

**MASTER THESIS**

**COAL MINING RECLAMATION IMPROVEMENT IN EAST  
KALIMANTAN, INDONESIA**

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**2020/2021**

## ABSTRACT

The coal mining industry is one of the most significant industries in the Indonesian economy. As a vast productive coal region, East Kalimantan has an enormous asset to their region. However, the improper management of this industry in East Kalimantan has caused numerous environmental issues and even social conflicts. To reduce the impact of the coal mining industry, the government obliged mining companies to conduct mining reclamation. Unfortunately, its implementation is still hindered by various factors. This study aims to comprehensively understand the challenges faced through the coal mining reclamation management and implementation in East Kalimantan, Indonesia. Several focuses studied in this research are the mining reclamation process, sustainability impacts, drivers and barriers for mining reclamation implementation, and success factors. This research uses qualitative analysis methods and content analysis. The qualitative method is done by conducting interviews with relevant respondents from the Ministry of Energy and Mineral Resources as the regulator of mining reclamation, and coal mining companies as mining reclamation implementers. This study showed that several key success factors such as a clear mining reclamation evaluation criteria, commitment from mining company, stakeholder involvement, and an excellent mining reclamation management, directly contribute to achieving the success of mining reclamation. Other important finding of this research shed light on how a well-implemented mining reclamation can have significant positive impacts economically, socially, and environmentally.

Keyword: mining reclamation, coal mining, East Kalimantan,

## **AKNOWLEDGEMENTS**

First and foremost, praise be to Allah, who has given me the opportunity, health and strength to complete this thesis in the current challenging circumstances.

I want to express my immense gratitude to my first supervisor Dr. Maria Laura Franco-Garcia, for providing me guidance and support with her knowledge and insights during the entire process of my thesis. I would also like to give my appreciation Dr. Gül Özerol as my second supervisor for her invaluable feedback to complete my thesis. I am also grateful to all MEEM lecturers, staff, and fellow students for the hospitality and friendliness throughout my master study.

Last but not least, thank you to my family whom I love the most, for their unwavering support and sacrifices that given me the strength and belief to finish my thesis. Also, thank you to all my friends for the precious support during my study.

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## LIST OF ABBREVIATIONS

|            |  |
|------------|--|
| AMD        | Acid Mining Drainage   |
| AMDAL      | Analisis Dampak Lingkungan – Environmental Impact Assessment     |
| CSR        | Corporate Sosial Responsibility                                  |
| ESG        | Environment and Social Governance                                |
| IMM        | Indominco Mandiri  |
| IUP        | Izin Usaha Tambang – Mining Business License                     |
| Komnas HAM | Komisi Nasional Hak Asasi Manusia – Commision on Human Rights    |
| Mha        | Million Hectares   |
| MHU        | Multi Harapan Utama  |
| NAF        | Non-Acid Forming   |
| NGO        | Non-Governmental Organization                                    |
| PAF        | Potential Acid Forming   |
| PESTLE     | Political, Economic, Social, Technological, Legal, Environmental |
| PNBP       | Pendapatan Negara Tanpa Pajak – Non-tax State Revenue            |
| RKAB       | Rencana Kerja Anggaran Biaya – Annual Workplan and Budget        |
| RR         | Rencana Reklamasi – Reclamation Plan                             |

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# CHAPTER 1. INTRODUCTION

## 1.1 Background

Indonesia is a country rich in natural resources. Numerous valuable natural resources such as oil, gas, minerals, and coal are becoming important resources in the development of the Indonesian economy. In 2020, the mineral and coal mining sector was one of the largest contributors to Indonesia's non-tax state revenue (PNBP) by generating over 34 trillion rupiahs (Ministry of Energy and Mineral Resources, 2020c). Coal is one of the resources that has the biggest potential in the mining industry in Indonesia. In 2018, it was noted that coal reserves in Indonesia amounted to more than 37 billion tons (Ministry of Energy and Mineral Resources, 2020a). In 2019, Indonesia was the biggest coal exporting country as they exported approximately 455 million tons (International Energy Agency, 2020). Coal is also important for national energy supply. Since 2009, the energy supply from coal has more than doubled (Ministry of Energy and Mineral Resources, 2020a). From 2015 to 2019, the total national energy demand in Indonesia for coal has risen from 86.81 million tons to 180.27 million tons (Figure 1).



**Figure 1.** Total coal production (produksi), export (ekspor), and domestic use (domestik) in Indonesia 2015-2019

Source: Ministry of Energy and Mineral Resources (2020)

According to report published by the Ministry of Energy and Mineral Resources, there are three main changes that have led to the increase in coal demand in Indonesia in the last few years.

The first is the increased demand for coal, especially for electricity generation in power plants. The second is the drafting of regulations that oblige mining companies to build smelters that need coal as their fuel. The third is an increase in the need for housing, since there has also been a rise in the demand by the cement industry (Ministry of Energy and Mineral Resources, 2018).

Coal reserves in Indonesia are dispersed in various regions, but the largest coal reserves in Indonesia are on the island of Kalimantan. East Kalimantan province is one of the most significant coal mining industry regions. East Kalimantan is located between the latitudes of 113°44'E and 119°00'E, and the longitudes of 2°33'N and 2°25'S (Figure 2). This province is the fourth largest province in Indonesia, with a land area of 127,267.52 km<sup>2</sup>. East Kalimantan Province has coal reserves amounted to 18.5 billion tons (Ministry of Energy and Mineral Resources, 2020a).



**Figure 2.** East Kalimantan Location

Source: Google Earth (2021)

Despite the development and the importance of the coal mining industry in Indonesia, this industry also causes ecosystem depletion in the mining areas. This threat to the mining areas can also affect the lives of residents around the mining areas. Generally, coal mining consists of several steps such as, geological survey, soil removal, excavation, processing, storage, and transport. Environmental impacts caused by coal mining activities can happen in all steps (Bian et al., 2010). The potential impacts of environmental damage that can occur due to mining activities include land subsidence, air pollution, water pollution, soil quality reduction, and land-use change. Apart from environmental problems, a mining environment that is not managed properly can potentially

cause health problems and accidents around the mining area (Bian et al., 2010; Dontala, Reddy, & Vadde, 2015).

Ecosystem damage and land-use change as a result of the coal mining industry are mainly caused by land clearing for mining areas and the development of supporting infrastructure. In East Kalimantan, the coal mining has been the main driver for ecosystem degradation and land damage (Afkarina et al. 2019). The research by the NGO Auriga showed found that 1.74 Mha of the forest is impacted by coal mining and around 1.1 Mha of currently allotted coal mining permits is in the area of selected conservation forest, although the laws ban any mining activity in conservation forest (Agrawal et al., 2018). Furthermore, a study conducted in East Kalimantan found that the water samples from several waterways and mining areas have acidity and heavy metal concentrations higher than the limits for food production (Waterkeeper Alliance & JATAM, 2017).

## **1.2 Problem Statement**

Although coal mining industry is crucial for the Indonesian economy, it also causes negative environmental impacts. In order to mitigate these impacts, some measures can be applied. Reclamation is one of those measures. It is required to restore mining areas and ensure these areas can be productive, safe, and stable post-mining activities (Maryati, 2013). There is a national policy that requires mining business license (IUP/IUPK) holders to carry out post-mining reclamation. This policy is regulated in Law No. 3 2020 concerning Coal and Mineral Mining and Government Regulation No.78 2010 concerning Reclamation and Post-Mining. However, the implementation of the policy is faced with several problems.

Many companies ignore the obligation to execute mining reclamation. Auriga Nusantara (2020) found that only 1569 out of 2569 IUP holders have fulfilled the obligation to pay for the mining reclamation. Abandoned mining voids have become a threat to residents around the mining area and caused many casualties (National Commission on Human Rights, 2016). In East Kalimantan, there were more than 30 victims of accidents in an abandoned mining area (Toumbourou, Muhdar, Werner, & Bebbington, 2020). Another problem is the dispute over the responsibility regarding the monitoring of mining reclamation (Agrawal et al., 2018). Lack of budget and personnel is also problem in the monitoring of mining reclamation, as happened in East Kalimantan (Toumbourou et al., 2020). These problems show that the implementation of mining reclamation in Indonesia should be improved in multiple ways. However, there has been limited

research on such improvements. East Kalimantan is chosen as the research focus because it is one of Indonesia's most significant coal production regions. By doing so, the problems in coal mining reclamation can be better understood and recommendations can be provided for improvements.

### **1.3 Research Questions**

From the problem statement described above, research questions were formulated with the purpose to address such important environmental problems generated from the coal mining industry. The main research question is as follows:

How to improve the implementation of coal mining reclamation in East Kalimantan, Indonesia?

Four sub-questions are formulated to answer the main research question:

1. What are the processes carried out in coal mining reclamation?
2. What are the economic, social, and environmental impacts of coal mining reclamation?
3. What are the drivers and barriers to implement coal mining reclamation?
4. What are the key success factors of coal mining reclamation?

### **1.4 Research Objectives**

The objective of this research is to create a comprehensive understanding of coal mining reclamation management and implementation in Indonesia, specifically in East Kalimantan. Through the analysis of the impacts, barrier, drivers and success factors of coal mining reclamation, this research also aims to provide recommendations to improve the implementation of coal mining reclamation in Indonesia.

### **1.5 Thesis Outline**

This thesis consists of six chapters. After this first chapter, the second chapter elaborates on the conceptual background that will be used in the research. The third chapter explains the methodology and research design. The research design includes a research framework, research questions, research strategy and data collection and analysis methods. The fourth chapter presents findings of research questions based on interviews and previous publications. The fifth chapter provides a discussion of the findings. Finally, the sixth chapter provides conclusions based on the answers to the research questions and recommendations.



## CHAPTER 2. CONCEPTUAL BACKGROUND

In this chapter, a review of the existing literature about mining reclamation and related key concepts is provided. There are several points described in this chapter. The first section provides explanation about the definition of reclamation in different regions. Then, the second section of this chapter presents description of mining reclamation regulations in Indonesia. The third and fourth section explain the sustainability impacts (social, economic, environmental) of mining reclamation and key success factors of mining reclamation, respectively. The last section of this chapter elaborates on the PESTLE analysis framework used to help answering the research question and sub-questions 2 and 3.

### 2.1 Mining Reclamation

In previous literature, the word found the most related to returning post-mining area's utility are *restoration*, *rehabilitation*, and *reclamation* (Kaźmierczak, Lorenc, & Strzałkowski, 2017). In an article by Kaźmierczak et al. (2017), the word "reclamation" is prevalently used in the literature with different meanings. In the article, it is mentioned that 'reclamation' is used in various topics. For example, Sweigard (1992) used the term as land recovery process to change it to other use. Although, it is also discussed about land recovery, it did not specifically mention about post-mining area (Kaźmierczak et al., 2017). However, many publications used this term to refer to the restoration of the post-mining area's utility and natural values (Kaźmierczak et al., 2017). In Poland, the terminology of reclamation consists of two things. The first is 'reclamation' which refers to the restoration phase of degraded land by restoring land, slope stability, water regulation, and other infrastructure such as roads so that they can be usable. While the second is 'land development' which refers to the usage of the restored land such as, agriculture, forestry, etcetera (Kaźmierczak et al., 2017).

In Indonesia there are also two terminologies that associate with mining reclamation. These terminologies are explained in Law No.3 2020. According to this law, the term 'reclamation' is defined as followed: "*Reclamation is an activity carried out during the stages of the Mining Business to organize, restore and improve the quality of the environment and ecosystem so that it can function again according to its designation*" (Government of Indonesia, 2020) . The stage after the reclamation projects according to the regulation referred as 'post-mining activity'. In the

same line, the definition of ‘post-mining activity’ according to the regulation is the following: “*Post-mining activities, hereinafter referred to as post-mining, are planned, systematic, and continuous activities after part or all of mining business activities to restore natural environmental functions and social functions according to local conditions throughout the mining area*” (Government of Indonesia, 2020).

In order to have a better understanding of mining reclamation implementation in Indonesia, it is crucial to look at the previous and current regulation about mining reclamation in Indonesia. Explanation about regulations is presented in the next section.

## **2.2 Mining Reclamation Regulation in Indonesia**

Mining reclamation in Indonesia is regulated by several regulations from various levels. At national level, the regulations are Law No. 3 2020 about Coal and Mineral Mining, Government Regulation No.78 2010 about Reclamation and Post-Mining, and Regulation of the Ministry of Energy and Mineral Resources No. 26 2018 About Implementation of Good Mining Practice and Supervision of mineral and Coal Mining. In those regulations, it is stated that the party holding the mining business license is obliged to carry out reclamation and post-mining throughout mining activities and after all activities are completed. The regulations also stated that prior to carry out mining activities, the mining business license holder is obliged to submit a reclamation and post-mining plan along with a reclamation bond to the authorized party (Government of Indonesia, 2010; 2020; Ministry of Energy and Mineral Resources, 2018c).

Regulations regarding reclamation and post-mining are regulated in more detail in Government Regulation No.78 2010 about Reclamation and Post-Mining. In article 4, it is emphasized that there are three main principles in implementing reclamation and post-mining. The three principles are (i) *protection and management of the mining environment*, (ii) *health and safety*, and (iii) *coal and mineral conservation*. Article 4 paragraph 1 further elaborates further on the principles of protection and management of the mining environment. There are six things that must be covered in implementing these principles (Government of Indonesia, 2010):

- a. Surface water, groundwater, seawater, land, and air quality protection based on quality standards or environmental damage standard criteria in accordance with the provisions of statutory regulations
- b. Protection and restoration of biodiversity

- c. Guaranteeing the stability and safety of overburden piles, tailings ponds, ex-mining areas, and other artificial structures
- d. Use of ex-mining land according to its designation
- e. Pay attention to local social and cultural values
- f. Protection of the quantity of groundwater following the provisions of statutory regulations

Policy regarding sanctions of reclamation and post-mining activity violation is regulated in Law No.3 2020 article 161b. The regulation stated that mining business license holders who do not provide reclamation bond or do not carry out reclamation and post-mining activities can be given a minimum criminal sanction of 5 years in prison and a fine of 100,000,000,000 billion rupiahs (Government of Indonesia, 2020).

These regulations in Indonesia are established with the intention of enabling mining reclamation implementation which can have a maximum number of significant impacts to all stakeholders involved. Several potential impacts of mining reclamation are described in the next section.

### **2.3 Sustainability Impacts of Mining Reclamation**

In planning the final land use of mining reclamation, the mitigation of the environmental impact of mining reclamation is not the only one aspect that must be considered but the economic and social impacts should also be addressed. The main objective of mining reclamation is to restore the quality of the environment and ecosystem of the former mining area. By implementing mine reclamation, there are several environmental benefits for the mining area, for example, the increment of forest and grassland that enhance the regional ecological environment, improving the air condition, increasing aerobic content, and enhancing soil fertility (Yu, Mu, & Zhang, 2020). It is expected that as the amount of land converted to forest grows, increase oxygen production and CO<sub>2</sub> sequestration will be observed (Setiawan, Zhang, Corder, & Matsubae, 2021).

