International Journal of Sustainable Development and Planning
Vol. 17, No. 7, November, 2022, pp. 2279-2285
Journal homepage: http://iieta.org/journals/ijsdp

Ecological Impacts and Socio-Legal Infrastructure as an Approach to Environmental Management in Ex-Mining Land Reclamation

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https://doi.org/10.18280/ijsdp.170729

Received: 9 April 2022
Accepted: 5 July 2022

Keywords:
ex-mining land reclamation, environmental management, spatial planning, local participation, social infrastructure

ABSTRACT

Mining, along with plantations, is one of the main economic backbones of the Indonesian provinces of Kalimantan. The main concern of extractive economics is deforestation and environmental damage that threatens natural sustainability. Most of the previous research focused on the issue of environmental sustainability in the industrial context and regional spatial planning. To fill this void, this study originally aims to analyze how local wisdom is useful in managing ex-mining reclamation practices. This research was conducted in Margahayu, Kutai Kertanegara, East Kalimantan Province. The method used in this research is empirical legal research by adopting a data-based approach. The results show that ex-mining reclamation in Margahayu aims to restore the land use according to its function and is beneficial for agriculture and small-scale plantations. The findings underline that the participation of local communities is very useful in restoring the function of the ex-mining land, due to their interest in rehabilitating spatial planning and ecological supports that are useful for their livelihoods. In this context, this finding requires inclusion of local interest-based participation as an important social infrastructure in reforestation and mine land reclamation in Kalimantan.

1. INTRODUCTION

Indonesia is a country rich in minerals and mining including gold, silver, copper, oil and natural gas, coal, and others. As specified by the Constitution, the mineral extraction and production in Indonesia are controlled by the state [1, 2]. Law No. 4 of 2009 defined mining as part or all of the stages of activities in the context of research, management and exploitation of minerals or coal which include general investigation, exploration, feasibility studies, construction, mining, processing and refining, transportation and sales, as well as ex-mining activities. For some mining-rich provinces in Indonesia, such as those in Kalimantan and Papua, extractive industries have played a very contributing role to their regional economies. For example, one of the largest gold producers in the world, Freeport-McMoran (PTFI) contributes to 0.78 percent of Indonesia's Gross Domestic Product. At the local level, this contribution skyrocketed to 34 percent of Papua's GRDP and 67.7 percent of Mimika Regency's GRDP. This shows that the economic structure of mining-rich areas in Indonesia is extremely dependent on extractive industries.

Another example of this structure is the Province of East Kalimantan. Thanks to mining and plantations, several districts in this region are among the richest districts in Indonesia. In its economic structure, the mining sector accounts for 42.94 percent of the Gross Regional Domestic Product. In the first quarter of 2020, East Kalimantan's GRDP from this sector was IDR 72.4 trillion at current prices, and IDR 64 trillion in the second quarter. From a social perspective, this extractive economy also contributes to environmental damage, social inequality and corrupt practices between local bureaucrats and businessmen.

Furthermore, the land use and spatial planning posture in East Kalimantan shows that the land use permit covers an area of 13.83 million hectares, which consists of three main sectors, namely forestry with an area of 5,619 million hectares, coal mining covering an area of 5,137 million hectares, and oil palm plantations. covering an area of 3,095 million hectares (Table 1).

Although economically the mining sector has been regarded as a source of prosperity and one of the main sources of state income for many years, environmental damage and drastic changes in the socio-economic environment of the communities around mining areas have become serious concerns [3]. Previous studies have examined heavy metal pollution on the farms of communities around the mines, which influence people's perceptions of the benefits of this industry for the local economy in their area [4, 5].

