Ecology and sociology analysis for mineral resources management in Indonesia

T Hidayat¹*, L Fitrianingrum², Suharto³, Sudibyo³

¹ Planning and Financial Bureau, Indonesian Institute of Sciences (LIPI)
² Center For Electric Power and Mechatronics Research, Indonesian Institute of Sciences (LIPI)
³ Research Unit for Mineral Technology, Indonesian Institute of Sciences (LIPI)

*E-mail: tauf008@lipi.go.id

Abstract. Mineral resources should be an important resource in supporting the Indonesian economy. However, equal welfare has not been felt by the people of Indonesia for seventy-four years of management of abundant mineral resources. People often oppose the management of mineral resources. These facts show problems in managing mineral resources in Indonesia. One of the problems examined in this study is the sociological aspects of the management of mineral resources in Indonesia. This research uses descriptive qualitative method by collecting data through observation and documentation. It can be concluded from this study that: (1) the inadequate mastery of mineral technology in Indonesia causes the management of mineral resources to be suboptimal, (2) Management of mineral resources that is not optimal results in low state revenues from the management of mineral resources, (3) Management of mineral resources opens employment opportunities and increases the escalation of conflict in the surrounding community as well, (4) Management of mineral resources causes environmental damage and health problems for the surrounding community, and (5) The contribution of the management of mineral resources to the economic improvement of the surrounding community is considered insignificant.

Keywords: Ecology analysis; sociology analysis; Management; Mineral Resources; Empowerment; Indonesia

1. Introduction

Mineral resources are important natural resources in supporting the Indonesian economy. Some minerals, such as oil and gas, were once the pillars of the government's economy. On a global scale, minerals - specifically major energy producers; it even plays a strategic role in determining the map of world politics. Minerals in the form of gold also have an important position in the world economy.

In line with technological advances, more and more minerals are exploited to meet various kinds of human needs. In short, it can be said that human life cannot be separated from the role of various mineral resources.

Unfortunately, mineral resources are non-renewable resources; therefore, this resource will no longer exist on earth if it is used continuously. In addition, mineral resources also have different values at different times and are vulnerable to being influenced by global problems. Therefore, government
policy is important in managing mineral resources by understanding the full characteristics and potential of mineral resources in Indonesia for the progress and prosperity of the nation.

The development of the mining sector which embodies the mandate of Article 33 of the 1945 Constitution is essentially an effort to develop mineral and energy resources that have the potential to be used efficiently and optimally for the welfare and welfare of the people, through a series of exploration, exploitation and beneficiation activities of mining products. This effort is based on the utilization of various resources, especially mineral and energy natural resources, supported by quality human resources, mastery of science and technology, and management capabilities. Mining development is an integral part of national development to realize the ideals of the nation to achieve a just and prosperous society and are equal in material and spiritual, based on Pancasila and the 1945 Constitution of the Republic of Indonesia.

Natural mineral and energy resources have special characteristics that require approaches according to their development. Specific characteristics of the mining sector that need to be considered in mining development, among others are that they occupy certain spatial distributions on earth and the seabed, are available in limited quantities and are generally non-renewable; its operations involve investments and full risk activities, which often must be capital and technology intensive; their processes have high potential for environmental change; their products have a dual function, mainly as a source of industrial raw materials and energy, both for domestic and export needs; and their business has a role as the main driver and the spearhead of regional development, not to mention their role in meeting the livelihoods of the wider community.

The Chairperson of the Indonesian Permanent Committee on Energy and Mineral Mining, Poltak Sitanggang [1], said that natural resources offer challenges and opportunities to bring Indonesia's economy towards sustainable development. Responsible, sustainable and equitable management of natural resources will ensure that this wealth benefits the people's welfare and long-term benefits. Poltak who is also the Chairperson of the Indonesian Mineral Entrepreneurs Association (APEMINDO) also said there was a mistake in placing a development paradigm in natural resource management. He said that natural resources offer challenges and opportunities to bring Indonesia's economy towards sustainable development. Responsible, sustainable and equitable management of natural resources will ensure that this wealth benefits the people's welfare and long-term benefits.