Along with the positive impact from the environmental aspect, mining reclamation also has benefits from the economic standpoint. One example is explained by Burger and Zipper (2009) in their article on restoring forest value in mining reclamation areas, the economic benefit is that if the mining reclamation area is well planned and executed, it can become a productive area and provide benefits to landowners, miners and local society. The benefits obtained by the landowner

are in the form of resources in the area, for example timber. For miners, the benefits are reduced compliance costs and timely recovery of reclamation bonds. For the local community, a productive mining reclamation area will provide employment opportunities from the resources available in the area

The last positive impact is the social aspect. Indications of the achievement of positive social impacts from mining reclamation include the formation of social stability by reducing the conflicts between landowners and miners (S. Zhao & Zhang, 2015).

Those impacts explained above only can be achieved if the implementation of mining reclamation is well executed. There are several key factors that can help to achieve well executed mining reclamation. These factors are explained in section 2.4.

## **2.4 Key Factors in Mining Reclamation**

According to Zhao et al. (2015), the main issues of the mining reclamation process are related to planning, stakeholder involvement, financial assurance, and operations and clear evaluation criteria. In order to minimize the occurrence of these issues, it is crucial to take into account several factors or approaches that can support the implementation of mining reclamation. However, before looking at these factors, the most important thing is to know what is meant by successful mining reclamation.

To find out whether the mining reclamation that has been carried out by a mining company can be evaluated as successful or not, clear evaluation criteria is relevant. Unfortunately, determining the appropriate criteria is still a continuing issue for regulators and the mining industry (Coppin, 2013). As priory mentioned, for the implementation process, mine reclamation requires the establishment of clear indicators or criteria. Coppin (2013) explained that good criteria should consist of two things, objectives and specific. Clear objectives in the criteria will be able to describe purposes, the results obtained, and the (economic) benefits that society can obtain. Good criteria must also be specific so that the progress can be acknowledged. Also, specific criteria can accommodate the strategic planning process to decide whether adjustments are needed to achieve the target. Even further, in the criteria determinants, it should be considered that there is no "one size fits all" criteria. However, the set of objectives can be arranged, generally or specifically, for one mining area, depending on the existing situation and circumstances. By determining the objectives, it is necessary to pay attention to several aspects such as, corporate policies, regulatory

standards, local needs and demands, physical condition, available resources, and financial capability (Coppin, 2013).

In Indonesia itself, a company is considered successful in conducting mining reclamation if it has fully met the evaluation criteria for mining reclamation success issued by the Ministry of Energy and Mineral Resources listed in Ministerial Decree 1827K/30/MEM/2018. The criteria (Table 1) contain three main activities and their weight. By gradually fulfilling these “success criteria”, the mining company will be able to obtain their previously deposited reclamation bond, returned by the government.

**Table 1.** Mining Reclamation Success Criteria in Indonesia

| No. | Criteria           | Parameter                                      | Percentage (%) |
|-----|--------------------|--|----------------|
| 1   | Land Re-contouring | Land Surface Contouring                        | 40             |
|     |                    | Top Soil Spreading                             | 10             |
|     |                    | Erosion Control and Water Management           | 10             |
| 2   | Revegetation       | Cover Crop Growth                              | 2.5            |
|     |                    | Fast Growing Trees Growth                      | 7.5            |
|     |                    | Local (Intermediate/Under-Shelter Trees Growth | 5              |
|     |                    | Acid Mine Drainage Control                     | 5              |
| 3   | Final Completion   | Canopy or Crown Cover                          | 10             |
|     |                    | Maintenance                                    | 10             |

Source: Ministry of Energy and Mineral Resources (2018)

Beyond physical condition and regulatory, a crucial factor for successful mining reclamation practices is *commitment*. The application of leading practice sustainable development in the mining industry requires a solid commitment to facilitate companies to keep up the reputation, have sustaining value, and guarantee there is support from other stakeholders such as the government, and local communities (Government of Australia, 2016). One of the elements of the leading practice of sustainable development in the mining industry is conducting mining reclamation or mining rehabilitation to display the company's commitment. Successful

demonstration of the company's commitment to mining reclamation can ease the company's other operational processes (Government of Australia, 2016).

The second essential successful factor is *planning*. Mining reclamation planning is a crucial element in the environmental management of the mining industry. It is essential that mining reclamation planning is developed and assessed continuously overtime during the whole stage of mining activities to assure that the aspects in the planning can benefit and stay associated with the progress state of the mining area (Y. Q. Zhao et al., 2015). To figure out how much mining reclamation can actually address and alleviate the effects of mining-related activities, it is crucial to understand the local environment. A correct and rigid baseline assessment of the local environment is necessary to ensure the guidelines can support mining reclamation success (Government of Australia, 2016). Several data that should be included in the baseline assessment, for example, local climate (rainfall intensity, temperature), soil characteristics (pH, soil nutrients), and flora and fauna existence, especially for the endangered species (Government of Australia, 2016).

The third successful factor is *stakeholder involvement*. Based on Ministerial Decree 1827K/30/MEM/2018 of the Ministry of Energy and Mineral Resources, stakeholders consist of the Ministry of Energy and Mineral Resources, related institutions, and local communities impacted by mining activities (Ministry of Energy and Mineral Resources, 2018b). Zhao et al. (2015) argued that mining companies should recognize these stakeholders as mining reclamation performance assessors. Stakeholder involvement should take place in all stages of mining reclamation. It is an opportunity for mining companies to manifest their contribution to society and economic development by communicating and involving stakeholders (Y. Q. Zhao et al., 2015). Having a good relationship with these stakeholders may lead to an improvement of the company's reputation. A poor reputation can impede their operations, such as struggling to obtain a permit or losing the company's social license to operate (Government of Australia, 2016).

*Financial assurance* is the fourth successful factor of the mining reclamation. In implementing mining reclamation, it is crucial to consider the available funds to ensure that it is adequate to execute all the plans (Y. Q. Zhao et al., 2015). Thus, the inclusion of mining reclamation cost in the planning is crucial to understand company's capability to start all mining operations including mining reclamation. The calculations of mining reclamation cost should cover direct cost and indirect cost. Direct costs include all costs from land re-contouring,

revegetation, acid mining drainage control, and other technical activities. While indirect cost is calculated from mobilization, planning, administration, and supervision (Ministry of Energy and Mineral Resources of the Republic of Indonesia, 2018b). Zhao et al. (2015) explained that mining reclamation cost should be continuously reviewed/updated to assure its efficiency. Currently, there are three common financing mechanisms for ensuring mining reclamation; (a) governmental regulatory approach, which commonly comes in the form of margin deposits, (b) financial market approach, which primarily takes the form of bond issuance and closure guarantees, and (c) civil society approach which takes the form of closure funds (Y. Q. Zhao et al., 2015).

*Monitoring and maintenance* are the final important successful factors to consider. The main reason for continuing to monitor a post-mining site after it was reclaimed is to verify that all operations and processes are delivered as planned and in compliance with mining reclamation success criteria (Y. Q. Zhao et al., 2015). In the mining reclamation context, monitoring activity usually includes monitoring slope stability, erosion control, water quality, plants development, and colonization by fauna (Government of Australia, 2016). Furthermore, during the monitoring period, site surveillance is required to guarantee that the mining site stays secure and causes no environmental or health threats because these threats typically take more than 5 years to occur (Y. Q. Zhao et al., 2015).

The implementation of mining reclamation can be influenced by various external factors. In order to identify these problems as a whole, a suitable tool is required so that the existing problems can be analyzed. In this research, the factors that influence the implementation of mining reclamation are analyzed using the PESTLE concept. Further explanation about PESTLE will be further elaborated in the next section.

The implementation of mining reclamation can be influenced by various external factors. In order to identify these problems as a whole, a suitable tool is required so that the existing problems can be analyzed. In this research, the factors that influence the implementation of mining reclamation are analyzed using the PESTLE concept. Further explanation about PESTLE is further elaborated in the next section.

## **2.5 PESTLE Analysis**

PESTLE is a tool utilized in the management to analyze or evaluate the impacts of external factors on the environment where the management operate (Yudha, Tjahjono, & Kolios, 2018).

PESTLE presents a more detailed observation of a system and its synergy with the environment. There are six external factors that are analyzed in the PESTLE analysis in a system. These factors are political, economic, social, technological, legal, and environmental (Srdjevic, Bajcetic, & Srdjevic, 2012). PESTLE is useful for analyzing problems in a holistic way and also observe problems that are essentially qualitative in nature (Thomas, Sandwell, Williamson, & Harper, 2021). Although PESTLE analysis is often used at the organization level, there are studies that used this method in a topic that involved several actors. For example, Yudha et al. (2018) analyzed fossil fuel energy industry in Indonesia, and Thomas et al. (2021) applied it on solar home systems in Rwanda. Therefore, the PESTLE analysis can also be utilized for this research as it can help to holistically understand the underlying issues between the actors concerned and also in the implementation process of mining reclamation.

To apply PESTLE analysis, defining each aspect of the external factor used as the analysis subject is crucial (Marinovic-Matovic, 2020). Therefore, the summary of the external factors focused on in the research are described in Table 2.

**Table 2.** PESTLE analysis focus in the research (Adapted from Marinovic-Matovic, 2020)

| <b>External Factor</b> | <b>Research Focus</b>  |
|------------------------|--|
| Political              | How stakeholders regulate and share responsibilities for implementing mining reclamation                                   |
| Economic               | Which economic policies and factors impact mining reclamation implementation   |
| Social                 | How the behavior, culture, and social perception of residents around the mining area affect the reclamation implementation |
| Technological          | What technology and processes are available and can be carried out by the company for mining reclamation purpose           |
| Legal                  | How the regulations in Indonesia impact the implementation of mining reclamation   |
| Environmental          | How the environmental conditions in the mining area affect the reclamation process and post-mining planning                |

Mining reclamation is an activity that involves various actors such as the government, companies, and local communities. Therefore, in the political aspect, the focus here is how these parties carry out their roles and whether there are issues in the implementation process. For economic factors, the focus is on things that can affect the implementation of mining reclamation from an economic point of view so that problems that can arise due to this can be described more clearly. The social aspect is certainly an important part of my reclamation activities. However, this



aspect is still often covered by the stigma that mining reclamation is only carried out by companies to improve the environment without considering the social conditions of the local community. The technological aspect that is become the focus in this study is how significant the assistance of technological development enhances the mining implementation result. For the legal aspect, the focus is how the government regulates the implementation of mining reclamation so that companies can plan and carry out mining reclamation properly with these regulations as guidelines. The environmental aspect is very influential in the implementation of mining reclamation. Planning, execution, and monitoring phases must pay attention to the local environmental conditions of the existing mining area. Therefore, the focus of this aspect in this research is to show how the environmental aspects of mining in East Kalimantan might influence the implementation of mining reclamation in the area.

## CHAPTER 3. RESEARCH DESIGN

This chapter describes the design of the research, which consists of a *research framework*, *research strategy*, *data required*, *data source and data collection methods*, *methods of analysis*, and *research ethics*.

### 3.1 Research Framework

Verschuren and Doorewaard (2010) define research framework as a research objective that presented in a schematic format and consists relevant steps that need to be carried out to achieve the objective. According to Verschuren and Doorewaard (2010), there are seven steps to develop research framework. Those steps are:

#### **Step 1: Characterize briefly the objective of the research project**

The objective of this research is to describe the problems or challenges that exist in the management of coal mining reclamation in Indonesia and make recommendations for enhancing the implementation of reclamation operations.

#### **Step 2: Determine the research objects**

The research object in this research is the coal mining reclamation activities in East Kalimantan, Indonesia.

#### **Step 3: Establish the nature of the research perspective**

This research is a combination of problem-analysis research and prescriptive-oriented research. This research provides an overview of the challenges and problems that occur during the implementation of coal mining reclamation in Indonesia and compiles the potential solutions or recommendations to improve coal mining reclamation implementation.

#### **Step 4: Determine the sources of the research perspective**

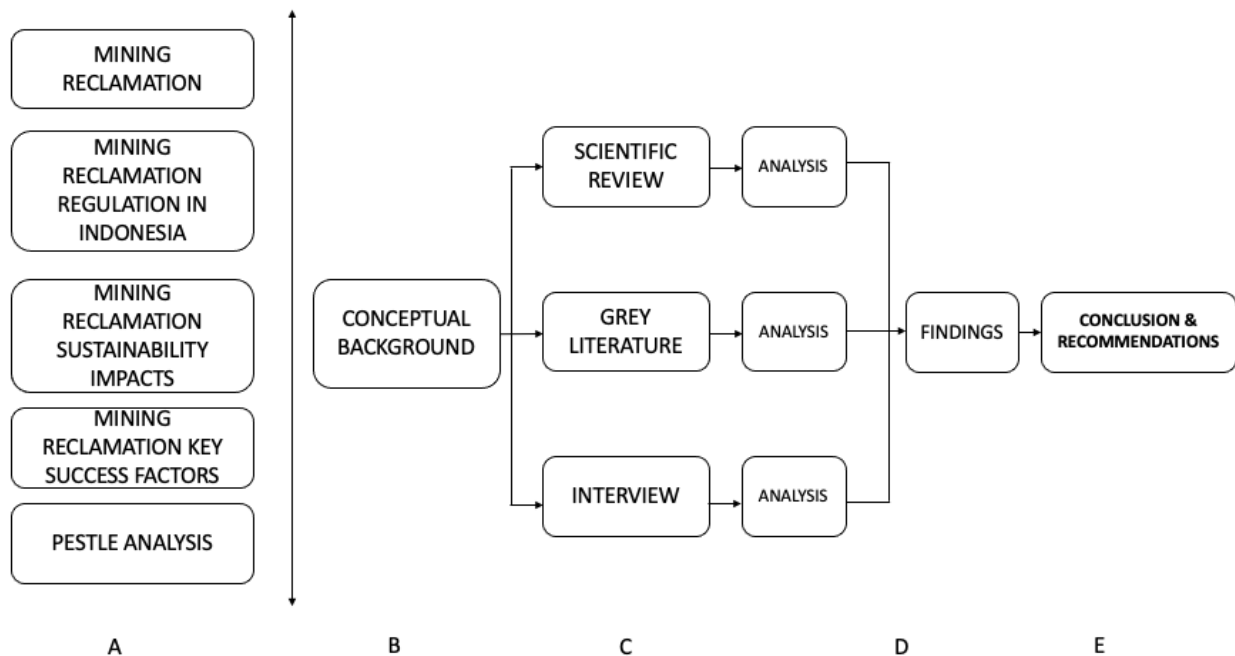
In this research, scientific literature review and existing documented studies are used to develop the conceptual and empirical background of this research. List of concepts used for this research are shown in Table 3.

