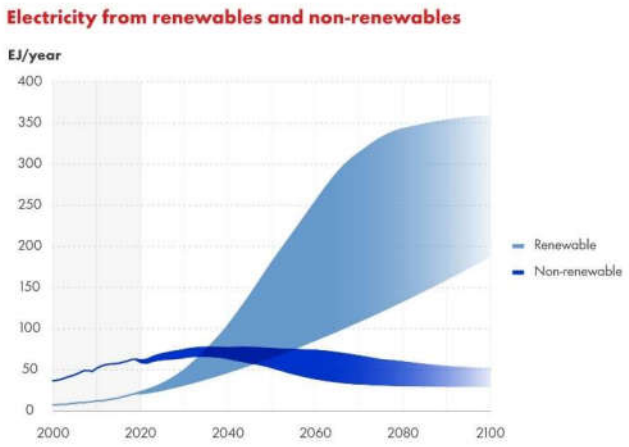
of BaU), waste (1,63%), energy and transportation (1,93%), agriculture (0,38%) and industry (0,17%) (ROI, 2016).

The Government has also included environmental resilience into National Priority No. 6 of RPJMN (medium-term government development planning) 2020-2024. The program comprises (1) enhancing environmental quality, (3) enhancing the disaster environment and climate change, (3) and low carbon development. The low carbon development aims at 27,3% GHG emission reduction and 24% GHG emission intensity reduction by 2024.

One of the most critical sectors in green infrastructure development is energy. As the most dependable source of energy available to end customers, electrification rates often increase as economies improve. However, fossil fuel electricity and heat energies sectors contribute to Indonesia's second-largest source of GHG emissions (Ritchie, 2019).

Shifting electrification from fossil fuels to renewable energy is crucial to achieving the Government's environmental goals. Renewables require a high initial investment, leading to a more expensive electricity price than conventional coal electricity. However, the continuous environmental disasters and coal supply depletion will pressure countries to build more renewable power plants, lowering inefficiency and increasing profitability. Renewable energy will dominate the future electricity demand with a projected tenfold increase within the next 30 years, as presented in Figure 2 (Shell, 2020).

Figure 2 Renewable Electricity Demand Projection



Source: Shell (2020)

The GOI has committed some policy towards energy-shifting. The NDC targeted to increase renewable energy mix by at least 23% by 2025 and 31% by 2050. RPJMN 2020-2024 directs energy diversification by utilizing new and renewable energy (energi baru dan terbarukan/EBT), i.e., hydro, geothermal, solar, wind, and biomass.

However, shifting fossil fuels to renewable energy cannot be done instantly in reality. There is a cost constraint on renewable energy compared to the relatively cheaper fossil and nuclear energy. Current renewable energy resources in Indonesia are also still struggling with the power supply stability because of natural uncertainties (i.e., cloudy weather covering sunlight). Another problem is the insufficient grid between the power plant site and end-users like the industry and residential areas (Utama, 2020).

Out of other renewable energy sources, geothermal is one of the most promising choices for Indonesia. From the cost perspective, geothermal is within the fossil-fuel cost range of 0.05 to 0.15 USD/kWh, along with the hydro and onshore wind. Moreover, from the grid perspective, geothermal and hydro grids can be developed gradually. Supply stability depends on the availability of grids. Both can be achieved by conforming to geothermal infrastructure needs (Utama, 2020).

The GOI intends to raise geothermal energy utilization. Out of the total geothermal potential of 23.9 GW, the utilized capacity is only 8.9 percent or 2.1 GW (EBTKE, 2020). The Government intends to increase the utilization to 9.3 GW by 2035. The current strategies propose government drilling, cooperation with state-owned enterprises, existing plants expansion, and small-scale geothermal power plants development (Harris, 2021). The example of small-scale geothermal power plant projects to be developed is presented in Table 1.

Table 1 Indonesia Small-Scale Power Plant Projects

No	Power Plant Project	Developer	Capacity (MW)	Year
1	Tulehu #2	PT PLN (Persero)	5	2022
2	Sokoria #4	PT Sokoria Geothermal Indonesia	5	2022
3	Jaboi #2	PT Sabang Geothermal Energy	5	2023
4	Sokoria #5	PT Sokoria Geothermal Indonesia	5	2023
5	Ulubelu Small Scale	PT PGE	20	2023
6	Lahendong Small Scale #1	PT PGE	5	2023
7	Lumut Balai Small Scale	PT PGE	5	2024
8	Lahendong Small Scale #2	PT PGE	5	2024
9	Hululais Small Scale #2	PT PGE	10	2025
10	Kamojang Small Scale #1	PT PGE	10	2025

Source: Agustina & Suyanto (2019)

However, the GOI is facing a financial challenge to develop environmental infrastructure projects. The 2018 National Budget/APBN allocation for GI is IDR 109.7 trillion. That amount covers only 38% of the estimated funds needed by BUR 2018, around IDR 288.4 trillion per year. Meanwhile, an 51,6% increase in the climate change spending budget between 2016 and 2018 indicates an increasing trend of financial need in the future. The most significant NDC's estimated financial need is the forestry of IDR77.8 trillion and the energy sector of IDR3.3 trillion for 2018-2030 (BKF, Pendanaan Publik Untuk Pengendalian Perubahan Iklim Indonesia, 2019).