In reality, there is often community resistance to mineral resource management activities. For example, hundreds of students and environmental organizations in South Kalimantan took action against mining in the region. Two districts in South Kalimantan, Hulu Sungai Tengah and Kotabaru, reject coal exploitation. On Tuesday (January 16, 2018), hundreds of residents who joined Aliansi Pelajar Peduli Meratus, the South Kalimantan Walhi environmental organization, and Pena Hijau Indonesia, held a demonstration and speech in front of the South Kalimantan DPRD Building, Banjarmasin. The day before, the Indonesian Muslim Student Action Unit (KAMMI) also received a rejection at the South Kalimantan Governor's Office in Banjarbaru. The field coordinator of the Meratus Peduli Student Alliance, Khairul Jimmy, revealed that they strongly opposed the existence of a mining company owned by Mantimin Coal Mining Co. Ltd., Antang Gunung Meratus Co. Ltd., Hulu Sungai Tengah District (HST). The demonstrators also urged the central government to immediately revoke mining permits which caused polemic and wave of protests in various regions. The demonstrators were received by the Chair of Commission III of the South Kalimantan DPRD, Supian HK. South Kalimantan DPRD itself expressed support for community resistance to mining activities and promised to send a letter to the Ministry of Energy and Mineral Resources related to people's aspirations. A wave of rejection of mining activities was also conveyed in Kotabaru Regency against the presence of Silo Co. Ltd. (Sebuku Group). The Head of the South Kalimantan Energy and Mineral Resources Office, Isharwanto, in Hulu Sungai Tengah Regency, mining companies can only be operated on an area of 5,800 hectares, and they must acquire land owned by residents. This will be very difficult to do because almost all residents reject the existence of mining companies. As for mining refusal in Kotabaru, there are two groups of people who oppose or accept mining companies [2]. These facts indicate problems in mineral resources management in Indonesia. One of the problems
examined in this research was the sociological aspect of mineral resources management in Indonesia. Based on the limitations, the purpose of this research was to identify

A related study in this research is the Government Affairs Management of Energy and Mineral Resources in Sragen Regency, published in the Journal of Politics, Volume 5 Number 1 October 2014. The results of this study: There is an overlap in energy authority and management of mineral resources in Sragen Regency. This is caused by the unpreparedness of the Sragen Regional Government in managing the authority of energy and mineral resources. Overlapping of authority occurs between the Environmental Agency, the Public Works Office, the Natural Resources Division of the Regional Secretariat, and the Office of Industry and Trade, regarding energy management and mineral resources in several sectors. Secondly, regarding one-stop licensing, it turns out that the Integrated Licensing and Investment Agency (BPTPM) has not been able to issue permits related to mining, only issued the location permissions. Mining location permits are handled by the Water Division of the Public Works Office and the Mining and Energy Office, while the environmental impact and environmental sustainability analysis is submitted to the Environment Agency. Separately, the Natural Resources Division of the Regional Secretariat can only provide recommendations on the feasibility of mining exploration if necessary. Third, the benefits and benefits of licensing regarding energy and mineral resources are identified. These benefits include: simplification of mapping mineral resources in Sragen Regency, people who are satisfied with the permits granted, and are helped to monitor the environmental impacts of natural resource exploration. Fourth, the weaknesses in licensing realization in Sragen Regency were identified, namely the lack of clarity of the main tasks and functions of separation/disposition between agencies and related agencies in carrying out integrated licensing of energy and mineral resources, resulting in "throwing" responsibilities in the licensing process because there were recommendation requirements from the unit related such as those from the Public Works Office and the Environmental Agency. In addition to the above weaknesses, the lack of employee resources in energy and mineral management also results in delays in getting recommendations by the technical team [3]. The novelty of this research is the study of the criteria of social problems in the management of mineral resources in Indonesia.

2. Methodology
The research methodology used in this study is a descriptive exploratory approach. The explorative descriptive approach is carried out with documentation and observation studies. Document studies and observations are carried out to find information/data on the management of mineral resources in Indonesia. Observation studies conducted on related news. Document studies are carried out in books, journals and related court decisions. This data was analysed descriptively qualitatively.