**Table 3.** Key concepts

| Key Concept                                | Literature and Documentation   |
|--|--|
| Mining reclamation                         | - Literature about definition of mining reclamation in different regions   |
| Mining reclamation regulation in Indonesia | - Mining reclamation regulation in Indonesia<br>- Mining reclamation regulation in East Kalimantan<br>- Mining reclamation success criteria issued by Indonesian Government  |
| Mining reclamation sustainability impacts  | - Literature about economic impact of mining reclamation implementation<br>- Literature about social impact of mining reclamation implementation<br>- Literature about environmental impact of mining reclamation implementation |
| Mining reclamation key success factors     | - Literature about key factors that can support successful mining reclamation implementation   |

**Step 5:** Make a schematic presentation of the research framework.

The framework of this research is schematically presented in Figure 3.



**Figure 3.** Schematic Presentation of Research Framework

**Step 6:** Formulate the research framework in the form of elaborate argument.

The explanation of schematic research framework is elaborated here below:

- a. Conducting literature review about mining reclamation definition in different regions, mining reclamation regulation in Indonesia, sustainability impacts of mining reclamation, key success factors of mining reclamation implementation, and the concept of PESTLE to frame the external factors.
- b. Develop conceptual background from reviewed concepts in literature review
- c. Data collection by conducting semi-structured interview, with selected interviewees based on their knowledge on the management and implementation of mining reclamation. Grey literature and scientific literature are also used to add necessary data to answer the research questions.
- d. Analyze interviews findings, grey and scientific literature to create gather additional findings
- e. Formulate conclusions from the findings and making recommendations to improve the implementation of coal mining reclamation in Indonesia, specifically in East Kalimantan.

**Step 7:** Check whether the model necessitates any changes.

Currently, there is no indication for changes required.

## **3.2 Research Strategy**

### **3.2.1 Research Unit**

The selected units in this research are the coal mining reclamation in East Kalimantan, Indonesia. The research units also include stakeholders involved in the implementation of coal mining reclamation in Indonesia, such as government bodies and companies.

### **3.2.2 Research Boundaries and Limitations**

Research boundaries are established to ensure that the research objectives can be accomplished within the timeframe given by the University of Twente. The research boundaries in the research are the coal mining industry in East Kalimantan, Indonesia, as the geographical scale. The boundaries selected are based on the prevalence and the significance of the coal mining industry in Indonesia.

Throughout the research processes, there are several limitations which hindered the progress of this research:

1. The *time restriction*: Due to the limitation of time set by the university, the researchers focused on coal mining reclamation in East Kalimantan, Indonesia.
2. *Access to information or to people who has access to information*: Some relevant documents or publications need access requirements, and not all interviewees were willing or able to respond in time.
3. This research is limited due to the *COVID-19 pandemic*: Because of this pandemic, there are added regulations that have restricted travel and face to face meeting. Hence, all interviews held via online platforms due to this circumstances.

### **3.3 Data Collection**

#### **3.3.1 Data Required, Data Source and Method of Data Collection**

This research is conducted by using qualitative methods. The data collection methods used are preliminary research regarding the empirical background, and semi-structured interviews with selected interviewees based on their knowledge of coal mining reclamation in Indonesia specifically in East Kalimantan.

The interview process begins by contacting prospective interviewees to fulfil the research data. Requests for the availability of interviews to prospective interviewees are made by sending messages containing self-introductions, brief explanations of research, technical explanations of interviews, consent forms for prospective informants and interview application. If the interviewee has agreed to conduct the interview, the schedule is adjusted to the interviewee's preferred time. In general, all interviews were conducted for a period of time between 45 and 70 minutes. The first respondent contacted was from the Ministry of Energy and Mineral Resources as the government party that has the authority and responsibility in regulating, supervising, and evaluating the implementation of mining reclamation by mining companies in Indonesia. After the Ministry of Energy and Mineral Resources agreed, the next party to be contacted was a coal mining company in East Kalimantan. The coal mining companies selected are recommended by the Ministry of Energy and Mineral Resources as companies classified as advanced and have a good evaluation in their mining reclamation execution. The selection of companies that have an exemplary implementation of mine reclamation is chosen with the intention that the company will have more

insight to provide information about the implementation of good mining reclamation. The list of informants and the date of the interviews are provided in the Table 4.

**Table 4.** List of Interviewees

| <b>No.</b> | <b>Name</b>   | <b>Institution</b>                       | <b>Interview Date</b> | <b>Code</b>   |
|------------|---------------|--|-----------------------|---------------|
| 1          | Lana Saria    | Ministry of Energy and Mineral Resources | 01/06/21              | Interviewee 1 |
| 2          | Heru Hernowo  | PT Indominco Mandiri (IMM)               | 03/06/21 & 18/06/21   | Interviewee 2 |
| 3          | Interviewee 3 | Company A                                | 11/06/21              | Interviewee 3 |
| 4          | Adi Rachmani  | PT Multi Harapan Utama (MHU)             | 18/06/21              | Interviewee 4 |
| 5          | Interviewee 5 | Company B                                | 18/06/21              | Interviewee 5 |
| 6          | Ayub Zalman   | PT Kideco Jaya Agung                     | 24/06/21              | Interviewee 6 |

In addition to interviews, document review was applied during the research to access relevant data about coal mining reclamation in Indonesia. The data and information were identified to accomplish the general objective of this research, sources of required data and information, and the data accessing methods are shown in Table 5.

**Table 5.** Source of Data and Method of Data Collection

| <b>Research Sub-Questions</b>  | <b>Data/Information</b>  | <b>Source of Data</b>   | <b>Method of Accessing Data</b> |
|--|--|---|---------------------------------|
| 1. What are the processes carried out in coal mining reclamation?                  | Available techniques and processes for coal mining reclamation | - Scientific and grey literature  | - Desk research<br>- Interview  |
| 2. What are the economic, social, and environmental impacts of mining reclamation? | Economic impacts of mining reclamation implementation          | - Scientific and grey literature  | - Desk research<br>- Interview  |
|  | Social impacts of mining reclamation implementation            | - Scientific and grey literature  | - Desk research<br>- Interview  |
|  | Environmental impacts of mining reclamation implementation     | - Scientific and grey literature  | - Desk research<br>- Interview  |
| 3. What are the drivers and barriers to implement mining reclamation?              | Barriers and drivers for mining reclamation implementation     | - Primary data  | - Desk research<br>- Interview  |
| 4. What are the key success factors of coal mining reclamation?                    | Mining reclamation regulation in Indonesia                     | Ministry of Energy and Mineral Resources documents                            | Desk research                   |
|  | Previous documents of mining reclamation implementation        | - Ministry of Energy and Mineral Resources documents<br>- Company's documents | - Desk research<br>- Interview  |
|  | Criteria for mining reclamation success in Indonesia           | Ministry of Energy and Mineral Resources documents                            | Desk research                   |

### 3.4 Data Analysis

This research uses qualitative method to answer the research questions. The analysis process of this research is conducted for several points from different data collection methods, which are interviews, and content analysis of previous publications which include grey literature and scientific articles. The scope of the analysis includes identifying the available techniques and processes of coal mining reclamation and external factors that can affect mining reclamation implementation; the sustainability impacts of coal mining reclamation implementation which cover economic, social, and environmental aspects; the drivers and barriers to implement mining reclamation; and the key factors to implement mining reclamation successfully. The results of

these analysis were used to develop recommendations to improve the implementation of mining reclamation in East Kalimantan, Indonesia. Methods for analyzing the data are shown in Table 6. The questionnaire and interviews' summary for several interviews are shown in Appendix 2.

**Table 6.** Data Required and Method of Analysis

| <b>Research Sub-Questions</b>  | <b>Data/Information</b>  | <b>Method of Analysis</b>   |
|--|--|---|
| 1. What are the processes carried out in coal mining reclamation?                  | Available techniques and processes for coal mining reclamation | Qualitative: Identify available techniques and processes in coal mining reclamation and its impact on environment.<br>Content Analysis                            |
| 2. What are the economic, social, and environmental impacts of mining reclamation? | Economic impacts of mining reclamation implementation          | Qualitative: Analyze the economic impacts of mining reclamation implementation to residents around mining area.<br>Content Analysis                               |
|  | Social impacts of mining reclamation implementation            | Qualitative: Analyze the social impacts of mining reclamation.<br>Content Analysis  |
|  | Environmental impacts of mining reclamation implementation     | Qualitative: Analyze the environmental impacts of mining reclamation and compare areas in which mining reclamation has been well implemented.<br>Content Analysis |
| 3. What are the drivers and barriers to implement mining reclamation?              | Barriers and drivers for mining reclamation implementation     | Qualitative: Analyze what are the factors that drive and hinder implementation of mining reclamation.<br>Content Analysis   |
| 4. What are the key success factors of coal mining reclamation?                    | Mining reclamation regulation in Indonesia                     | Qualitative: Analyze what has been the weaknesses of the regulation which hinder implementation of mining reclamation.<br>Content Analysis                        |
|  | Previous documents of mining reclamation implementation        | Qualitative: Analyze the key factors in well implemented mining reclamation in mining areas.<br>Content Analysis  |
|  | Criteria for mining reclamation success in                     | Qualitative: Analyze how these indicators can stimulate the results of mining reclamation.<br>Content Analysis  |



### **3.5 Research Ethics**

In order to conduct this research, an interview process is required as a method of data collection. Therefore, this research followed the University of Twente Ethics Policy as the standard. This is to ensure that the data obtained in the interview is only used for research and is not misused for other purposes. Confidentiality of the interviewee's profile was adjusted to the wishes of the interviewees. Therefore, before conducting the interview process, a consent form was made available to obtain the consent of the interviewees regarding this matter. The signed consent forms are included in the corresponding appendix.

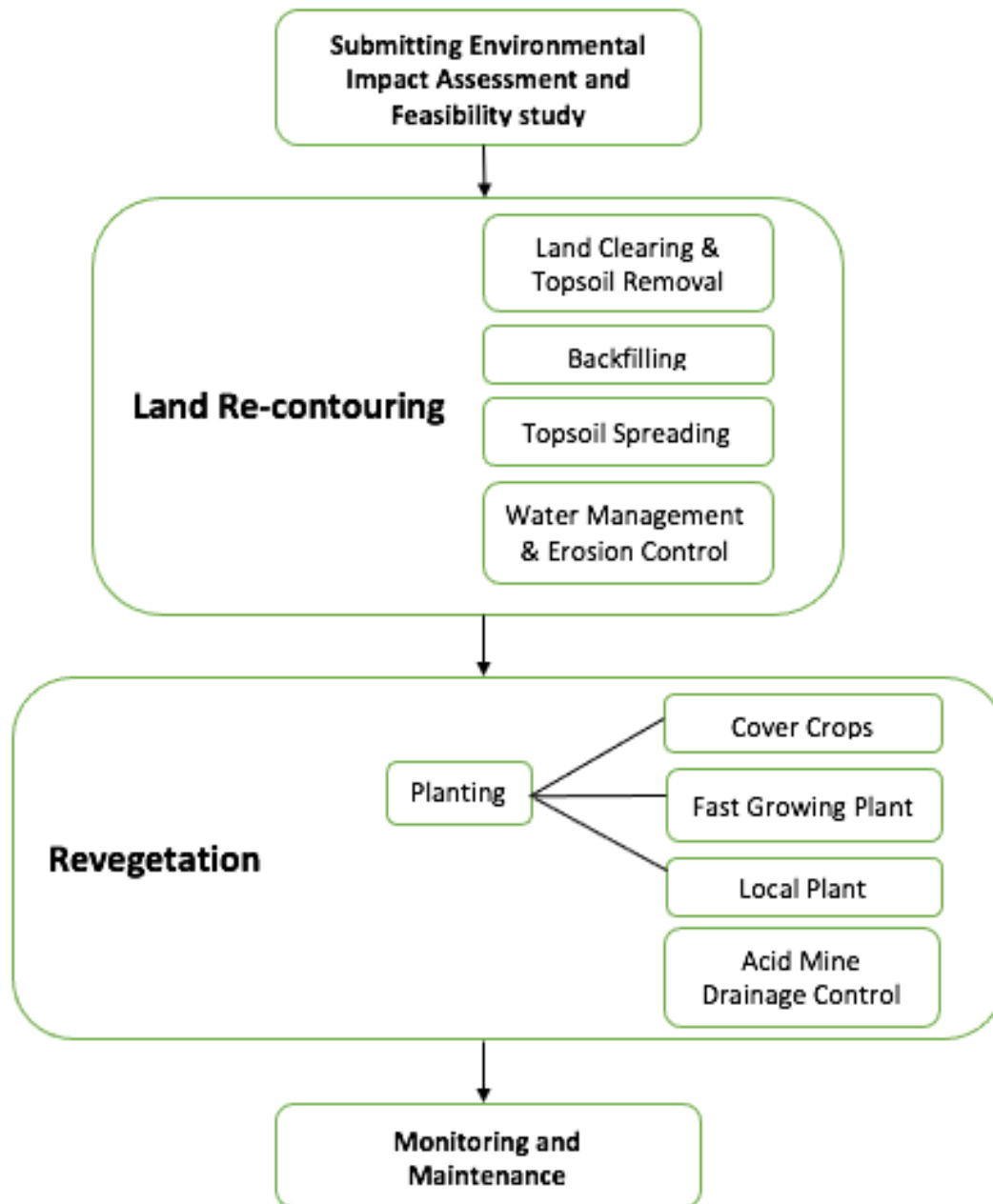
## CHAPTER 4. FINDINGS

In this chapter, the findings from interviews and document reviews are presented. The chapter consists of mining reclamation processes, PESTLE analysis, the sustainability impacts of mining reclamation, drivers and barriers of mining reclamation, and the key success factors to implement mining reclamation successfully.

### 4.1 Mining Reclamation Processes

The general processes of mine reclamation conducted by mining companies is shown in figure 4. It was found in the literature that during mine reclamation, the most important study to start with is to carry out and document an environmental impact assessment (AMDAL) and a feasibility study. These two documents are an official confirmation that the operational activities by the company have been declared feasible in terms of economic, social, and environmental aspects. Based on those documents, the reclamation plan and post-mining plan to be conducted are elaborated and informed in more detail. The composition of the document should be adjusted to the format regulated in Ministerial Decree 1827K/2018 of the Ministry of Energy and Mineral Resources.