The GOI has created innovative financial instruments for environmental projects, such as Green Sukuk and the SDGs Indonesia One/SIO platform. The GOI also leveraged access to international financing facilities such as the UNFCCC's Green Climate Fund/GCF, Global Environment Facility/GEF, Indonesia Climate Change Trust Fund/ICCTF, and Adaptation Fund/AF (BKF, Pendanaan Publik Untuk Pengendalian Perubahan Iklim Indonesia, 2019). Specifically for geothermal development, there are PISP (geothermal sector infrastructure financing), Geothermal Exploration Upstream Development Project/GEUDP, and Geothermal Resource Risk Mitigation/GREM (Harris, 2021).

The sovereign Green Sukuk can be potential alternative financing for green infrastructure projects, i.e., small-scale geothermal power plants. As a Government's financial instrument, Green Sukuk can be allocated for projects that are financially heavy but needed by society. Green Sukuk is also characterized by Sharia compliance and environmental preservation. It potentially attracts semi-

philanthropic investors who seek environmental and religious benefits beyond economic returns, causing the cost of capital to be relatively low (BKF, 7th Sharia Session "Mengenal Green Sukuk Lebih Dekat" [Video], 2020).

Green Sukuk is an innovation in Indonesia's public financial instruments. The GOI debuted the first global sovereign Green Sukuk in 2018 and received awards such as Asia Pacific Green/SRI Bond Deal of the Year at the Global Capital's Sustainable and Responsible Capital Markets. The GOI innovated with the Retail Green Sukuk to reach the domestic market in 2019. The sukuk is under Indonesia's Green Bond and Green Sukuk Framework that achieved Medium Green shade review by CICERO (MOF, 2020).

Indonesia's Green Sukuk has shown consistently good performance. The last issuance of the Global Green Sukuk in June 2020 got the lowest yield in 3 years, namely 2.3% p.a. for a tenor of 5 years. The trend of Green Sukuk attraction on investors is also increasing. The enthusiasm is reflected in the oversubscription of the Global Green Sukuk 2020 by 7.37 times and an increase in 2020's Retail Green Sukuk investors by 2.2 times from 2019's issuance (BKF, 7th Sharia Session "Mengenal Green Sukuk Lebih Dekat" [Video], 2020).

Green Sukuk issuance has shown tangible environmental benefits. The GHG emission reduction from the proceeds in 2018 and 2019 is estimated at 8,994,511.9 tons. The proceeds are allocated to renewable energy, energy efficiency, sustainable transportation, disaster risk readiness, and waste management. The project examples are solar power plant in Selayar island, Trans

Sumatra railway from Aceh to Lampung, and medium-size Bus Rapid Transit (BRT) procurement in all provinces except DKI Jakarta. Green Sukuk also contributes on Sustainable Development Goals/SGD points (7) affordable and clean energy, (8) decent work and economic growth, (9) industry, innovation, and infrastructure, (11) sustainable cities and communities, and (13) climate action (MOF, 2019; MOF, 2020).

1.2. Problem Formulation

Despite the potential benefit, the proposal of Green Sukuk to finance green infrastructure might face several challenges during project implementation as follows.

1. Green Sukuk is issued by the Government and tied with binding regulatory requirements. Even a financially feasible project needs to be legally eligible to be able to get Green Sukuk allocation. Therefore, a legal evaluation of the Green Sukuk and green infrastructure deals is required beforehand.
2. Green infrastructure/GI requires enormous initial capital, long-term construction and operation, tied with return obligation, and accounted with GHG reduction impact targets. The developer must assess whether GI provides additional benefits with the limited cost and whether investors will be willing to fund it (Staddon et al., 2018). Specifically, in a geothermal context, smaller power plants usually still require just as high capital expenditure. Therefore, a financial feasibility analysis is

vital for the Government to decide which investment project to finance and implement.

1.3. Previous Research

Previous research about Green Sukuk and legal evaluation has been conducted by Abubakar & Handayani (2020), Meilani (2017), Handayani & Surachman, (2017), Ramadhan & Wirdyanigsih (2020), and Yunan et al. (2013). All of the application objects are infrastructure projects, but some use SBSN and general non-sukuk financing sources. The legal analysis is applied to DSN-MUI fatwas, laws related to sukuk for project financing, Green Sukuk Framework, Green Sukuk Allocation and Impact Report, and OJK regulations.