Furthermore, the mining law in Indonesia requires that land reclamation be carried out by corporations to restore land functions [6]. For example, Law No. 3 of 2020 has regulated the obligation of mining corporations to carry out ex-mining reclamation with a success rate of 100 percent, and provide sanctions for permit holders who do not carry out reclamation. Reclamation activities are the final stage of mining activities that can restore land to its original state, even better than the conditions before mining [7]. Reclamation activities include restoration of ex-mining land to improve ecologically disturbed land and preparing ex-mining land whose ecology has been repaired for further use [8]. Furthermore, it is to improve the ex-mining land so that its condition is safe, stable and not easily eroded so that it can be reused. However, the

data shows that few companies are willing to carry out reclamation sincerely in accordance with regulations. Data shows that around 70 percent of ex-mining pits in East Kalimantan have not been reclaimed until 2019. This province makes up the majority of the 1,735 mining pits found in Indonesia. Law 9/2009 concerning Mineral and Coal Mining requires reclamation through payment of deposit funds. The amount depends on the initial application for land clearing and is calculated according to the area and depth of the concession being worked on by each permit holder (Table 2).

So far, efforts to prevent and mitigate negative impacts due to coal mining have taken regulatory-based measures to reduce pollution and repair environmental damage caused by coal mining activities. From an academic perspective, investigations so far have focused on the effects of pollution, ex-mining pollution management, and industrial-scale reclamation. So far, few studies have investigated community participation in ex-mining reclamation. Based on social infrastructure theory, this study analyzes how participation based on local interests can be effectively used to restore ex-mining land. This participation is to support a sustainable local economy through plantations, livestock and small-scale agriculture while at the same time restoring spatial planning in accordance with ecological functions to support community livelihoods. The purpose of this study is to investigate the role of local communities in restoring the function of ex-mining land, and to analyze the importance of grassroots interests in rehabilitating spatial planning and ecological support that is useful for their livelihoods by taking a case study in Margahayu, Kutai Kartanegara, East Kalimantan.

Table 1. Land use proportion in East Kalimantan province

No	Land Use	Area	Units	Percentage
1	Forestry:	5,619,662	hectares	40.56
	a) Timber plantations	3,973,680	hectares	28.68
	b) Forest-related products	1,645,982	hectares	11.88
2	Coal mining:	5,137,875.22	hectares	37.09
	a) Local government permit (IUP)	4,131,735.59	hectares	29.83
	b) Central government permit (PKP2B)	1,006,139.63	hectares	7.26
3	Palm oil Plantation	3,095,824	hectares	22.35
	Total	**13,853,361.22**		**100**

Source: [2]

Table 2. Data reclamation in the districts in East Kalimantan

District/city	Mining Permit	Deposit Required	Already Deposit
Samarinda	63	59	54
Penajam Paser Utara	151	93	19
Paser	67	55	53
Kutai Timur	161	35	33
Kutai Kartanegra	625	295	219
Kutai Timur	244	68	21
Berau	93	84	14
Total	**1404**	**689**	**413**

Source: [9]

2. LITERATURE REVIEW

2.1 Social infrastructure in mining operations

Social infrastructure has long been examined in various social studies, including mining. Moffat and Zhang [10] emphasize the importance of mining corporations to build trust with local communities as a crucial part of gaining legitimacy of operations. As an industry with a giant influence, both social and economic, mining requires an acceptance basis from the local community by reducing negative impacts. Social infrastructure in this mining context relates to the quality of contacts that industry has with locals, the fairness they can get and the benefits of allowing a mine to operate on their territory. Ultimately, this will shape local perceptions of mining operations through the trust that results from the good relationship between the company and the surrounding community.

Furthermore, Lockie et al. [11] emphasized the need for social infrastructure policies by mining companies by identifying vital local economies and mining profitability. This in turn requires an assessment of the community-owned resource project life cycle through investment strategies and workforce recruitment. This requires the company's strategy to integrate itself into the social environment to encourage the legitimacy of operations. In more detail, Cesar [12] emphasizes six types of conformity that are needed in the mining industry to gain social legitimacy, namely natural resources, production processes, social infrastructure, increasing water use, social projects, and social projects outside the surrounding environment. This implementation becomes moral legitimacy for mining companies to be accepted in the social environment. Ultimately, mine operations require community participation before, during and after operation. Ocelik et al. [13] affirm that the reluctance of companies to integrate and involve communities can result in local opposition to mining. In this context, Cao [14] stated that the mine land reclamation program will involve many social units, both the central government as regulator, local governments, mining companies, and local communities. These various interests need to be involved to support the functions and interests of each party in the reclamation program. Furthermore, Cao [14] emphasized the need for effective cooperation and balancing the interests of all parties in the reclamation of ex-mining land.