2.1. Sociology
Sociology is the science of human life in group relations. Sociology has the same object as other social sciences, but it views social events in its journey; deep into the nature of all group formation, the nature of cooperation, and coexistence in a material and cultural sense [4]. Sociology is "a review or study of the interrelationships and influences between various types of social phenomena (for example between economic phenomena with religion; family with morals; law with economics; community movements with politics, etc.), Learning of the interrelationships and influences between social phenomena with non-social phenomena (e.g. geographical phenomena, geological phenomena, etc.), and study the general characteristics of all types of social phenomena ". When we talk about social phenomena, our attention is focused on the relationship of humans in social groups or communities with their environment, both in social and cultural aspects or non-social and cultural aspects. By studying social institutions and all economic, religious, political, and other problems, we learn about how humans adapt to their environment, social mechanisms, and civilization processes [5].
The function of sociology according to Soejono Soekanto [6] is to understand human behaviour because the role of human life is strongly influenced by social subsystems. Social subsystems, in essence, include individual or personal elements in society and the life that is produced by that society. Sociology is the science that addresses problems and social phenomena, as a step to find and examine data about various social problems in society and to find the source of these problems so that solutions can be sought [7].

Furthermore, Soerjono Soekanto [8] made several criteria for social problems, including:

1. Economic factors are poverty problems, in which poverty is divided into two, namely structural poverty and absolute poverty.
2. Biological factors in which some problems must be solved such as endemic problems or infectious diseases as they occur today, namely avian influenza, SARS virus, HIV, and sexually transmitted diseases that endemic in some areas.
3. Psychological factors such as depression, stress, mental disorders, madness, and so on.
4. Social and cultural factors such as divorce, crime, sexual harassment, juvenile delinquency, racial conflict, monetary crisis, and so on.

2.2. Management

The word "management" which means arrangement or organization. Many people manage, organize, and regulate, and indeed understand what is popular at the moment. Management is defined as a series of work or business carried out by a group of people to carry out work assistance to achieve certain goals [9]. In the Big Indonesian Dictionary, management is the process of getting things done or doing certain activities with and through others, the process of planning, organizing, directing, and controlling all things involved to achieve goals [10].

Marry Parker Follet [11] agrees that management is a senior process that accomplishes something related to the achievement goals. There are three factors involved 1) Organizational resources, both human resources and other factors of production, 2) The process starts with planning, organizing, directing and implementing, to control and supervision, and 3) The art of getting work done.

2.3. Mineral resources

Mineral resources are mineral reserves that are expected to be used significantly. Mineral resources with certain geological beliefs can turn into reserves after a mining feasibility study and meet mining criteria. Reserves are mineral deposits where size, shape, distribution, quantity, and quality are identified, and they can be mined economically, technically, legally, environmentally and socially [12].

The Indonesian Dictionary defines minerals as homogeneous inorganic solids that are formed naturally, with a definite chemical composition, very large numbers, for example, copper, gold, diamonds; mining goods; pelicans [13]. Thus, based on a literature review, it can be explained that the framework of this study is: a description of the influence of reciprocity, based on the criteria of social problems on regulation/management of mineral resources in Indonesia. The framework of this study can be described as shown in Figure 1.

![Figure 1. The research framework of The Sociology of Mineral Resource Management in Indonesia](image-url)
3. Discussion: Sociology of Mineral Resource Management in Indonesia

Indonesia is a country rich in mineral resources of various types and spread throughout its territory. Various minerals, both metals and non-metals such as iron ore, copper, nickel, bauxite, chrome, lead, titanium, zeolite, bentonite, silica, limestone, gold, platinum group elements, rare earth elements, coal, radioactive elements (uranium and thorium) and others are contained below the surface of the archipelago as shown in Figure 2.

![Figure 2. The distribution map of mineral and coal resources in Indonesia:](image)

The mineral and coal mining sector controls around 3.2 million hectares of land in Indonesia which consists of 41 Concession Agreements for Metals, 75 PKP2B for Coal, 4,471 IUP for Metals, 2,525 IUP for Non-Metals and Stone, 3,922 IUP for Coal. Mining has not only been on land but has also spread to coastal, marine and small islands, including tailings disposal in coastal and marine areas [14].

Minerals are non-renewable natural resources controlled by the state and their use is for the greatest prosperity of the people. Therefore, mineral management must provide added value to the national economy and be able to prosper the people.

However, the lack of technical mastery and improper way of thinking of mining entrepreneurs, in which some entrepreneurs prefer to export concentrates, makes the economic independence of the Indonesian people still quite low, especially in exploiting these abundant mineral resources.

