Application of green banking on financing infrastructure project industry: environmental perspective

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Abstract. Presently, the rapid transformation of economic creates the more significant attention to the environmental impact. The large-scale business activities emerge financial gaps that require the hedge funds support for longer investment necessity without raising up the ecological problem. The infrastructure project should consider the sustainability aspect, to achieve environmentally friendly development. Financial institutions have a significant position to change economic and infrastructure development to be more responsible and classified as a ‘green institution. The implementation of green banking or finance system proposes a solution to the sustainability resources. This study first focuses on the overview of green banking structure and its impact on the people, profit, and planet. This study aims to provide a general overview and determine the priority options related to green banking implementation in Indonesia. Besides, the paper explores the criteria preference of policy determination to implement the financial system using AHP approach. The assessments involve several aspects on different dimensions. However, it is apparent that the model illustrated reasonable and applicable solutions for the case. The result of this paper shows that the priority rank for green banking implementation sequentially is formulating policy (64.64%), developing market mechanism (25.54%) and providing incentives for research and development (9.82%). Finally, the research supports the assumption that green banking scheme is an alternative solution to establish ecological protection resulted from the massive infrastructure projects.

1. Introduction
Recently, the worldwide face a significant challenge of an environmental problem and the impact of their large-scale business activities. Many global issues, include financial and energy crisis, add the complexity of the environmental problems. Many problems remain unsolved by the government and stakeholders involved on infrastructure projects in Indonesia. The increasing number of infrastructure projects, and the impacts on natural damage should be a red warning to the government and stakeholders for taking determined effort in projects evaluation. The evaluation should be done since the very beginning of the process, including the design planning until the implementation and maintenance phases.

However, the infrastructure project should consider the sustainability aspect, to achieve environmentally friendly development. The whole perspective proposed a new paradigm, that is the green economy which intends to pursue the balance of the People, Profit, Planet (3P). Financial
institutions have a significant position to change economic and infrastructure development to be more responsible and classified as a ‘green institution.’ Without financial support from the hedge fund, it will be complicated to change the focus of the business paradigm from solely profit-oriented business to the green business investment, which considers people, profit, and the planet. [1]

Green banking scheme is protecting the future generation resources, and it further makes infrastructure development become more efficient and environmentally friendly. It performs its function as a bank in general yet pays more attention to the environmental and social factors. Green banking promotes sustainability for the environment in the future by reducing waste and natural impact to a minimum level. Green financing is an innovative economic model aimed at achieving sustainable resource use and environmental protection [2]. Issuance of large-scale green funding with relatively low capital costs persuades more corporation to take the same path for eco-friendly financing despite relevant external compliance and reporting necessary [3][4]. Green Finance is considered as a promising business area.

In Indonesia, green banking was held in response from Law No. 32 of 2009 on Environmental Protection and Management which requires compliance of every economic activity with the promotion of environmental sustainability. Besides, Bank Indonesia also made their regulations encourage the sustainability of green financial policy. The financial regulators in Indonesia take the steps of management and financial risk governance to anticipate potential financial crisis re-occur. Finally, The Minister of Finance Decree on the Determination of Instant Investment in the field of Eco-Friendly Investment issued since April 2010 to compete with other countries and maintain the stability of natural resources in Indonesia. This policy supports the existence of Sustainable Infrastructure in Indonesia.

Sustainable Infrastructure is a multidisciplinary endeavor, by extending its coverage from green building to sustainable infrastructure and pursuing the social, economic, and environmental sustainability objectives [5]. Sustainable infrastructure is a critical point for the welfare, the economy, and the earth, through the effort of the minimalizing destruction of nature. The people awareness in related issue plays a crucial role in encouraging sustainable business banking model in the future, as the level of awareness will impact on customer appeal. The UNEPFI defined the sustainable banking as a process whereby banks consider the impact of their various operational activities and their products and services to meet current needs as well as future generations [6]. Sustainability in the banking sector has two forms, the use of environmental and social responsibility on the operational bank in daily life and incorporate sustainability on the products and strategies of the bank for example in green loans [7].

However, to fill the gaps, the green finance system requires the public awareness and government intervention, such as formulating the regulation and providing incentives for research and development activities to develop proper green investments system. The monitoring system allowed to control the projects and the client obligated to make a report in every phase of their project on various environmental criteria. This study aims to provide a general overview and determine the priority options related to green banking implementation in Indonesia.

2. Methodology

The research uses AHP approach to define the best alternative policy. The Analytic Hierarchy Process (AHP), initiated by Thomas L. Saaty [8]. Saaty illustrated that AHP is a multi-criteria decision-making approach in which factors are organized in a hierarchic structure. AHP undertakes the biased and quantitative criteria that associate with the improvement subjects and allow participation from the chosen group to inspect purposely, think about and decide the necessity of the proper criteria and sub-criteria. The description of the AHP method can be found elsewhere.