2.2 Mining policies and environmental protection in Indonesia

Indonesia is rich in gas, oil and minerals. However, such rich natural resources presumably become a curse to the Indonesian economy, especially in terms of the mining industry. The Article 33 paragraph (3) of the Indonesia's Constitution state firmly that Indonesia's natural wealth is controlled by the state and utilized for the greatest prosperity of the Indonesian people [15]. According to Law No. 4 of 2009 concerning Mineral and Coal Mining, mining is part or all of the stages of activities in the context of research, management and exploitation of minerals or coal which include general investigations, exploration, feasibility studies, construction, mining, processing and refining, transportation and sales, as well as ex-mining activities [16]. Mining business itself is an activity in the context of mineral or coal control which includes the stages of general investigation, exploration, feasibility study, construction, mining, processing and refining, transportation and ex-mining sales.

Viewed from the point of view of the legal substance which is the legal umbrella for the implementation of mineral and coal mining management, currently it has provided a fairly

good legal norm, in providing guidelines for the government and local governments in carrying out the authority to issue Mining Business Permits, so that in the end the mining excavated is truly cultivated for the greatest prosperity of the people. Where the legal norms include constitutional legal norms, administrative legal norms and even still being strengthened by the existence of criminal law norms (administrative), where all three serves as guidelines for the government and local governments as implementers of decentralization in the mineral and coal mining sector.

Based on Law No. 32 of 2009 concerning environmental protection and management is a systematic and integrated effort carried out to preserve environmental functions which include planning, utilization, control, maintenance, supervision, and law enforcement. Normatively, based on the general provisions of Article 1 point 1 of Law No. 32 of 2009 concerning the protection and management of the environment that the environment is defined as a unitary space with all objects, conditions, and living things including humans and their behavior that affects nature itself, the continuity of life and the welfare of humans and other living creatures [17]. The scope of environmental management is an integrated effort to preserve environmental functions which includes policies for structuring, utilizing, developing, maintaining, recovering, monitoring and controlling the environment. The notion of sustainable development with an environmental perspective is a conscious and planned effort that integrates the environment, including resources, into the development process to ensure the welfare and quality of life of present and future generations.

Based on Article 3 of Law No. 32 of 2009 concerning the protection and management of the environment, the objectives of environmental protection and management are to protect environment from pollution and/or environmental damage, ensure safety, health and human life, ensure the survival of living things and the preservation of ecosystems, maintain the preservation of environmental functions, achieve harmony, and environmental balance, ensure the fulfillment of justice for present and future generations. Environmental and social aspects are also considered by ensuring the fulfillment and protection of environmental rights as part of human rights and control the wise use of natural resources, realizing sustainable development, and anticipating global environmental issues.

In Law No. 32 of 2009 concerning Environmental Protection and Management it is stated that the use of natural resources is carried out based on the carrying capacity and capacity of the environment by taking into account the sustainability of environmental processes and functions, sustainability of environmental productivity and safety, quality of life, and community welfare. Article 69 of Law No. 32 of 2009 reads that everyone is prohibited from committing acts that result in pollution and/or destruction of the environment. Mining activities are definitely closely related to pollution and environmental damage. And it is also a complex and very complicated business activity, full of risk, is a long-term business activity, involves high technology, is capital intensive, and regulatory rules issued from several sectors. In addition, mining activities have a very large environmental change, so that it requires careful total planning from the initial stage to the ex-mining stage. Environmental damage when viewed from the event it occurs can be divided into two: The damage occurs by itself, which is caused by nature and human actions, and due to pollution, which comes from water, air and soil [18]. Control of pollution and or environmental damage consists of three things, namely prevention, control, and restoration of the environment by applying various instruments [19]. Everyone who pollutes and or damages the environment is obliged to restore environmental functions by cessation of pollution sources and cleaning of pollution elements, remediation, rehabilitation, restoration, and or other methods in accordance with the development of science and technology. Maintenance of the environment is carried out through efforts to conserve natural resources such as conservation of natural resources, preservation of atmospheric fungi. Meanwhile, resource conservation is the protection of natural resources and the management of natural resources.