One of the most striking case studies is the export of laterite nickel ore. Indonesia is a country with the fourth largest reserves of laterite ore in the world (12% of nickel reserves in the world), but in 2010, Indonesia became the second largest exporter of crude laterite ore in the world. Another case is bauxite ore. Indonesia has the 7th largest reserve in the world and the 4th largest producer of bauxite ore in the world. Bauxite ore is sold as raw material abroad, then bought back in the form of alumina to be processed into aluminium metal in Indonesia Asahan Aluminum Persero Co. Ltd. (Inalum Co. Ltd.) in North Sumatra Province due to the absence of a bauxite ore processing plant into alumina in Indonesia.

The same thing happens with lead, copper, gold, silver, rare earths and other mineral ores. This massive exploitation of mineral resources is worrying because it will damage the resilience of local mineral resources in the future without having a more significant economic impact on Indonesia.
Syahrir Ika's research shows that the Indonesian mining sector has not succeeded in increasing the amount of state revenue and bringing prosperity to the people [15]. The main problem is that the Government is paying more attention to the upstream sector which gives low added value than the downstream sector. The government then reformed mining management by moving from upstream to downstream. This mining reform is indicated in Law Number 4 of 2009 concerning Minerals and Coal. But its implementation faces several technical and financial challenges. This study outlines the urgency of "downstream policy". The author also describes the implementation and a challenge faced by the government and recommends several steps that need to be done. In conclusion, the authors suggest that the Government needs to (1) revise Law No. 4/2009 as a better choice compared to stipulating a number of Government Regulations which are proven to not solve the problem, (2) encourage efforts to integrate downstream industries to increase the country's revenue potential, and (3) support strategic alliances between state companies to act as downstream pioneers.

The Ministry of Energy and Mineral Resources (ESDM) recorded that the Non-Tax State Revenue (PNBP) from the Mineral and Coal mining sector reached IDR 40.6 trillion in 2017 [16]. Mining up to now is a word that is considered negative among the people of Indonesia. According to Law No. 4 of 2009, mining is part of all stages of mineral, coal or research, management and exploitation activities which include general investigations, exploration, feasibility studies, construction, mining, processing and refining, transportation and sales, as well as post mining activities. Based on this understanding, mining has a broad meaning in economic, ecological and social terms. Indonesia as a developing country has several companies engaged in mining both in the processing of oil and minerals and coal. If we explore deeper, mining companies do have a negative impact on the environment and public health. Of course there are impacts from mining companies such as mining waste which can pollute the environment and affect health [17].

In terms of employment opportunities, Herwin Eka Putra's research [18] shows that the absorption of local workforce in the mining process is 7.7 %. Coal mining activities had an economic impact on local communities with a multiple effect of 1.09 in 2015. The direct economic impact of mining activities was IDR 8,826,136,000, indirect economic impacts of IDR 618,000,000 and affecting the economic impact of IDR 180,000,000. The existence of coal mining companies indirectly has a social impact on the community; this can be seen from the increasing intensity of the conflict after the presence of the company and the lack of community participation in social activities such as social security (sickle) and mutual assistance.

Looking at the case in Lumajang Regency, iron sand mining carried out since 1998 has caused environmental damage. The physical environmental impact that can be seen from mining activities is that a large number of former mining holes with more than 3 holes have the smallest diameter of 5 meters with a depth of about 15 meters [19]. Other physical environmental impacts include road damage. Iron sand separated from dirt is then transported by local trucks to the location of iron sand weighing in Munder Village, to facilitate large trucks in the transportation process. The quality of the road in Wot Galih village belongs to group III-A, where the road can be traversed by vehicles with a maximum load of 8 tons. But local trucks transport iron sand with a load of 10 tons one way [20].

The peak of the conflict occurred in mid-2015 when the assassination of environmental activist (Salim Kancil) caused much discussion. This incident began when Hariyono was elected as the head of the Selok Awar-Awar Village even though he made illegal payments and illegal mining for his profits. Hariyono was interrupted by the presence of Salim Kancil and then killed him by sending Team 12 which was the success of his campaign team. After this case, Hariyono was suspected of illegal mining of sand and the mastermind behind the murder of Salim Kancil [21].