After that, the plan is evaluated by the government. The document contains details about how much land is reclaimed and the period required for the activity. Mining reclamation evaluation by the government will be based on what the company includes in that document (Interviewee 1, 2021). Along with the mining reclamation plan, the reclamation bond is submitted. The cost of the mining reclamation activities, including future value, is used to calculate the mining reclamation bond. The reclamation bond is refunded depending on the proportion of successful criteria met by the mining company, as determined by the Ministry of Energy and Mineral Resources in a certain period (Amanah & Yunanto, 2019)



**Figure 4.** Mining Reclamation (Revegetation Reclamation) Processes

In practice, there are three main steps that mining companies should execute to successfully conducting mining reclamation according to Ministry of Energy and Mineral Resources. The first step is land re-contouring. There are two main activities in land re-contouring (Figure 5), namely land clearing and topsoil removal.



**Figure 5.** Land Re-contouring

Source: PT Indominco Mandiri Documentation (2021)

At the land clearing stage, what needs to be considered is the existing flora and fauna in the area, especially the protected species. Topsoil removal is an activity carried out to take topsoil to be used as a planting medium during revegetation activities. The collected topsoil is placed in the stockpile area and marked with coordinates and codes for each sample. After that, the excavation of soil and rocks which commonly called overburden. To make it easier, blasting is also performed to get the overburden. In this activity, heavy equipment such as excavators and dump trucks are required. The overburden is transported using a dump truck for backfilling to cover the existing mining voids with the overburden material. Backfilling is carried out so that existing ex-mining voids are closed and reduce the potential for casualties or other disasters.

The next step is to do soil mapping before topsoil spreading (Figure 6). Soil mapping is completed to determine the composition of the soil to know the fertility level of the soil. Another purpose is to figure out the Potential Acid Forming (PAF) of the soil/rocks to prevent the formation

of acid mining drainage (AMD). In the soil layer that has a high PAF level, it will be covered with Non-Acid Forming (NAF) materials before topsoil spreading is carried out on it.



**Figure 6.** Topsoil Spreading

Source: PT Multi Harapan Utama Documentation (2019)

After topsoil spreading, slope stability and drainage are constructed. For the drainage (Figure 7), it is constructed in the form of channeling, and also sometimes drop structure is made in areas with high slopes, to reduce the potential for erosion and control runoff. After the land is considered stable from the geotechnical aspect, the revegetation stage can be executed. Based on research conducted by Amanah and Yunanto (2019) about the mining reclamation period to successfully meet criteria in Indonesia, generally in the first year, the percentage of the land re-contouring stage is achieved. Before planting cover crop, pioneer (fast-growing) species and intermediate/under-shelter species, the land re-contouring stage must be evaluated to meet the existing criteria. Three types of plants should be planted in mining reclamation activities: cover crops, fast-growing plants, and local plants. Plant seeds used for revegetation activities are usually obtained from the company's nursery for plant development (Figure 8), or in collaboration with the local communities.





**Figure 7.** Drainage Construction

Source: PT Multi Harapan Utama Documentation (2020)



**Figure 8.** Company's Plant Nursery

Source: PT Indominco Mandiri Documentation (2021)

The first types of plants to be planted are cover crops (Figure 9). Those commonly used are legumes (Interviewee 2, 2021) or those from the Fabaceae family (Amanah & Yunanto, 2019). Cover crops are planted at the early stage to improve soil structure and also attract nitrogen to the

soil to enrich organic matter (Interviewee 2, 2021). It is also done to reduce the potential for erosion due to high rainfall (Amanah & Yunanto, 2019).



**Figure 9.** Cover Crops Planting

Source: PT Indominco Mandiri Documentation (2021)

After the cover crops are planted, the next step is to plant fast-growing plants. In Indonesia, one of the most well-known fast-growing plants is *Paraserianthes falcataria*. To minimize environmental pollution, some companies used compost as fertilizer (Interviewee 2, 2021).

After some time, and fast-growing plants form a canopy cover, and local plants are planted. Apart from planting activities, monitoring of acid mining drainage is also carried out at the company's settling pond to ensure that the flow does not have the potential to pollute public waters and complies the limits of quality standards issued by the Ministry of Environment and Forestry. The last stage is monitoring and maintenance. Some of the things included in this stage are fertilization, re-planting, pest and weed control and erosion control (Amanah & Yunanto, 2019).





**Figure 10.** Example of Mining Reclamation Area After 5 Years

Source: PT Indominco Mandiri Documentation (2021)

## **4.2 PESTLE Analysis**

In this section, PESTLE analysis is applied to identify the external factors that influenced mining reclamation in East Kalimantan, Indonesia. PESTLE analysis is conducted to provide information relevant to the answers to research questions 2 and 3 so that a comprehensive understanding of the findings can be formed.

### **4.2.1 Political Factors**

The main political factor is the roles and responsibilities of the governmental organizations involved in mining reclamation implementation. The Ministry of Energy and Mineral Resources is responsible to make regulations, allocate supervisors, and issue licenses regarding mining reclamation by mining companies. Before the amendment of Law No. 3 of 2020, the provincial-level Ministry of Energy and Mineral Resources still had the right to issue a permit to mining companies in their area. However, since the new law has been inaugurated, the issuance of mining business permits is only performed by the national-level Ministry of Energy and Mineral Resources. The Ministry of Environment and Forestry also has a role in monitoring mining reclamation because one of the main aspects in the mining reclamation criteria published by the Ministry of Energy and Mineral Resources is water management. This ministry is responsible for monitoring wastewater and acid mining drainage to ensure that mining companies meet the quality standards before being discharged into public waters. This Ministry can also be involved if the mining company's concession area is in a forest area belonging to the Ministry of Environment



and Forestry. In this case, the mining reclamation performed by the company must also meet the criteria for the success of mining reclamation owned by the Ministry of Environment and Forestry.

#### **4.2.2 Economic Factors**

As explained in section 2.1, coal mining impact on Indonesian economy is very significant for East Kalimantan as one of the most productive regions. From the economic aspect, the low price of coal is the most relevant factor affecting the implementation of mining reclamation. Coal price can affect the operational activities of coal mining companies so that their activities are not conducted according to schedule. The delay in operational activities will also affect mining reclamation implementation because it usually generates modifications or revisions to the work plan and budget (RKAB) and reclamation plans (RR). One example of such a case that happened was in the 2011-2015 period, where commodity prices such as low petroleum prices, declining coal demand caused 125 companies in East Kalimantan to stop operating, either temporarily or permanently and an estimated 5000 people lost their jobs (Indonesian-Investments, 2015).

#### **4.2.3 Social Factors**

The activities of coal mining companies cannot be separated from the attention and pressure of numerous parties such as NGOs and the local community. The negative stigma of mining companies regarding resource exploitation and environmental damage has gained more awareness of the activities of coal mining companies. Hence, it is necessary to take some measures to reduce the skepticism level towards mining companies by involving these parties in the company's activities. Community development is one of the integral elements of mining reclamation activities. In planning for mining reclamation, having discussions with local communities and interested parties is required. With that discussion, mining reclamation plan can be adjusted to accommodate the needs of local communities in the future. For example, East Kalimantan area is a region that has a minimal level of groundwater and also poor clean water quality (Interviewee 5, 2021). Poor water quality is a result from removal of vegetation that also leads to river siltation, suspended solids, and water contamination. Soil fertility also deteriorates rapidly to the point where the condition is sometimes irreversible. This increases the difficulty of rice farming and decreases rice production by local rice farmers (Waterkeeper Alliance & JATAM,

2017). Therefore, one of the reclamation plans being developed in that region is utilizing ex-mining voids as a source of clean water (Interviewee 3, 2021; Interviewee 5, 2021)

Another social factor that can affect the success of mining reclamation is the illegal activities done by the local community especially in a region where many mining areas located near urban areas like East Kalimantan. In a mining area that is being reclaimed, the potential for illegal logging, illegal mining, or land encroachment is likely to occur (Amanah & Yunanto, 2019). As an example, it is something that happened in the MHU concession area where mining land that had not been reclaimed 100% was asked to be returned by the local community. This could harm the company because the success criteria of mining reclamation cannot be delivered (Interviewee 4, 2021).

#### **4.2.4 Technological Factors**

Technology is also a fundamental part of implementing mining reclamation. In revegetation reclamation, innovation in revegetation activities is carried out to ensure plant growth can be optimal with no environmental pollution. Several companies have adopted composting and natural fertilizers in their revegetation activities.

Another important technological advance that is beneficial for water treatment is settling pond. Mining industries are responsible for preventing erosion in disturbed areas and treating runoff before it is transferred into the surrounding water. Large amounts of suspended particles can be transferred by surface water runoff which can cause environmental harm in the area. If existing erosion prevention or sediment control technologies are insufficient, sediment ponds are used to lessen sediment loadings from mining activities (BC Ministry of Environment, 2015). Moreover, monitoring also requires good technology so the monitoring can be performed efficiently. Currently, drones are used as a monitoring tool for several companies (Interviewee 3, 2021; Interviewee 4, 2021).

#### **4.2.5 Legal Factors**

The implementation of mining reclamation in Indonesia is an obligation that must be carried out by mining business license holders as part of good mining practice called for by the government of Indonesia as an effort to maintain a sustainable environment. It is regulated in several regulations,

1. Law No.3 2020 concerning Amendment to Law No 4 20099 Concerning Mineral and Coal Mining.
2. Government Regulation No.78 2010 concerning Reclamation and Post-mining.
3. Regulation of the Ministry of Energy and Mineral Resources No. 26 2018 concerning Implementation of Good Mining Practice and Supervision of mineral and Coal Mining.

In addition, the Ministry of Energy and Mineral Resources issued guidelines for the implementation of good mining practice which also includes the implementation of mining reclamation in Ministerial Decree 1827K/30/MEM/2018. Regulations regarding mining reclamation in Indonesia are already advanced compared to other developing countries in Asia. This is because the regulations in Indonesia require the success of reclamation to reach 100% before reclamation bond returned (Interviewee 1, 2021). In the new law, Law No. 3 2020, sanctions for companies that fail to achieve mining reclamation up to 100% will be in various stages of sanctions to criminal sanctions (Interviewee 1, 2021)

For mining companies in East Kalimantan, there is additional regulation that they need to abide. East Kalimantan Regional Regulation No.8 2013 about Reclamation and Post-mining. Although this regulation more or less is similar and support the regulations issued at national scale, there are some requirements or criteria that are more specific than the criteria in the national regulation. For example, in East Kalimantan regulation, it is explicitly mentioned that for revegetation activities, there should be at least 625 trees in 1 hectare, which consists of pioneer plants, local plants, or plants that have economic value (Government of East Kalimantan, 2013). This specification is not mentioned in the criteria issued by national government.

For companies whose concession areas are in forest areas belonging to the Ministry of Environment and Forestry, the company must also meet the reclamation criteria issued by this ministry. The two main regulations that must be observed are Regulation of the Ministry of Forestry No. 60 2009 about Guidelines for Assessment of Forest Reclamation Success and Regulation No. 4 2011 about Guidelines for Forest Reclamation.

#### **4.2.6 Environmental Factors**

The implementation of mining reclamation is also strongly determined by the environmental conditions in the mining area. The first thing that matters is rainfall, therefore planting in revegetation activities must be done in the right season (Interviewee 1, 2021). In a

season with high rainfall or the weather is too dry, plant growth will be more difficult. This can be detrimental to the company because it fails to meet the criteria for successful reclamation at the right time (Interviewee 1, 2021). Another thing is that coal mining areas in the equatorial region were different from those not in the region. In the equatorial region with higher rainfall, if the mining area is not reclaimed immediately, the main problems are erosion and sedimentation (Interviewee 3, 2021).

Soil characteristics are also things that must be considered in mining reclamation implementation. The soil composition in the mining area must be assessed and analyzed properly, especially the content of PAF (Potentially Acid Forming) and NAF (Non-Acid Forming). Analyzing PAF and NAF in soil/rock is done to avoid the formation of AMD (Acid Mining Drainage). Soil characteristics also crucial in determining the fertility of the soil for revegetation activities.

### **4.3 Sustainability Impacts of Mining Reclamation**

#### **4.3.1 Social Impact**

Paying attention to local social and cultural aspects is one aspect that must be covered in implementing mining reclamation (Government of Indonesia, 2010). As priorly described in section 4.2.3, local communities become a major element for the progress of mining activities. With the reclamation activities, the positive impact on the local community must be included in the consideration of the operating companies because the sustainability and continuity of the mining business can be determined with the relationship between locals and companies. From the information obtained from interviews with several companies' representatives, they explained how their company tried to run programs such as Corporate Social Responsibility (CSR) and other programs with the main objectives of the community and regional development (Interviewee 5, 2021; Interviewee 2, 2021).

Mining companies that have been operating for a long time usually allocate large costs for community development or their company's CSR, as this is also the most frequently reminded by the Ministry of Energy and Mineral Resources (Interviewee 2, 2021). The Ministry of Energy and Mineral Resources will encourage companies to always increase their contribution to the local community. The involvement of the community can increase the sense of belonging from both parties (Interviewee 1, 2021). Another informant stated that the involvement of local community

in company's activity such as mining reclamation is crucial in order to make them participate and learn new competencies (Interviewee 5, 2021). Therefore, several CSR programs are designed to be in line with mining reclamation activities by educating the local community about company activities that can be executed by the local community. By having good relations between the company and the surrounding community, the company's image will certainly improve in their eyes. This can also be one of the company's motivations to have proper mining reclamation by involving and giving positive impacts to the community. The drivers to implement mining reclamation will be explained in more detail in section 4.4.

The social impacts as explained above will also connected to the economic impacts the local community have due to mining reclamation implementation. The economic impacts of mining reclamation will be elaborate further in next section.

#### **4.3.2 Economic Impact**

As mentioned in the previous section, the impact of community development conducted by mining companies also affects the economic conditions of local communities around the mining area. With the mining reclamation activities, mining companies use these activities as an opportunity to involve local people in their activities, especially at the revegetation stage. The revegetation activities which are included as part of the mining reclamation provide job opportunities for the locals. According to the statement from Interviewee 3, the revegetation worker in Company A is dominated by local people. Apart from being a worker, the improvement of economic condition also comes from seed development. For instance, Company A bought 30,000 seeds just from one local seed developer which can give the supplier a profit of up to hundreds of millions of rupiah in a month (Interviewee 3, 2021). The same thing was also done at other coal mining company by working with local planting contractors. Based on the interview, one of the interviewees said,

*"The reclamation activity can have a big impact on the surrounding community. In revegetation activities, the provision of seeds, planters and maintenance workers come from the surrounding community so they can be educated and developed"* (Interviewee 5, 2021).