2.3 Reclamation of ex-mining land

Reclamation and ex-mining activities are a series that cannot be separated from mining activities [20, 21]. Ex-mining is a planned, systematic, and continuing activity after the end of part or all of mining business activities to restore the natural environment and social functions according to local conditions throughout the mining area [22]. The reclamation is firstly directed to achieve the revegetation of local plants. Ex-mining land is generally arid, plants are difficult to grow so it becomes critical land. To overcome this, it is necessary to carry out revegetation efforts. In certain areas, local plants have the advantage of being easy to adapt. The selection of plant species is adjusted to the soil conditions and microclimate. Using local plants is also an effort to preserve biodiversity [23]. There are about 45 types of local plants that can grow in ex-mining areas such as Laban (Vitex pinnata), Kerumbi (Homalanthus populheus), Merambung (Vernonia arborea), and others. Types of trees that are often used for reforestation are acacia and eucalyptus oil, as applied by PT Bukit Asam. In addition to planting trees, it is necessary to add other elements such as compost to accelerate tree growth.

Secondly, it is to synergize with nature. Ex-mining rehabilitation with a combination of human efforts and natural forces is a very good synergy for ex-mining land restoration, said Ishak Yasir from the Samboja Natural Resources Conservation Technology Research Institute. Mining land which is a forest area in the form of a borrow-to-use area is the main reason for this concept. Degraded land such as loss of material in the form of wood from land clearing can be processed to improve soil quality. Another way of using this concept is to plant fruit with the intention of inviting the presence of birds and bats, which are expected to bring seeds from the remaining forest around the mining area so that later the seeds brought by birds and bats can grow in ex-mining areas.

The third is by utilizing microorganisms. One of the dominant microorganisms in the soil ecosystem that can improve land function is fungi or fungi. Some fungi are also capable of forming ectopic associations in the root system of forest trees [24]. Fungi can help move phosphorus and nitrogen deep into the body of plants that grow above the soil. Three groups of soil fungi that can help improve soil balance are Aspergillus, Euphenicillium and Penicillium. This effort is good to try because fungi have special features, namely adaptive to various soil conditions and have the ability to decompose organic matter and help the process of mineral formation in the soil.

In this regard, phytoremediation is widely used. Phytoremediation is one of the efforts that can be done to improve the balance of land involving chlorophyll plants [25]. This phytoremediation technique is used to absorb pollutants

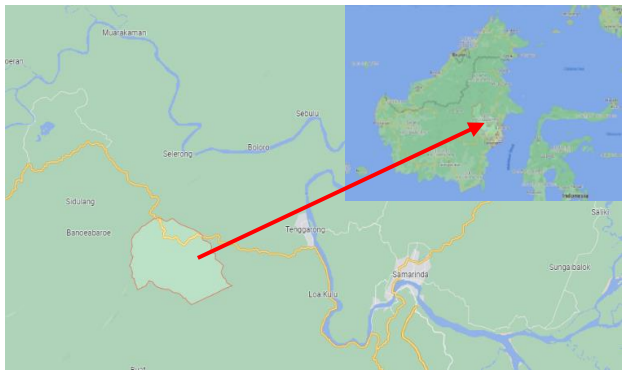
in soil and water through these chlorophyll plants. With this technique, the pollutant content in Acid Mining Water (AAT) can be reduced by absorption of heavy metals through plant roots [26]. This technique is also referred to as an artificial swamp system. The plant that is often used in this phytoremediation is water hyacinth because it is easy to obtain and grows fast [27]. Phytoremediation is worth trying because it is more economical and effective and can be combined with lime to increase the pH.

Lastly, the purpose of land reclamation is functioned as tourist destinations. The ex-mining pit is used as a tourist spot to be an attractive option. In addition to being able to enjoy the natural beauty, tourist sites of ex-mining holes can be used as educational tours to provide mining insights for visitors who travel. An example of an ex-mining pit that has been transformed into a tourist spot is to make a fish pond that accommodates various types of fish. Another example as a vehicle for water sports. Previously, the water in the ex-mining pit was treated first to remove the influence of heavy metals. Ex-mining pit tourism can be used as regional income and provide access for local residents to earn income by providing goods and services at tourist attractions so that they can help the local economy. Environmentally sound, reclamation of ex-mining pits is very important for the sustainability and socio-economic sustainability of the community. With some of the efforts described above, it is hoped that it will provide benefits for companies that will carry out reclamation of ex-mining land.