Deanna Kemp [22] said the source of conflict in the mining sector is rooted in unequal relations between residents and companies (entrepreneurs). This unequal relationship results in an unfair distribution of benefits. In Deanna Kemp's study, the escalation of conflict is caused by economic interests or livelihood security, access, and ownership of land and water and environmental impacts caused by extractive industry activities. Also, conflicts can stem from gender issues, weakening social cohesion and cultural beliefs, violence or violations of basic citizens' rights (HAM) and injustice in the
distribution of profits. In other words, conflicts occur because mining companies ignore environmental problems related to the human dimension.

The Mining Advocacy Network (Jatam) estimates that around 70 percent of environmental damage in Indonesia is caused by mining operations. Around 3.97 million hectares of protected areas are threatened by mining, including biodiversity there. Not only that, the watershed (DAS) has been badly damaged in the last 10 years. Around 4,000 watersheds in Indonesia, 108 were severely damaged. Nearly 34 percent of mainland Indonesia has been handed over to companies through 10,235 mineral and coal mining licenses. The amount does not include permits for large scale plantations, oil and gas working areas, geothermal and mining. Community rejection continues. However, mining permits continue to emerge despite protests from residents. One of Sinjai's protests demanded that the Bonto Katute mining exploration permit be revoked [23].

Furthermore, the impact of mining activities on public health can be explained by research from Restu Juniah, et al. [24] who concluded that the value of an Ecosystem is through its functions. Environmental services are ecosystem products. Forest conversion activities such as coal mining cause forests to not vegetate and the release of carbon into the air can cause this loss of function. The next impact that arises is the health problems and external costs of the community, especially those living around coal mining. This impact is a negative externality from mining activities on society. Research conducted at Bukit Asam Co. Ltd. (BA Co. Ltd.) Tanjung Enim in 2011 aims to identify the types of disorders and efforts made to address health problems experienced by the community and the costs incurred to overcome these disorders. The results found various types of public health disorders, and Upper Respiratory Infection (URI) is the most experienced by the community. The average external cost of public health per respondent living in the vicinity of BA TAL Co. coal mining. Ltd. in the amount of IDR 20,794.

Then the results of Fachlevi's research [25] show that: West Aceh Regency has a coal resource potential of 1.7 billion tons with known coal resources of 600 million tons and a total reserve of 400 million tons. One district that has coal reserves is Meureubo Regency. Coal mining activities will certainly have positive and negative impacts on the economy, the environment, and the community for the surrounding community. This research was conducted in 5 villages in the Meureubo sub district, the closest village to the location of the MBA Co. mining activity. Ltd. The purpose of this study is to analyse how much the economic impact of coal mining activities on local and regional communities, to estimate how much the environmental impact of coal mining activities on local communities, to identify the social impact of coal mining activities. To the local community and to evaluate the policies of the West Aceh government in the management and delivery of the benefits of coal mining. The analytical tool used in this study consisted of an analysis of local economic impacts, changes in productivity, pain costs, and loss of income, quantitative descriptive analysis, and Analytical Hierarchy Process (AHP). The results show that mining activities contribute positively to the local economy but damage the environment. The direct economic impact is IDR 24,873,147,494, indirect economic impacts of IDR 1,357,976,000 and economic impact of IDR 3,349,610,256 in 2013. The greatest economic impact was felt by Balee Village and Sumber Batu Village. Estimated losses from the community due to coal mining that affect changes in environmental quality are IDR 1,972,833,514. The biggest loss due to changes in environmental quality caused by changes in the income of rubber farmers due to changes in rubber production is IDR 1,181,463,429 in 2013. The biggest loss due to coal mining activities was in the village of Balee. Socially, mining activities increase the potential for conflict in the community related to land tenure rights and job vacancies. An alternative strategy in evaluating coal mining policies is to continue to give licenses to companies with environmentally friendly mining programs and mine land reclamation.

4. Conclusion

It can be explained from the research that the mutual influence, based on the criteria of social problems in the regulation/management of mineral resources in Indonesia, is as follows: (1) Mastery of mineral technology that is not optimal in Indonesia leads to management of mineral resources that
is not optimal, (2) Inadequate management of mineral resources results in low state revenues from the management of mineral resources, (3) Mineral resource management opens employment opportunities and increases the escalation of conflict in the surrounding community as well, (4) Management of mineral resources causes environmental damage and health problems for the surrounding community, (5) and the contribution of mineral resource management to improve the economy of the surrounding community is considered insignificant.

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