As well as to being a supplier of seeds, revegetation in reclamation activities also provides opportunities for local residents to plant seeds of the plants they want so that they can use them in the future (Interviewee 2, 2021).

The positive economic impact not only affects local communities, but also for mining companies. As regulated in Indonesian regulations, to obtain mining business permit mining companies are required to meet requirements, one of which is to submit reclamation plan and put reclamation bond (Government of Indonesia, 2010, 2020). Without these, companies will not be able to obtain the permit and continue their business which will cost them economic losses. Completing mining reclamation properly and timely so it can meet the criteria from the government will also speed up the return of the reclamation bond to the company (Interviewee 3, 2021). It also provides benefits to the company in cost efficiency in the process of their mining activities and help them avoid additional costs by preventing a disaster such as flood and erosion (Interviewee 1, 2021).

### **4.3.3 Environmental Impact**

Coal mining is an activity that is generally carried out in a large area. Therefore, this activity has a major negative impact on the environment of the area. To conduct mining activities, removal of soil and trees is inevitable (Dontala et al., 2015). These will cause deterioration of the natural ecosystem in the area. Therefore, the effort to improve the environment of the mining area is to conduct mining reclamation. As defined in several Indonesian regulations, for example in Law No. 3 2020, mining reclamation is an activity that aims to organize, restore, and improve the quality of the environment and ecosystem so that the area can be reused according to its use.

By conducting mining reclamation, there are numerous positive impacts on the environment of ex-mining area, the first one is ecosystem restoration. As previously explained, one of the main objectives of mining reclamation is to restore the ecosystem. Evidence of a real impact from the implementation of mining reclamation is the amount of land that has been revegetated in several mining companies. As an example, in 2019, one of coal mining companies has planted more than 900 thousand plants and completed a reclamation area of 1085.4 ha. So far, this company has reclaimed nearly 37% of the total active operating area of 28,553.5 ha. Of this amount, most of the reclamation carried out is reclamation in the form of revegetation which aims to restore the ecosystem (Kaltim Prima Coal, 2019). In another company, efforts to implement mining reclamation with revegetation to restore the ecosystem have also been performed for a long time. This company has been carrying out mining reclamation since 1997 and has reclaimed more than 75% of their 25,000 ha operation area (Indominco Mandiri, 2020).

Restoring the ecosystem will not be conceded as a success if the flora and fauna that should exist in the area are not visible. Therefore, in the monitoring stage, companies also pay attention to the flora and fauna in the area. Proper attention to flora and fauna is one of the aspects that must be incorporated in mining reclamation based on Government Regulation No.78 2010. One of the earliest steps in the mining reclamation stage is flora and fauna mapping in their concession (Interviewee 2, 2021). This is performed to classify which species are considered as protected species to conserve their existence. Another important thing about the presence of flora and fauna in the mining reclamation area is that they can be a bioindicator of the success of mining reclamation even though it is not one of the success criteria issued by the Ministry of Energy and Mineral Resources (Interviewee 6, 2021; Interviewee 2, 2021). For example, the presence of dragonflies in the mining reclamation area is a positive thing because dragonflies can be used as bioindicators of clean water. Additionally, the presence of frog species is also a bioindicator of the formation of a microclimate in the area (Interviewee 6, 2021).

As explained previously in section 4.2.6, the main threats to mining area that is not reclaimed immediately are sedimentation and erosion. By conducting mining reclamation successfully, the runoff water from the mining area that is diverted into public water bodies will fulfill the government's standards, and averting water pollution from the mining area (Interviewee 3, 2021).

#### **4.4 Mining Reclamation Implementation Drivers and Barriers**

##### **4.4.1 Drivers**

In implementing mining reclamation, various factors can be a driver for companies. One of the main drivers for companies is a commitment to comply with the mining company's obligation to carry out reclamation in accordance with the existing regulations (Interviewee 2, 2021; Interviewee 3, 2021; Interviewee 4, 2021; Interviewee 5, 2021; Interviewee 6, 2021). Mining reclamation must be implemented to show company's compliance to the laws and regulations from the Ministry of Energy and Mineral Resources and the Ministry of Forestry as the landowner (Interviewee 4, 2021). The same thing was conveyed by another interviewee,

*"This is non-negotiable compliance with the government and stakeholders. If the reclamation cannot be completed, the company's business will not be completed also. Therefore, this is mandatory. Even on a global scale this is not something that can be ignored, especially now*

*there is something known as Environment and Social Governance (ESG). This movement is quite massive which cannot be ignored” (Interviewee 5, 2021).*

Another driver to implement mining reclamation is the company's moral responsibility. In the whole process of mining activities, there will be periods where these activities disturb the surroundings. Therefore, after mining activities have been finished, mining companies must be responsible to return the existing conditions according to their designation (Interviewee 5, 2021). In carrying out coal mining activities or businesses, all activities must be environmentally friendly, and it is starting with self-awareness. This opinion is in accordance with what was said by one of the interviewees from a mining company who stated,

*“It's a business, especially since most companies in mining industry are private companies, so they are profit- oriented. Whatever the business is, it must be profit-oriented. But we have to be environmentally friendly and that should come from ourselves. Protecting the environment, social responsibility comes from us. Even though we are profit-oriented, we still have to practice good mining” (Interviewee 2, 2021).*

Apart from being an obligation and moral responsibility, completing mining reclamation activities can also improve the company's image. For mining companies, image or reputation is a crucial asset. Having a good image increases the social acceptance of the company, which can improve their capability to compete. However, poor communication and policies can also harm their reputation (Botin, 2010). By showing commitment to regulations, the company's image will improve not only in the eyes of the government but also the local community (Interviewee 4, 2021). Improving the image of the company with good environmental management can also have an impact on buyers (Interviewee 3, 2021). Successful implementation of mining reclamation also can be a benchmark for the company's mining operations, even sometimes only by showing their mining reclamation activities, buyers can believe that the company's mining activities will also be good. This activity is also an opportunity to educate and show the public that the mining industry is not only doing environmental damage but also there is a real effort and contribution from mining companies to manage the environment in a sustainable manner (Interviewee 1, 2021; Interviewee 2, 2021; Interviewee 4, 2021; Interviewee 5, 2021).

The government also has its own way of appreciating the efforts and good performance of mining companies to execute out mining reclamation. Appreciation is usually carried out by presenting award to mining companies who are not only successful in their mining reclamation,



but also make breakthroughs or innovations to develop and improve their mining reclamation (Interviewee 1, 2021). This is done so that other companies are motivated to innovate and show that there are ways to accelerate reclamation and speed up recovery so that it can be seen that the mining industry has contributed to the environment (Interviewee 1, 2021).

#### **4.4.2 Barriers**

Various issues can become barriers that cause the implementation to be less than optimal. The barriers can occur before the process starts or during the process. A major issue that has the potential to become a barrier is land rights in the company's concession area are not yet clear (Interviewee 1, 2021). During the negotiation process with landowner, in some cases the process was not as smooth as expected. There were cases where the landowner only wanted to sell it for a very high price, and sometimes the price is unreasonable to rent or buy. Furthermore, the area of East Kalimantan is considered narrow and many mining areas that are located near urban areas. Thus, the reclamation achievement was not achieved due to the lack of land availability. Sometimes with such conditions, the government opens up opportunities for companies to revise their reclamation plans.

Another barrier in mining reclamation implementation is that several companies do not deposit reclamation bonds to the government (Interviewee 1, 2021). This is partly because such companies do not want to disrupt their cash flow during operating activities. In cases like this, the government does not accept this as an excuse for not depositing the reclamation bond (Interviewee 1, 2021).

In the implementation process, the thing that is also become a barrier is the process of supervision by the government. The huge differences between the number of mining permits and the mining inspector staff becomes a barrier to ensure sufficient enforcement of rules. In Indonesia, there are about 5000 IUPs and the number of mining supervisors spread throughout Indonesia is only around 800 (Interviewee 1, 2021). Furthermore, there are mining sites that located in a remote area, making it difficult to have regular monitoring. Based on research conducted by Toumbourou et al. (2020), the number of staff at the provincial government level in Kalimantan is insufficient coupled with a limited budget. This makes the mining inspector who is supposed to do monitoring every 3 months only do it once a year. Even so, as described in section 4.2.5, technological development can support different activities of mining reclamation. For instance, the government

is currently trying to improve this supervision by using satellite imagery in collaboration with the private sector so that supervision can be carried out in detail and efficiently (Interviewee 1, 2021).

In addition, as mentioned in section 4.2.5, For mining companies whose concession located in area owned by Ministry of Environment and Forestry, they also need to meet the evaluation criteria from this ministry. Some interviewees who experience this, argue that with the existence of these two different evaluation criteria, it creates inefficiency for the company and might hinder their mining reclamation progress (Interviewee 2, 2021; Interviewee 4, 2021; Interviewee 5, 2021). It is because the criteria are quite similar, but the company still need to do two different evaluations. Therefore, the synchronization of these two criteria issued by both Ministries will improve efficiency so that the company only needed to pass one evaluation which already covers both criteria (Interviewee 5, 2021).

#### **4.5 Key Factors to Deliver Mining Reclamation Successfully**

To improve and ensure the implementation of mining reclamation can work successfully, there are several factors that must be integrated in the implementation of mining reclamation. The first success factor lies in evaluation criteria used as guidelines for mining reclamation implementers. The next success factor is good management in the implementation of mining reclamation, from the planning stage to monitoring and maintenance

##### **4.5.1 Evaluation Criteria**

As mentioned in section 2.4, the implementation of mining reclamation in Indonesia can only be deemed as a success when mining companies manage to complete 100% of the evaluation criteria. The importance of evaluation criteria for successful implementation of mining reclamation is for both government and mining companies. For the government, the criteria are utilized as a tool to evaluate companies' performance in mining reclamation. From the evaluation results, the government can determine measures or sanctions against certain companies (Interviewee 1, 2021). For mining companies, these criteria are used as the basic guidelines in implementing mining reclamation (Interviewee 4, 2021). The current evaluation criteria for the success of reclamation issued by the Ministry of Energy and Mineral Resources are already adequate (Interviewee 1, 2021; Interviewee 2, 2021; Interviewee 3, 2021; Interviewee 4, 2021; Interviewee 5, 2021; Interviewee 6, 2021). Although, there are cases where the criteria are more difficult to implement

in certain areas than in others. As explained by Coppin (2013), that in the criteria determinant, it should be considered that there is no "one size fits all" because environmental and social conditions of an area also have effects. For example, one of the companies is experiencing more difficulties in meeting the criteria for canopy closure because in the mining reclamation area the company has land that does not have sufficient soil. Therefore, further handling is required, and it takes longer time to reach the criteria, things like this can certainly harm the company. Thus, in the evaluation of the criteria, there are also things that need to be considered (Interviewee 4, 2021). Given the differences that exist in each site/region, the criteria from the government are not enough to be a reference, the company must also have its own guidelines that can support the achievement of the criteria for successful mining reclamation (Interviewee 6, 2021).

Another thing that can be improved concerning mining evaluation criteria is the establishment of criteria for other forms of mining reclamation. Currently, the criteria for success of mining reclamation in the regulations are only for reclamation in the form of revegetation. Whereas the potential for other forms of reclamation such as the utilization of mining voids is enormous. The inclusion of criteria for other forms of reclamation in the regulations will make it easier for companies to implement this because the company will use these criteria as guidelines or instructions in implementing other forms of reclamation (Interviewee 4, 2021).

#### **4.5.2 Excellent Mining Reclamation Implementation Management**

After the existence of good evaluation criteria, things that become a success factor for mining reclamation is excellent management in the entire process of implementing mining reclamation. There are various important factors that are the key to successful reclamation. The first success factors is good commitment from all levels of the company. A good commitment to existing regulations will benefit the company with a corporate image towards the government and local community (Interviewee 4, 2021). There are a lot of mining companies are already aware of the environmental and social impacts caused by company activities and have tried to affirm their commitment to tackling these challenges, but still the public view of this industry remains poor in terms of environmental and social management (Botin, 2010). The company's solid commitment determines how external factors will not undermining the company's commitment to managing the environment properly or conducting mining reclamation. This opinion was stated by one of the interviewees from a mining company who argued,

*“It depends on the company's commitment. It may be true, there are people who do not implement good mining practices in their operations. Therefore, it returns to the commitment of their respective companies. If the company's commitment has been committed to good mining practices, external factors such as fluctuations in coal prices will not hurt their commitment”* (Interviewee 2, 2021).

In affirming the company's commitment, the company realizes that commitment in the company's internal policies. With the company's internal policy, it is used as proof of the company's commitment, that this activity is fully supported by the company. This internal policy is also an additional guideline when planning work and executing activities other than those given by the government (Interviewee 5, 2021). In planning mining activities, the company's commitment to environmental management will be integrated in procedures where the most important factor is the synergy between mining activities in general and reclamation activities (Interviewee 4, 2021).

Commitment from the company certainly does not come only from the support of the company's board, but also the entire company staff who will contribute to executing the plans that have been made. To ensure that the company's plans and policies can run well, the company has taken various steps. For example, the socialization of company policy is carried out by holding meetings and discussions on work plans that are carried out consistently within a certain period. Other than that, there is a competency data collection of every employee of the company. From this data, planning is carried out to decide the additional training and certification needed for these employees to ensure that the company's strategy included in the reclamation planning document given to the government can be fulfilled (Interviewee 5, 2021). Furthermore, training on mining reclamation is also held routinely which can involve external parties or only internal companies. Another step is to use Key Performance Indicators (KPIs) for teams in the field so that the company's targets for mining reclamation can be well socialized, both in quality and quantity (Interviewee 4, 2021).

After the commitment from the company has become a good foundation, the next key factor is planning. According to the definition of mining reclamation in Indonesian regulations, mining reclamation mainly aims to restore and improve the quality of the environment and ecosystem so that it can function again according to its designation. However, in the planning

process, what must be considered also is how the mining reclamation that will be carried out has a sustainable value. This was emphasized by government representative who stated, *"What we want from the company is not only the ex-mining area to become 'green' again, but the sustainability function of the area"* (Interviewee 1, 2021).

Sustainable mining reclamation planning must look at the potential and needs of the area so that the value of the results of mining reclamation carried out will increase in the future. For example, in the form of revegetation reclamation, plant selection can be the key to increasing the sustainability value of the reclamation area. Therefore, in the planning process, it would be very beneficial if spatial planning was made for the zoning of the types of plants to be planted (Interviewee 2, 2021). Besides reclamation in the form of revegetation, the mining void reclamation also has enormous potential. Mining void reclamation can be used for various things, ranging from clean water sources, mini-hydropower, fisheries, and flood retention. However, its implementation for the reclamation of the void utilization itself is still difficult to realize because to decide the use of mining voids, requires further study and approval from all stakeholders (Interviewee 5, 2021). Also, the existence of a skeptical perception of the mining voids also complicates the implementation of the reclamation of the use of these voids. Therefore, education about mining void potential and stakeholder involvement in mining reclamation is also another key factor in the success of mining reclamation (Interviewee 5, 2021; Interviewee 2, 2021).