3. METHOD

This research was conducted in Margahayu, Kutai Kertanegara, East Kalimantan Province. The research was conducted in March to June 2021. The method used in this research is empirical legal research by adopting a data-based approach. The data in this study obtained from relevant authorities administering mining activities in East Kalimantan. More specifically, the research method with the type of research used in this research is empirical legal research, namely research with field data as the main data source, such as the results of interviews and documentation. Empirical legal research is used to analyze the law which is seen as patterned behavior in society in society always interact and relate in social aspects, especially regarding how mining activities involve locals in their decision-making in the operations and ex-mining land reclamation. To highlight the sociological context of the research, this study explores the scientific foundation by using theoretical perspective of social infrastructure in mining industries in ex-mining land reclamation. This theory, albeit quite new, offers a different perspective in exploring moral legitimacy of mining company activities and operations.

Furthermore, to denote the empirical legal research, this study also employs normative approach by exploring some relevant provisions of Indonesian Mining Law. This study specifically focused on the Mining Law which specified mining permit and mining company obligations. This normative aspect is used to investigate the degree of conformity or deviation from mining operations activities at the practical level. Using the basis of the primary policy on mining in Indonesia, the results of the study are expected to draw specific conclusions regarding ex-mining land reclamation in Margahayu, Kutai Kartanegara (Figure 1).



Source: [28]

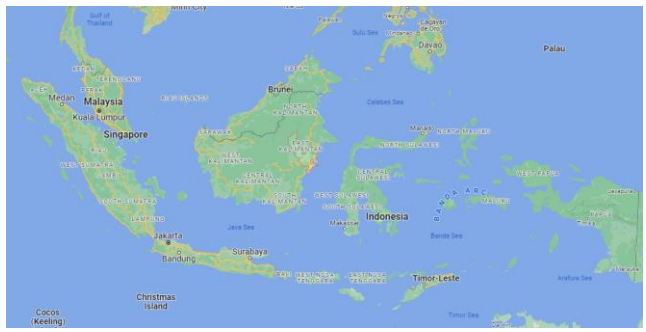
Figure 1. Location of Margahayu village in Kalimantan

Moreover, the observation was also conducted in Margahayu village. This study also specifically observes the reclamation compliance by PT. Multi Harapan Utama (MHU), which operates in Margahayu. In addition, interviews were also held with mining and livestock authorities at the district and village authorities and local residents. The data in this study are described descriptively. The analysis used in this study is qualitative analysis, using data triangulation firstly coined by Denzin [29], and elaborated by Noble and Heale [30].

4. RESULTS

Kutai Kartanegara Regency is located in the southwestern part of East Kalimantan Province and is at an altitude between 22 to 946 meters above sea level. Kutai Kartanegara Regency has an area of 23,263.10 square kilometers and a water area of approximately 4,097 square kilometers. Geographically, it is located between 115 26 28 East Longitude – 117 36 43 East Longitude and I 28 2I North Latitude – 1 08 06 South Latitude (Figure 2).

Kutai Kartanegara Regency has dozens of rivers scattered in almost all sub-districts so that this makes the river the main means of transportation in addition to land transportation. The longest river is the Mahakam river with a length of 920 kilometers. The mainland of Kutai Kartanegara district is inseparable from the cluster of mountains and mountains that are found in almost all sub-districts, which are about 10 mountains.



Source: [31]

Figure 2. Location of Kutai Kartanegara

Based on the distribution of percentages by business field, the mining sector provides a large contribution to the revenue of Kutai Kartanegara Regency (Table 3).