This study evaluates the three levels of hierarchy, consists of goal as placed in the highest level, criteria in the middle level and alternatives for the third level. We set variable for implementation of green finance system in Indonesia as a goal that will be assessed based on three criteria. The criteria consist of effective, sustainable and acceptable. Besides, we choose three policies as the alternatives,
and there are alternatives to developing a market mechanism of green finance, formulating policy to support the implementation and giving incentives for research and development activity. Each assessment analyzed through the pairwise comparison concerning the criteria and alternatives. The determination of green banking implementation policy involves a model that calculates several aspects on different dimensions. These alternatives consist of developing the market mechanism of green finance, formulating policy, and providing incentives for research and development on green banking scheme. The next step in this issue is designing a network model, refers to Fig 1 below.

![Figure 1. AHP Model for Green Banking Implementation](image)

The study utilizes Super decision ver 2.6, a software to assist the pairwise comparison model analysis for PC. Those elements submitted to the software, once they have been calculated, the result then requires to be interpreted.

3. Result and Discussion
Furthermore, the AHP method used 1 to 9 scale to illustrate the importance level of criteria or alternatives. The scale of importance levels of each elements quantified based on expert judgment. We conduct the pairwise comparisons between each level of the hierarchy; the results then figured in table 1 to table 4.

### Table 1. Pairwise Comparison Matrix of The Criteria with Respect to The Objectives

| Criteria          | Effective | Sustainable | Acceptable |
|-------------------|-----------|-------------|------------|
| Effective         | 1         | 0.11        | 0.20       |
| Sustainable       | 9         | 1           | 3          |
| Acceptable        | 5         | 0.33        | 1          |

**Percentage**
- Effective: 6.29%
- Sustainable: 67.16%
- Acceptable: 26.54%

**Consistency Ratio**: 2.80%

Sustainable factors became the most desirable criteria to determine the preference of green banking implementation. It is reasonable considering that the system is at the very early stage to be implemented in Indonesia and has still many gaps. The green banking implementation demands collaboration between government and private sectors. Grants and subsidies take a significant role to guarantee the implementation of the green banking scheme. The matrix showed that the consistency ratio for the analysis of these criteria had been qualified (<10%). This method is dealing with subjective judgment, and it may engage too much inconsistency. If Consistency Ratio is equal to or less than 10%, the result is categorized as consistent and acceptable [9]. Hence, the option should consider the effective, acceptable and sustainable criteria [10].

Thus, table 2 to 4 discussed the pairwise comparison matrix of the alternatives option with respect to effective, sustainable and acceptable criteria.
The pairwise comparison between the alternatives related to the effective criteria described that strategy to formulating policy will be the most effective choice (64.19%), followed by developing market mechanism (27.89%) and strategy to provide incentive to research and development program (7.19%). This analysis is consistent as the consistency ratio is lower than 10%.

The results show the importance of establishing green finance ecosystem as a prerequisite to a green banking implementation, related to the acceptable criteria. Similar to previous table, formulating regulation becomes the excellent choice by 66.94%, followed by developing the market mechanism at 24.26%, while the effort in providing incentives to research and development has less consideration by 8.79%. The significant part of the green banking scheme is the requirement of a stable and proper policy environment that not solely establishes funding support but also sets a regulation and tax policy that simplifies the investment process [11].
The pairwise comparison related to sustainable criteria gives the different result with the two previous analysis. The market mechanism development is the most important alternative to ensure sustainability agenda of green banking implementation. This illustration supports the prior explanation that the emergence of a green financing system is a global movement to improve environmentally friendly development [11]. On the other hand, the long-term stability of the regulation is a critical point to ensure the financial innovation in the future [12].

| Result                      | Normal | Ideal  |
|-----------------------------|--------|--------|
| Developing Market Mechanism | 25,54% | 39,52% |
| Formulating Policy          | 64,64% | 100%   |
| Incentives to R&D           | 9,82%  | 15,19% |

The summary in table 5 shows that the priority rank for green banking implementation sequentially is formulating policy (64,64%), developing market mechanism (25,54%) and providing incentives for research and development (9,82%).

The policies to support the establishment of green banking are required to manage the disagreement between ecological environment protection and green finance. The principal contradiction is the liquidity of funds that raised by green banking system for environmental protection in term of infrastructure development. Liquidity refers to the asset potential to be liquidated at a feasible market price [13]. Hence, the policies should increase the green banking market activity through expanding other finance scheme related to ecological protection thereby directly increasing the liquidity of related investment.

4. Conclusion
Green banking implementation is an alternative financial pattern to protect the environment and achieve the sustainable resources utilization. The preferable option for establishing the green banking scheme is formulating the proper regulation, promoting market mechanism and government intervention in providing an incentive for research and development activities. Meanwhile, the determination criteria dominated by sustainable and acceptable factors. The compelling regulation is required to elude the information asymmetry related to the negative impact of massive infrastructure projects in Indonesia. The green banking system creates an opportunity to promote renewable energy and other resources to advance the practice of environmentally friendly investments.

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