Another key factor for success of mine reclamation is stakeholder involvement. Collaboration with universities, other institutions that have knowledge in the field can contribute more to the success of reclamation by providing new knowledge that companies cannot do because of limited time (Interviewee 5, 2021). Moreover, stakeholder involvement is also an important key to reducing social conflicts that occur by showing that the company is making more efforts in managing its environmental impacts while also maintaining good relations with the community through CSR programs and activities. Even so, complaints and pressure from stakeholders are needed as a reminder for the company (Interviewee 2, 2021).

The last key factor is monitoring. Continuous monitoring must be carried out to ensure the good progress of the reclamation. One of the future threats to reclaimed land is the entry of residents into the area and carrying out illegal activities such as illegal logging, illegal mining, or the construction of other buildings (Interviewee 4, 2021). Security and supervision for reclamation areas are also aspects that need to be considered. With many cases claiming victims in ex-mining

areas, more supervision is required to avoid victims and conflicts that potentially occur (Interviewee 5, 2021). In addition, there are also many cases where acid leaching occurs long after reclamation is carried out (Interviewee 2, 2021). Another main thing that monitoring must be carried out properly is ensuring the return of ecosystems and biodiversity in the area. Companies must ensure plants which can grow well and animals that previously migrated can return to the ex-mining area (Interviewee 1, 2021). The importance of monitoring can also be helped by the development of technology for monitoring. The use of satellite imagery and drones as monitoring tools has now been developed by several companies and also the government as a supervisor for the implementation of mine reclamation (Interviewee 4, 2021; Interviewee 1, 2021).

## CHAPTER 5. DISCUSSION

The dependency of Indonesia on the coal mining industry is inevitable due to its heavy influence on national energy usage and economic development. For high coal productive regions like East Kalimantan, a vast amount of coal resources undeniably become a huge asset. However, improper management of the industry by all stakeholders involved can potentially have unwanted repercussions to the region, especially for the environmental condition of the region. In general, more people have negative perception on mining activities. That is understandable because it is easier to highlight the destructive evidence of mining activities rather than the effort to restore the environment integrated in mining activities. One of the measures which have been done for many years to reduce the negative impacts of the coal mining industry is by conducting mining reclamation.

Currently, it is easy to discover research or studies about the adverse impacts of coal mining. Studies regarding this particular matter are crucial to understanding the reality we face right now, where many companies still neglect their mining reclamation obligation or have not adequately implemented mining reclamation. However, this should not be the reason to be sceptical about the potential result of mining reclamation implementation.

The positive impacts of mining reclamation can be from different aspects such as social, economic, and environment perspectives. It is not easy to realize the socio-economic benefits of mining reclamation without looking into the environmental aspects. Perhaps, most people understand that the main idea of conducting mine reclamation is to restore the environment around mining areas which coal mining activities have harmed it. However, intangible social and economic impacts also occur. Sections 4.3.1 and 4.3.2 show that mining reclamation has positive impacts in social and economic aspects, not only for the company but also for the local community. By conducting mining reclamation, it enables opportunities for the local community to be involved in the company's activities, which potentially generate income and competencies for them. A good relationship with the local community might increase trust between them and might change the negative perception of coal mining companies. The fact that the company also gets various benefits in carrying out mine reclamation should be a driver for companies to carry out their obligations. Mining companies should start considering mine reclamation as an investment that also has the potential to provide benefits for the company in the future.

As more people recognize the positive impact of mining reclamation, it has also led to progress in the views of what can be achieved and resulted from carrying out mining reclamation. Initially, with the primary objective of mining reclamation being to improve and restore the environment, reclamation in the form of revegetation became the conventional approach for reclamation of ex-mining areas. However, currently one of the most important and considered elements from mine reclamation is the sustainable functionality of the area. For example, in the form of revegetation reclamation, it is vital to consider the type of plants, which can be valuable in the future. Thus, after all mining activities have ended, the area still has assets that the local community can utilize. In addition, with the development of knowledge and technology, various innovations and new insights open the possibility of additional forms of reclamation, such as the use of ex-mining voids as sources of clean water, fisheries, flood retention, and mini hydropower. (Interviewee 1, 2021; Interviewee 5, 2021).

Regardless of the form of reclamation, many factors effect reclamation results. The first factor that becomes the key is commitment. Without commitment, let alone the emergence of an innovation or a good reclamation plan, mining reclamation will not be considered a mandatory activity for mining companies. The focus will be only making profits regardless of the negative impacts resulting from the mining activities. Commitment is the core in conducting mining reclamation. When a company is committed, it will attempt to conduct its activity in the best way possible. All crucial factors in achieving reclamation success such as planning, involving all stakeholders, monitoring and maintenance will be integrated into their mining reclamation activities.

Another factor is to have an agreement with various stakeholders involved. Currently, the impression is that each stakeholder still works on their own when it comes to mining reclamation. That is one of many reasons other forms of reclamation are still not implemented prominently. Clearly, each of them has their own concerns, with mining companies as an implementer to comply with regulation, government as supervisor and regulator, local community and NGOs as affected parties who can provide public pressure. If they deliberate and create a mining reclamation plan which can be agreed upon and supported by all stakeholders, the potential positive impacts of mining reclamation discussed before may be realized.

To conclude, mining reclamation implementation has tremendous impacts in numerous aspects, regardless of what reclamation form is implemented. What really matters is the



seriousness of all stakeholders involved to realize the mining reclamation potential and transform it into realization by collaborating for the sustainability of the region and the local community.

## CHAPTER 6. CONCLUSIONS & RECOMMENDATIONS

In this chapter, the first part consists of the conclusions based on the findings chapter, The conclusions build on the arguments provided to answer the sub questions which all in all give an answer to the main research question. The second part consists of recommendations for mine reclamation practice and also future study in this topic.

### 6.1 Conclusions

The purpose of this research was to provide comprehensive understanding of coal mining reclamation management and practice in Indonesia, specifically in East Kalimantan. Below some highlighted findings for the research questions are provided:

#### 1. What are the processes carried out in coal mining reclamation?

To obtain a mining license business, mining companies must submit a feasibility study document, environmental impact assessment document, and mining reclamation bond. After the government approves these requirements, a mining company can start their mining operations. In general, mining companies should implement three primary stages to fulfil their obligation to conduct mining reclamation in the field. The first stage is land re-contouring. In this stage, the mining company should conduct several activities: land surface contouring, topsoil spreading, drainage construction, and water management.

The second stage is revegetation activities. After the company can ensure that the land is stable and safe, revegetation activities can begin. There are three types of plants that need to be planted during this stage, cover crop, fast-growing plant, and local plant. It is started with cover cropping to improve soil quality and also support erosion prevention. After that, fast-growing plants are planted, followed by local plants. In this stage, management of acid mining drainage is also conducted to ensure no AMD leached and potentially pollute surrounding waters and land, which can also cause plant growth issues.

The last stage is final completion. Things that need to do and pay attention to is the growth of the canopy cover in the reclamation area. In addition, monitoring and maintenance of plant growth and the return of biodiversity is a major concern at this stage.

## 2. What are the economic, social and environmental impacts of mining reclamation?

The most significant social impact of mining reclamation is the increase in good relations and trust between the company and the surrounding community. In its reclamation activities, in general, companies will have programs and CSR that involve the community, which aims to increase the knowledge and competence of the local community. Good relations with the community and good mining reclamation will improve the company's good image towards stakeholders, both from the government, buyers, or other related parties.

The economic impact can have an impact on local communities and companies. For the local community, the biggest economic impact comes from opening up job opportunities with mining reclamation activities. Companies usually employ local people in their revegetation activities. In addition, several companies obtain their seed supply from local seed developers to provide them income consistently. For companies, good mining reclamation will save them from additional budgets for fines, potential accidents and speed up the return of reclamation bonds.

The environmental impact of mining reclamation is extensive. The most important purpose of mining reclamation in Indonesian regulations is to restore the ecosystem. With a good mining reclamation implementation, thousands of hectares of land previously damaged by mining activities will be able to return to its value and use. Furthermore, ecosystem restoration is also a vital step to conserve local biodiversity. In addition to restoring the ecosystem, carry out mining reclamation is also to control erosion and sedimentation so that suspended particles carried by surface runoff do not pollute the surrounding waters.

## 3. What are the drivers and barriers to implement mining reclamation?

The main driver for mining companies to carry out mining reclamation is compliance with the obligation to carry out mining reclamation in accordance with regulations. Another driver is a moral responsibility. Mining activities will initially damage and disturb the environment and local community. Hence, it should be part of their responsibility to restore the area to its original state and show an effort from the mining company to manage the environment. The last driver is to improve the company's image. Company image is a crucial asset for mining companies. The negative perception of mining companies might be lessened by showing a real effort from the company to manage the environment. In addition, the company's appreciation from the

government can also be one of the drivers so that companies get recognition for their environmental performance.

The barriers of mining reclamation implementation can mainly come from the company and the government. One of the barriers is the land use clearance has not been completed when the company wants to start carry out operational activities. The delay of operational activities also causes mining reclamation activities to be hampered. The next barrier is observed when companies that ignore their obligations to provide reclamation bonds. Another barrier is the lack of capacities and financial resources for monitoring by the government. Approximately 5000 mining business permits are issued by the government, and only 800 mining inspectors are available to carry out monitoring routines. Monitoring with the help of satellite imagery is also not optimal due to the lack of efficient cooperation between the relevant institutions.

#### 4. What are the key factors to deliver successful mining reclamation operations?

The first key factor is the existence of appropriate regulations and criteria, which serve as guidelines for mining companies to carry out mining reclamation properly. The second key factor is commitment. With the commitment and support from the company's board, mining companies can execute their reclamation plans to the fullest. The third key factor is planning. In mining reclamation, proper planning is very influential on the company's mining reclamation implementation. Implementation in a right period and the sustainable function of the area becomes an essential aspect in the planning stage. The fourth key factor is stakeholder involvement. Involving the community will facilitate the company's operations from various things, such as new knowledge and avoiding conflicts, increasing the company's image. The last key factor is monitoring. Mining reclamation monitoring needs to be done continuously because environmental threats from the mining area can arise after a long time. In addition, monitoring the area's biodiversity must also be considered a sign of restoring the area's ecosystem function.

From the answers to the sub-questions, the answer is given to the main research question: **“How to improve the implementation of coal mining reclamation in East Kalimantan, Indonesia?”**

Mining reclamation is an activity with a long process and takes a significant amount of time and money. However, the impact of these activities is also significant from social, economic

and environmental aspects. Therefore, mining reclamation should be an obligation and a form of responsibility for mining companies in restoring the land they previously damaged. However, there are still many elements that hinder the implementation of a good reclamation from the company or the government angles. There are several key factors for successful mine reclamation that must be integrated in order to improve mine reclamation implementation. The first key factor is making sufficient and clear mining reclamation criteria to guide companies. The second is ensuring there is a commitment from the company board to support the implementation of mining reclamation. The third factor is planning for sustainable mining reclamation so the value of the area can increase after mining activities. The involvement of stakeholders such as the local community is also essential to maintain good relations that can facilitate the company both from the planning and implementation stages. Comprehensive monitoring with the help of technology to diminish the influence of the existing barriers for well implemented mining reclamation.

## **6.2 Recommendations for Practitioners**

Mining reclamation implementation in Indonesia, especially in East Kalimantan, can be improved in several ways. Three recommendations can be made for this purpose.

The first recommendation is based on finding that the implementation of mining reclamation in Indonesia is mostly in the form of revegetation. Hence, to increase the implementation of other forms of mining reclamation is to establish criteria regarding other forms of mining reclamation and include it in the regulation. From interviews, sources from various mining companies mentioned the potential for other forms of reclamation was mentioned, such as ex-mining void utilization for flood retention, fisheries, clean water sources, and even mini-hydropower plant. However, two main things hinder its implementation: the absence of government criteria about other forms mining reclamation and the lack of collaboration in planning. Making criteria regarding other forms of reclamation from the government and being incorporated into existing regulations will open opportunities for companies to develop their reclamation plans because there are basic guidelines that they can follow. For collaboration between stakeholders, discussions involving all stakeholders regarding the final function of the reclamation area must occur in the planning stage. Therefore, the reclamation plans have received approval from all parties, and the studies can be carried out simultaneously and increase the efficiency of time, cost and energy. In the planning, it is necessary to consider the local area's

potential and needs. For example, in East Kalimantan, where groundwater conditions are lacking, and water quality is poor, the potential for using voids to become a source of clean water can be the right choice. Moreover, there is a plan to move Indonesia's new capital city to the province. It should be one of many reasons to accelerate the development and implementation.

The second recommendation is based on the finding that lack of human resources and budget become a coupled barrier in mining reclamation implementation, especially in the monitoring stage. The government also need to consider to be stricter in issuing mining business permits so that the quantity of companies being monitored is still within the government's capability as the party that oversees it. In granting permits, the selection of companies must also be ensured that they have the capability to fulfil all their obligations, including mining reclamation. Of course, there are positive steps in increasing the sanctions if the company fails to carry out mining reclamation. This measure must be side by side with good supervision so that the gap for violations can be minimized. Thus, sufficient technological aid by technology innovation and development will be beneficial to cover the weaknesses in the mining reclamation implementation.

The third recommendation is based on the finding that part of the reasons that mining reclamation planning and implementation are still not fully supported by some stakeholders, especially the local community, is the negative stigma and insufficient knowledge about the mining reclamation. Currently, there are many people who do not apprehend or acknowledge the potential of mining reclamation, which may be partly due to the lack of publications on this subject. In general, there are more publications regarding the shortcomings of the implementation of mining reclamation. Thus, increasing education and awareness about the potential of mining reclamation may bring more positivity towards all stakeholders which also make them more supportive and participative in the implementation of mining reclamation in their area. The importance of providing information about the potential for mining reclamation can increase the interest of the surrounding community, especially local communities so that more people monitor and provide input in the implementation of mining reclamation.

### **6.3 Directions for Future Research**

The research on mining reclamation management is still preliminary and still many elements can be explored concerning this topic. The difficulties the researcher experienced in finding materials and references regarding the mining reclamation management for this research

is the evidence. Research on the management and potential of mining reclamation, especially other reclamation forms, is a topic that is still not widely published and can still be developed. Particularly since it has difficulties and obstacles in various aspects of its implementation in Indonesia.