Meanwhile, research about green infrastructure and financial analysis which are most relevant to this thesis are Cucchiella et al. (2012), Handayani & Surachman (2017), Insani (2019), Kim et al. (2018), Meilani (2017), Morea & Poggi (2016) and (2017), Surachman & Setiawan (2016), and Yunan et al. (2013). The object of study differs from geothermal, hydro, solar, and wind power plants, while the financing sources include Green Sukuk, SBSN, sukuk, and conventional. The analysis tools are ADSCR, ALLCR, DCF, NPV, IRR, B/C ratio, sensitivity analysis, Monte Carlo Simulation, and breakeven point analysis.

1.4. Research Gap

Most of the previous legal study about green sukuk evaluates the project's green eligibility using OJK regulations which are imprecise. There is also more relevant research that evaluates Green Sukuk-related documents or public project

financing regulation but not comprehensively. This research analyses more relevant regulations and elaborate deeper on the practical application potential for project proponents.

From the financial analysis, this research combines Green Sukuk and a small-scale geothermal power plant model. Most previous research used the general sukuk type (SBSN) or non-sukuk as the financing source. The model will also modify large-scale power plant data into small-scale.

2. Delimitation of Study

The scope of this research is limited to the legal and financial aspects of Green Sukuk's potential for financing the Muara Laboh geothermal power plant project. The legal and financial aspect aligns with the researcher's field of study about public financial management. Furthermore, Green Sukuk is chosen because it is a new variation of SBSN, and there has not been much research conducted about the practical use.

Muara Laboh geothermal power plant is chosen as the case study's object for several reasons. Renewable energy is the greenest sector (most positive environmental impact) of the Green Sukuk Framework. Indonesia has massive geothermal potential that has not been exploited. In addition, geothermal power plant research will help answer the issues of fossil-based electricity and energy shift.

The Muara Laboh GPP financial model will be modified to the small-scale power plant model for the financial analysis. The NDC’s assumptions used for the

projected emission reduction for the energy sector are derived from National Energy Policy (KEN) 2014, Electricity Supply Business Plan (RUPTL) 2016-2025, and National Energy Plan (RUEN) 2016. KEN 2014 includes the utilization of small and modular geothermal power plants. Meanwhile, RUEN 2016 directed the development of small RE to supply electricity in the areas not covered by grid expansion. Recently, small-scale geothermal development is included in the Government's strategy to accelerate geothermal development from 2020 to 2035 (Harris, 2021). Small-scale geothermal is also a part of the national priority research for RE development (Tempo, 2021).

3. Research Question

The question sought to be answered in this research is the potential implementation of Green Sukuk to finance green infrastructure in Indonesia with a small-scale geothermal power plant case. The question is elaborated into four sub-questions as follows.

1. How are the mechanism and potential implementation of Green Sukuk as an APBN financing source according to the public finance regulations?
2. How is the financial feasibility indicators of green infrastructure in a small-scale geothermal power plant project with Green Sukuk as the financing source?

4. Research Objectives

The objectives of this study are:

1. exploring and summarizing the mechanism and potential implementation of Green Sukuk as an APBN financing source according to the public finance regulations, and
2. measuring the financial feasibility parameters of green infrastructure in the case of a small-scale geothermal power plant project with Green Sukuk as the financing source.

5. Research Benefit

From an academic perspective, this research will enrich the literature about government financing strategies for green infrastructure projects. Specifically, there has not been much research about the potential implementation of Green Sukuk in a small-scale geothermal power plant project.

This research also offers practical benefits for the Government. For project proponents (line ministries and equal institutions), this research can be a reference about the potential financing source and its mechanism for their projects in green infrastructure. For the policy makers (BKF dan DJPPR), this research can illustrate the potential application of Green Sukuk for a geothermal project.

6. Research Outline

The research outline is as follows.

CHAPTER I INTRODUCTION

This chapter describes the study background and answers the importance of evaluating Green Sukuk's potentials to finance green

infrastructure. This chapter consists of the research background, research scope, research question, research objective, research benefit, and research outline.

CHAPTER II THEORETICAL FRAMEWORK

This chapter explains the theoretical framework of the research based on law, public policy, and reports. This chapter also elaborates relevant previous studies to broaden the understanding of the research context. Finally, this chapter is closed with the conceptual framework that explains the flow of research.

CHAPTER III RESEARCH METHODOLOGY

This chapter describes the methods used to conduct the research. It explains the research object, research type, data type and source, and data processing methodology.

CHAPTER IV RESULT AND DISCUSSION

This chapter elaborates on the outputs of data processing and analysis. This chapter also discusses the meaning and impact of the results to answer the research questions.

CHAPTER V CONCLUSION

This chapter concludes the research answers, explains the study's limitations, and provides further research and practice suggestions.