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## APPENDIX 1. INTERVIEWEES' CONSENT FORM

### Consent Form Template

#### CONSENT TO TAKE PART IN RESEARCH STUDY INTERVIEW

COAL MINING RECLAMATION IMPROVEMENT IN EAST KALIMANTAN, INDONESIA

|   | Yes                      | No                       |
|---|--------------------------|--------------------------|
| - I, ....., agree to take part in this research study interview of my own volition.   | <input type="checkbox"/> | <input type="checkbox"/> |
| - I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.   | <input type="checkbox"/> | <input type="checkbox"/> |
| - I accept that I have the right to refuse to allow data from my interview to be used after it has taken place, in which case the content will be deleted.  | <input type="checkbox"/> | <input type="checkbox"/> |
| - I have had the purpose and nature of the study explained to me and I have had the opportunity to ask questions about the study.   | <input type="checkbox"/> | <input type="checkbox"/> |
| - I agree to my interview being audio-video-recorded.   | <input type="checkbox"/> | <input type="checkbox"/> |
| - I understand that all information I provide for this study will be treated confidentially.  | <input type="checkbox"/> | <input type="checkbox"/> |
| - I understand that in any report on the result of this research my identity will remain anonymous if preferred to be so. This will be done by not explicitly mentioning my name and disguising any details of my interview which may reveal my identity or the identity of people I speak about. | <input type="checkbox"/> | <input type="checkbox"/> |
| - I understand that I am entitled to access the information I have provided after the interview.  | <input type="checkbox"/> | <input type="checkbox"/> |
| - I understand that I am free to contact any of the people involved in the research to seek further clarification and information.  | <input type="checkbox"/> | <input type="checkbox"/> |

The names of the people involved in this study who guarantee the agreed-upon use of this consent and the answer provided during the interview are mentioned below.

**Researcher:**



Tavidi Mutagin Ardana

**Project Supervisor:**

1. Dr. M.L Franco Garcia
2. Dr. Gül Özerol

**Participant:**

*Signature of participant*

Date:

**CONSENT TO TAKE PART IN RESEARCH STUDY INTERVIEW**  
COAL MINING RECLAMATION IMPROVEMENT IN EAST KALIMANTAN, INDONESIA

- |   | Yes | No                       |
|---|-----|--------------------------|
| - I ..... agree to take part in this research study interview of my own volition.   | √   | <input type="checkbox"/> |
| - I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.   | √   | <input type="checkbox"/> |
| - I accept that I have the right to refuse to allow data from my interview to be used after it has taken place, in which case the content will be deleted.  | √   | <input type="checkbox"/> |
| - I have had the purpose and nature of the study explained to me and I have had the opportunity to ask questions about the study.   | √   | <input type="checkbox"/> |
| - I agree to my interview being audio-video-recorded.   | √   | <input type="checkbox"/> |
| - I understand that all information I provide for this study will be treated confidentially.  | √   | <input type="checkbox"/> |
| - I understand that in any report on the result of this research my identity will remain anonymous if preferred to be so. This will be done by not explicitly mentioning my name and disguising any details of my interview which may reveal my identity or the identity of people I speak about. | √   | <input type="checkbox"/> |
| - I understand that I am entitled to access the information I have provided after the interview.  | √   | <input type="checkbox"/> |
| - I understand that I am free to contact any of the people involved in the research to seek further clarification and information.  | √   | <input type="checkbox"/> |

The names of the people involved in this study who guarantee the agreed-upon use of this consent and the answer provided during the interview are mentioned below.

**Researcher:**



Tawidh Mutaqin Ardani

**Project Supervisor:**

1. Dr. M.L Franco Garcia
2. Dr. Gül Özerol

**Participant:**



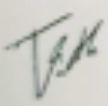
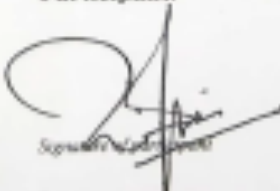
Dr. Lana Saria, M.Si  
Date: 01 Juni 2021

Interviewee 2

**CONSENT TO TAKE PART IN RESEARCH STUDY INTERVIEW**  
COAL MINING RECLAMATION IMPROVEMENT IN EAST KALIMANTAN, INDONESIA

|   | Yes                                 | No                       |
|---|-------------------------------------|--------------------------|
| - I, <u>Heru Hernowo</u> agree to take part in this research study interview of my own volition.  | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| - I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.   | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| - I accept that I have the right to refuse to allow data from my interview to be used after it has taken place, in which case the content will be deleted.  | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| - I have had the purpose and nature of the study explained to me and I have had the opportunity to ask questions about the study.   | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| - I agree to my interview being audio-video-recorded.   | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| - I understand that all information I provide for this study will be treated confidentially.  | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| - I understand that in any report on the result of this research my identity will remain anonymous if preferred to be so. This will be done by not explicitly mentioning my name and disguising any details of my interview which may reveal my identity or the identity of people I speak about. | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| - I understand that I am entitled to access the information I have provided after the interview.  | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| - I understand that I am free to contact any of the people involved in the research to seek further clarification and information.  | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

The names of the people involved in this study who guarantee the agreed-upon use of this consent and the answer provided during the interview are mentioned below.

|   |   |   |
|---|---|---|
| <p><b>Researcher:</b></p> <br><br>Tavidh Mutaqin Ardansu | <p><b>Project Supervisor:</b></p> <ol style="list-style-type: none"><li>1. Dr. M.L. Franco Garcia</li><li>2. Dr. Gül Özerol</li></ol> | <p><b>Participant:</b></p> <br><br>Date: 17-6-21<br>Heru Hernowo, ST, MBA |
|---|---|---|

## Interviewee 4

**CONSENT TO TAKE PART IN RESEARCH STUDY INTERVIEW**  
COAL MINING RECLAMATION IMPROVEMENT IN EAST KALIMANTAN, INDONESIA

- |   | Yes | No                       |
|---|-----|--------------------------|
| - I, Adi Rachmani agree to take part in this research study interview of my own volition.   | ✓   | <input type="checkbox"/> |
| - I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.   | ✓   | <input type="checkbox"/> |
| - I accept that I have the right to refuse to allow data from my interview to be used after it has taken place, in which case the content will be deleted.  | ✓   | <input type="checkbox"/> |
| - I have had the purpose and nature of the study explained to me and I have had the opportunity to ask questions about the study.   | ✓   | <input type="checkbox"/> |
| - I agree to my interview being audio-video-recorded.   | ✓   | <input type="checkbox"/> |
| - I understand that all information I provide for this study will be treated confidentially.  | ✓   | <input type="checkbox"/> |
| - I understand that in any report on the result of this research my identity will remain anonymous if preferred to be so. This will be done by not explicitly mentioning my name and disguising any details of my interview which may reveal my identity or the identity of people I speak about. | ✓   | <input type="checkbox"/> |
| - I understand that I am entitled to access the information I have provided after the interview.  | ✓   | <input type="checkbox"/> |
| - I understand that I am free to contact any of the people involved in the research to seek further clarification and information.  | ✓   | <input type="checkbox"/> |

The names of the people involved in this study who guarantee the agreed-upon use of this consent and the answer provided during the interview are mentioned below.

**Researcher:**



Tavidh Mutaqin Ardanu

**Project Supervisor:**

1. Dr. M.L Franco Garcia
2. Dr. Gül Özerol

**Participant:**



Adi Rachmani

Date: 19 June 2021

Interviewee 6

**CONSENT TO TAKE PART IN RESEARCH STUDY INTERVIEW**

COAL MINING RECLAMATION IMPROVEMENT IN EAST KALIMANTAN, INDONESIA

|   | Yes | No                       |
|---|-----|--------------------------|
| - I ..... agree to take part in this research study interview of my own volition.   | √   | <input type="checkbox"/> |
| - I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.   | √   | <input type="checkbox"/> |
| - I accept that I have the right to refuse to allow data from my interview to be used after it has taken place, in which case the content will be deleted.  | √   | <input type="checkbox"/> |
| - I have had the purpose and nature of the study explained to me and I have had the opportunity to ask questions about the study.   | √   | <input type="checkbox"/> |
| - I agree to my interview being audio-video-recorded.   | √   | <input type="checkbox"/> |
| - I understand that all information I provide for this study will be treated confidentially.  | √   | <input type="checkbox"/> |
| - I understand that in any report on the result of this research my identity will remain anonymous if preferred to be so. This will be done by not explicitly mentioning my name and disguising any details of my interview which may reveal my identity or the identity of people I speak about. | √   | <input type="checkbox"/> |
| - I understand that I am entitled to access the information I have provided after the interview.  | √   | <input type="checkbox"/> |
| - I understand that I am free to contact any of the people involved in the research to seek further clarification and information.  | √   | <input type="checkbox"/> |

The names of the people involved in this study who guarantee the agreed-upon use of this consent and the answer provided during the interview are mentioned below.

**Researcher:**



Tavidh Mutaqin Ardamu

**Project Supervisor:**

1. Dr. ML Franco Garcia
2. Dr. Gül Özerol

**Participant:**



Date: 24 Juni 2021



## APPENDIX 2. QUESTIONNAIRE AND INTERVIEWS' SUMMARY

### Questionnaire for Government

1. What are the processes carried out by the mining company in implementing mining reclamation?
2. What are the economic, social and environmental impacts of mining reclamation?
3. What measures are taken by the government to increase the success of mining reclamation?
4. Is the current regulation good and clear for mining company to implement proper mining reclamation?
5. Has there ever been a social conflict in East Kalimantan community due to mining activities?
6. In one of the Ministry of Energy and Mineral Resources, there are criteria for the success of mining reclamation. How critical are these criteria to maximize mining reclamation results?
7. How is the responsibility of the government and companies to be regulated in conducting mining reclamation?
8. What are the important things that become the main success factors in implementing mining reclamation properly and can increase mining reclamation results?

## **Questionnaire for Mining Company**

1. What are the processes carried out by the mining company in implementing mining reclamation?
2. What are the potential barrier in these processes of implementing mining reclamation?
3. What are the economic, social and environmental impacts of mining reclamation?
4. What is the driver for mining company to implement mining reclamation? What are the benefits for the company in conducting mining reclamation?
5. Has there ever been a conflict due to the company's activities?
6. Are the existing regulations clear for mining companies to implement mining reclamation and the existing mining reclamation criteria is already good?
7. What are the important things that become the main success factors in implementing mining reclamation properly and can increase mining reclamation results?

## **Interviewee 1 Interview Summary**

1. What are the processes carried out by the mining company in implementing mining reclamation?

To implement mining reclamation, it begins by compiling environmental documents and feasibility study documents. So, the general description of reclamation has been stated in general in these documents. Thus, the feasibility of mining operations is seen if the document is approved, which means that the plans carried out are technically, economically and environmentally feasible. From the approved documents, the company makes a more detailed reclamation plan called a reclamation plan. However, the reclamation plan is also related to the post-mining plan because both are recovery steps. The difference is that mining reclamation is carried out when the mining is still in existence, and the activities are ongoing. At the same time, the post-mining plan is a guideline for what will be done when the mining activities have been completed. So based on the Environmental Impact Assessment (AMDAL) and Feasibility Study documents, the reclamation and post-mining plans are prepared according to the format regulated by the government in KEPMEN ESDM 1827/2018 attachment 6. In addition, the reclamation and post-mining plan documents are also guidelines for calculating the placement of reclamation bond carried out by each company. These documents must be signed by the company's top brass to ensure that the company's management knows what is being planned for the mining reclamation. The government will evaluate how the company plans the mining area they will reclaim in a certain period. The government supervises so that there is a match between the cleared land and the reclaimed land.

In carrying out mining reclamation, it must comply with the principles of reclamation, start from safety, slope stability or geotechnical aspects, and from the mineral conservation aspect, to ensure that the reclaimed land has no resources that are still stored. In carrying out reclamation, it must also support the sustainability of environmental functions. If the reclamation is carried out in the form of revegetation, they must ensure the soil must be in accordance with the plant selection. If the reclamation is not carried out in the form of revegetation, for example, the mining company will leave the void after a few years. The certainty of what will be done with the void must be clear to have a clear function. However, for this, it must have an agreement with all stakeholders. What the government pays attention to is the output of mining reclamation. However, the government will also give appreciation if there are companies that have innovations. Usually, companies that have gone public want to show that they contribute to preserving the environment, so the company

will innovate to accelerate and maximize reclamation results in their area. Appreciation is usually done by giving higher grades which will be used at the time of the award. This appreciation is performed as a motivation to other companies, to show that there is a way to improve the results of reclamation and show the non-mining world that there is a contribution to the environment in the mining industry.

2. What are the economic, social and environmental impacts of mining reclamation?

In carrying out mining reclamation, the government does not see who is doing the reclamation. The important thing is that IUP holders fulfil their obligations to carry out mining reclamation. Usually, IUP holders cannot work alone for companies' CSR, seeds and fertilizer providers. Workers are usually local residents, so there is a sense of belonging, and from this, there are economic and social impacts. For environmental impacts, of course, reclamation can restore environmental functions. For mining companies, if they do not do reclamation, it has the potential to increase their environmental costs because if the land continues to be opened without reclamation, they will have difficulty meeting quality standards because sedimentation continues. Another thing is that now people are aware that if their land is continuously damaged without any attempt to repair it, the company will continue to get pressure from them.

3. What measures are taken by the government to increase the success of mining reclamation?

The process in the mining industry is a long process, starting from land clearing, mining activities, and finally, reclamation can be executed. The current portrait of the mining is when the land was damaged due to mining activities. The government's first measure is to let the community know the existing regulations demand that land clearing must be balanced with the reclaimed land. Then, the quality of supervision is also improved. If previously, the government had to do a field check with an area of 100 hectares which is impossible to cover all areas, now the supervision is more advanced because of the usage of use satellite imagery. Therefore, that the images taken provide a more detailed picture so that the supervision by the government can be more comprehensive.

4. Is the current regulation good and clear for mining company to implement proper mining reclamation?

I think it is good now. From my experience compared to countries on the Asian scale, the existing regulations in Indonesia are more advanced and more complete. For example, in other developing countries such as Thailand, Vietnam, they adopted the rules imposed in Indonesia. In addition, the new regulation, Law No. 3 of 2020, includes criminal sanctions if the company does not carry out mining reclamation. For companies that leave voids in their mining areas, the government will demand the companies responsible. In the future, the Ministry of Energy and Mineral Resources will cooperate with the Ministry of Public Works and Public Housing to plan the utilization of the mining void.

5. Has there ever been a social conflict in East Kalimantan community due to mining activities?

Sometimes, social conflicts exist, of course. In East Kalimantan, because the area is considered narrow, Many mining areas are located close to residential areas. It causes difficulties in negotiating land rights between the locals and the company because the locals will demand more to use their land.

6. In one of the Ministry of Energy and Mineral Resources, there are criteria for the success of mining reclamation. How critical are these criteria to maximize mining reclamation results?

We must have criteria to find out whether the mining area has been successfully reclaimed or not. The existing criteria are divided into 3, land management, revegetation, and final settlement, given weights according to the difficulty level. These criteria is also essential as a basis for providing sanctions to evaluate companies. Hence, clear, systematic, and measurable criteria are made. These criteria will also determine the reclamation guarantees that can be returned to companies in accordance with the progress that companies can make in implementing their mining reclamation.

7. How is the responsibility of the government and companies to be regulated in conducting mining reclamation?

For every IUP issued by the government, mining reclamation is obliged to the companies to implement. Even to start operations, even though they already have environmental impact

assessment (AMDAL) and Feasibility Study documents, but they do not have the reclamation and post-mining plan documents, the operations cannot start. Once the reclamation plan is approved, the IUP holder is responsible for mining reclamation. The government will monitor the performance of mining companies in mining reclamation to ensure they achieve the planned targets. What is also monitored is the placement of a mining reclamation bond. There are also companies that feel there is no need to conduct mining reclamation because they have placed their mining reclamation bond.

8. What are the important things that become the main success factors in implementing mining reclamation properly and can increase mining reclamation results?

The government will appreciate innovations in mining reclamation by companies. Next, is the presence of good management, starting from who is in charge and planning implementation. Reclamation must be carried out at the right time so that the results obtained are as planned. Furthermore, monitoring is required so that what has been done is maintained in quality. The last thing is company policy. The government also assesses the company's internal policies to ensure that the company also believes that the reclamation results can be achieved. In addition, the internal policy is assessed to assure that companies understand that what is required from them not only makes the area "green" but also pays attention to the sustainability of environmental functions in the area. This internal policy also ensures that the company always remembers the goals and objectives in their work.

## **Interviewee 2 Interview Summary**

### 1. What are the processes carried out by the company in implementing mining reclamation?

In mining reclamation, the ideal is if there is a finalized area. That is when completed mining area finished with backfilling. If there is such an area, the topsoil directly spread. If it cannot spread immediately, the topsoil taken is stocked and labelled. The following process is the excavation of rock or overburden called overburden with an excavator. To support the excavation process, blasting is also carried out. After that, transporting process is carried out using a dump truck for dumping. In this mining reclamation process, the company orientation is to conduct backfilling. The orientation of backfilling is adapted to minimize areas that cannot be reclaimed. In areas that cannot be reclaimed, it results in inundation in the area, which is called void. The next step is soil mapping to check whether the area is fertile or not. After soil mapping, an acid-forming test was carried out to determine the distribution of PAF. If there is an area that contains high PAF, it will be covered with NAF material. If it is not too high, then topsoil spreading can be done but with more soil thickness. Next is topsoil spreading and land management to minimize erosion that can occur. Engineering on drainage is also conducted by creating channelling to assure less potential for erosion. Sometimes drop structures are also formed on walls that are steep or high to control runoff. Another thing executed in water management is constructing a sediment pond so that the water discharged from the mining area meets existing standards imposed by the government. If it is ready for planting, planting is done with local and non-local plants. Non-local plants are fast-growing plants. Other types of plants planted are cover crops that cover the area, usually leguminous species, to improve soil structure and are rich in organic matter. In addition, the company is also developing organic fertilizers. In addition, the company is also developing compost. After the plants grow well, the intensity of plant maintenance is lessened and maintained until the plants can survive on their own.

### 2. What are the potential barrier in these processes of implementing mining reclamation?

Actually, there is the potential to become a barrier to implementing good mining reclamation at every step. Therefore, reconciliation must be carried out at every step so that the existing problems can be identified. The key is at the stage before and at the soil mapping stage so

that the selection of plants planted is in accordance with the level of acidity in the area and produces maximum plant growth. In other aspects such as economic, social that can hinder mining reclamation, there must be. Moreover, most of the mining companies are private companies, so they are profit-oriented. Even so, it must remain environmentally friendly, and it must come from ourselves, protecting the environment, managing social responsibility must come from ourselves. Although the orientation is making a profit, good mining practices must be implemented. Nonetheless, it all depends on each company's commitment. The threat in the future is how to maintain the commitment to carry out mining reclamation.

### 3. What are the economic, social and environmental impacts of mining reclamation?

The implications for the environment and the community around the mining area must be enormous with the fact that mining companies manage an extensive area that can reach tens of thousands of hectares. Usually, companies that have existed or have been operating for a long time have large allocations or budgets for community development or CSR. Community development is also what the Ministry of Energy and Mineral Resources remind the most to the company. The Ministry of Energy and Mineral Resources will continue to encourage companies to increase their contribution to society. It is because the key to the sustainability of the mining company's business depends on the relationship between the company and the local community. With the reclamation, it is an opportunity for the company to invite local communities to get involved. For example, in this company, several planting contractors come from the local community. In addition, the company attempt to get plant seeds from the local community. The point is that the involvement of local communities with the mining reclamation is a real thing. The other most important thing is education about reclamation and reforestation. Many people have a negative stigma towards mining companies due to their adverse impacts. Nevertheless, in fact, one of the massive activities of mining companies is planting.

### 4. What is the driver for mining company to implement mining reclamation? What are the benefits for the company in conducting mining reclamation?

Of course, apart from being the main requirement for obtaining a permit, mining reclamation can also be used as a benchmark. If the reclamation is successful then this can be an indication that the mining operations are also good



5. Has there ever been a conflict due to the company's activities?

Conflict can occur because the level of understanding is different. The fact is that it is difficult to change the stigma about mining in society. However, these conflicts are manageable. The important thing is that conflicts that occurred in the past do not often occur today. The key is to maintain good relations with the community through company programs such as CSR. What can be done is to minimize these negative things and use these conditions as the company's corrective action so that these things are getting less and less.

6. Are the existing regulations clear for mining companies to implement mining reclamation and the existing mining reclamation criteria is already good?

The regulations regarding reclamation from the Ministry of Energy and Mineral Resources are excellent and clear. Nevertheless, for companies that manage the Ministry of Environment and Forestry's area, the mining reclamation regulations must also pay attention to the regulations issued by the Ministry of Environment and Forestry. For example, in the Ministry of Environment and Forestry regulations, the minimum is 40% local plants and 60% non-local plants. In addition, companies whose concessions are in the Ministry of Environment and Forestry's territory must also carry out watershed rehabilitation by planting outside the company's concession area. The existence of rules from the two institutions sometimes makes the existing rules overlap. Things regulated in the Ministry of Energy and Mineral Resources regulations are mostly the same as the Ministry of Environment and Forestry. Consequently, companies with concessions in the Ministry of Environment and Forestry area will carry out two evaluations.

7. What are the important things that become the main success factors in implementing mining reclamation properly and can increase mining reclamation results?

The main factor is sustainable reclamation by designing reclamation in the form of sustainable revegetation. For example, selecting the type of plant to be planted must be a plant that has value in the future. Therefore, good reclamation will be very helpful if mutually supportive zoning is made. In addition, with the development of understanding about mining reclamation, reclamation is not only in the form of revegetation but also in other forms. This view is a new positive thing that requires proactive steps to provide more information to various stakeholders. Therefore, community development or corporate CSR plays an essential role in moving together

with reclamation in the form of revegetation to form a sense of belonging between the company and the local community. Hence, all parties have the same understanding to maximize the potential of mining reclamation implementation in the area. Although, of course, there are sections of society that are still sceptical of negative perceptions of mining.

### **Interviewee 3 Interview Summary**

1. What are the processes carried out by the company in implementing mining reclamation?

Since exploration, NAG test is conducted as the basis for selective dumping. This test is done to prepare for acid mining water management. Modelling in mining planning created from the test result. From the modelling, it can be seen the potential of NAF and PAF from the area. Regarding the soil, topsoiling is carried out for stock or direct spreading. In terms of mining planning, a long term or 5-year plan is presented from which area will be reclamation.

2. What are the potential barrier in these processes of implementing mining reclamation?

The main thing that can be a barrier is management commitment. Technical matters will be easier to manage when the management has a high commitment.

3. What are the economic, social and environmental impacts of mining reclamation?

Of course, if from the economy, the supply of seeds. Some of the community comes from the assisted members. In addition, there is also cooperation with revegetation contractors, starting from the supply of seeds and also workers who carry out revegetation activities dominated by local residents. In terms of the environment, the biggest thing about coal mining in equatorial areas like here is erosion control. In equatorial areas like this, the rainfall intensity is higher. If the mining area is not reclaimed immediately, erosion and sedimentation will occur, which causes the settling pond to work harder. Therefore, from an environmental point of view, the main issues if a reclamation is not carried out immediately are erosion and sedimentation. If reclamation well implemented, water quality management will be easier. In addition, reclamation can also impact the establishment of a micro-climate and increase carbon absorption.

4. What is the driver for mining company to implement mining reclamation? What are the benefits for the company in conducting mining reclamation?

Actually, mining reclamation is the company's obligation and, in this company, protecting the environment is part of our internal policy, which makes our commitment to this very good. All high-ranking company officials sign the internal policy. The benefits obtained are that the first is

the fulfilment of obligations, the second is that the company's image also becomes better internally and externally.

5. Has there ever been a conflict due to the company's activities?

Yes, we once got a red PROPER because there was a bleaching incident at the company. However, this can be overcome with the company's commitment and innovation.

6. Are the existing regulations clear for mining companies to implement mining reclamation and the existing mining reclamation criteria is already good?

I think the current regulations are clear regarding mining reclamation. There is a clear matrix to guidelines in terms of correspondence. It's just a matter of whether the company follows the rules or not. The current criteria are also good.

7. What are the important things that become the main success factors in implementing mining reclamation properly and can increase mining reclamation results?

From a management perspective, commitment and a good system are essential. In addition, the use of technology in monitoring, such as the use of drones. The key thing is also to maintain the quality of the soil because it is a vital asset in the revegetation process. For the future challenge is reclamation in the form of utilizing mining voids.

## **Interviewee 5 Interview Summary**

1. What are the processes carried out by the company in implementing mining reclamation?

In mining reclamation, there is what we call land re-contouring. In the land re-contouring process, there are several activities. When the land arrangement has been completed, then proceed to the planting process. Furthermore, after the planting process is complete, there is monitoring, maintenance, and fertilization until the area is ready to be returned. There are several types of mining reclamation, in the form of revegetation and also in other forms. Usually, a mining void that cannot be closed, a comprehensive study will be carried out that also considers the interests of stakeholders in the area to determine the future function such as clean water sources, tourist attractions, and other usages. These studies will be presented to the Ministry of Energy and Mineral Resources. For reclamation in the form of revegetation, it depends on the region. In concessions in the Ministry of Environment and Forestry territory, the revegetation will lead to the revegetation of forest plants. Companies whose concessions are in the Ministry of Environment and Forestry areas must also meet the criteria from the ministry. Biodiversity and heterogeneity in plant selection must be considered.

2. What are the potential barrier in these processes of implementing mining reclamation?

In the technical process itself, the challenge is in the backfilling process. Even though we already have a plan, there are things that in the implementation process can cause changes. For instance, low prices, the quality of the material that needs a further process to anticipate the formation of acid mining will be easier to meet quality standards by the Ministry of Environment and Forestry. For future threats, it is more directed to encroachment from the surrounding community.

3. What are the economic, social and environmental impacts of mining reclamation?

Economically, this activity can have a significant impact on the economy of the surrounding community. For this revegetation activity, starting from the provision of seeds, labour, planting partners come from the surrounding community. The surrounding community is educated, given knowledge, and employed. The company intentionally does not use large contractors so that the impact on the community is more apparent. Community empowerment is vital so that they are not only "spectators" but also understand and also get income which in the end also has a good

impact on social aspects. The company's CSR activities are also optimized to be in line with the community development activities. It is also an excellent way to show that mining industries are also making efforts to preserve the environment. In terms of the environment, of course, there are many impacts, such as reforestation, carbon capture, erosion mitigation, and others.

4. What is the driver for mining company to implement mining reclamation? What are the benefits for the company in conducting mining reclamation?

Mining Reclamation has various backgrounds. Compliance is one of the non-negotiable things from the Ministry of Energy and Mineral Resources or the Ministry of Environment and Forestry. If it is not resolved, the business with these parties will not be completed, making this activity mandatory. Then, even on an international scale, this cannot be ignored, especially now that there is a massive movement like the Environmental, Social, and (Corporate) Governance (ESG). Furthermore, this is also a moral responsibility for the company. The company should be responsible for disrupting the area. Another thing is that this is also part of company's strategic planning, which shows the company is serious in this matter.

5. Has there ever been a conflict due to the company's activities?

Many people perceive mining in a good or bad way. Moreover, many NGOs around us can still influence other people to think badly about this matter. Of course, this cannot be avoided. What matters is the truth on what they point out. Usually, if there is such an incident, the stakeholders or the relevant ministry will verify. Indeed, there must be experience about the demonstration or public pressure in the mining area because it is common. The most important thing is that we do our duty, even beyond compliance. In making the Mining Closure Plan (RPT), stakeholders from the surrounding community were involved and invited to discuss, especially mining reclamation in the form of void utilization. If it has good quality, there are many benefits, especially in Kalimantan. In Kalimantan, the rainfall is relatively high, making it prone to flooding, and many blame the mining area. Even though the area is indeed a swamp, it will naturally store air so that if there is or no mining, there will be flooding. However, their opinion really cannot be faulted. However, it will be terrific if all can think positively and manage it as flood retention. Why not if an advantage can be taken from this so that it can save many costs. If all stakeholders approve it from the start, it can be well designed so the planning is more systematic and can be

maximized. However, to realize this requires understanding by all stakeholders to understand the same thing so that it can then be followed up.

6. Are the existing regulations clear for mining companies to implement mining reclamation and the existing mining reclamation criteria is already good?

The existing regulations are good because they can provide guidelines to the company. In the regulation regarding mining voids, in the Province of East Kalimantan regulations, it is stated that the maximum void is 10% of the disturbed area. While according to the regulations of the Ministry of Energy and Mineral Resources, voids must have a specific designation. The existing mining reclamation criteria is also quite good. However, what needs to be synchronized is the criteria of the two existing ministries. Although there is only a slight difference, it also affects the mining reclamation's success grade. That way, if the two things can be synchronized, it will be very efficient.

7. What are the important things that become the main success factors in implementing mining reclamation properly and can increase mining reclamation results?

Commitment from the ministry and also certainly from the company. Support from the company is essential for workers in the field to meet all essential requirements. Therefore, the company's internal policy is fundamental as an affirmation and guideline in implementing mining reclamation. In addition, collaborating with other institutions such as universities that know the field will be helpful to contribute to the success of reclamation.