Table 3. Economic Structure of Kutai Kartanegara Regency based on GRDP, 2017

Sector	Percentage
Mining and excavation	64.91
Agriculture, forestry and fisheries	12.98
Construction	7.85
Processing industry	4.06
Trading and vehicle repair	3.64
Education services	1.23
Transportation and warehousing	1.01

Source: [32]

Mining itself has used sophisticated tools to carry out mining activities, so as to minimize the occurrence of worker accidents, besides that, with the use of modern, sophisticated tools, they can produce more excavated materials easily, quickly and practically. So, for the possibility of environmental damage and worker accidents can be avoided. Technically, the mining land reclamation business consists of recontouring/ regrading/ resloping ex-mining holes and making drainage channels to obtain an area with a stable slope, top soil spreading to meet the requirements as a plant growth medium, to improve soil as a planting medium, and revegetation with fast growing plants, local native plants and introduced forestry plants. Table 4 showed the Land Utilization Permit (IPPT) in East Kalimantan. The data also showed that forestry permit in Kutai Kartanegara is 661,134 hectares,mining permit is 876,878 ha, and plantation permit is 873,397.

Table 4. Land Utilization Permit (IPPT) in East Kalimantan

Regency/city	Forestry	Mining*	Plantation
Paser	129,836	104,956	322,451
Kutai Barat	361,095	1,252,612	703,323
Kutai Kartanegara	661,134	876,878	873,397
Kutai Timur	1,145,995	1,369,232	883,343
Berau	1,012,289	285,978	345,306
Penajam Paser Utara	32,996	218,927	238,315
Balikpapan			
Samarinda		27,438	3,000
Bontang			
Mahakam Hulu	728,345		
Lintas Provinsi	1,374,635		
Total	5,619,662	5,137,875,2	3,095,824

**Total IUPs issued by local governments, plus 30PKP2B with a total area of 1,006,139 ha*

Source: [2]

The ex-mining land reclamation in Margahayu Village, Kutai Kertanegara Regency, is by land management. Land arrangement is carried out to improve the condition of the landscape, among others by:

(a) closing the dug hole (under) using tailings waste (overburden) by exploring a very deep pit being left open, to collect water.

(b) making drainage channels to control excess water.

(c) organizing ex-mining land so that revegetation is easier and erosion is controlled, including by leveling the soil surface, if the soil is very bumpy, land management is carried out simultaneously with the application of a conservation technique, for example by making terraces.

(d) placing topsoil so that it can be used more efficiently. In general, the amount of topsoil is limited, so topsoil is placed in the area or plant path. Topsoil can also be placed in the planting hole.

One of the companies operated in the village is PT. Multi Harapan Utama (MHU). Its main business is mining coal. PT. Multi Harapan Utama (MHU) is enlisted in coal mining operations. They have land that has been mined, so that ex-mining land reclamation must be carried out. The reclamation is deemed as an activity aimed at repairing or managing disturbed land as a result of mining business activities to restore the function of land efficiently according to its designation. When the company has a production operation mining business permit, it has to make a reclamation guarantee as the basis if the company does not practice reclamation. Their basis for reclamation was based on Mining Law has provided legal certainty and important economic certainty for the company. This is considered important for entrepreneurs so that they can continue to carry out economic activities and invest. Indonesia has high economic growth, partly because it relies on the exploitation of natural resources, including mining. Article 33 paragraph 3 of the 1945 Constitution mandates that natural wealth be used as much as possible for the prosperity of the community.

Based on the observation, coal mining owned by Multi Harapan Utama is very beneficial for the community around the mine as they have a close cooperation with locals. People who used to be unemployed, even become migrant workers abroad, for now many of them go home and work in mining and do not come back again. Almost half of the villagers who work in mining and have arable land. Multi Harapan Utama is reclaiming ex-mining pits by building infrastructure that has not been reached by the government. Activities carried out include the construction of clean water treatment facilities, irrigation facilities, cattle breeding areas, repair of roads and bridges as well as development of tourist areas. The ex-mining pit becomes a clean water reservoir which is very helpful for the community around the mining area. Previously, people living far from clean water sources had to walk about 3 km from their homes.

PT. MHU built a clean water facility in the form of a water treatment plant (WTP) with a capacity of 26 liters per second located in Margahayu Village (void 27). The raw water source comes from water that is accommodated in former mining pits which are quite far from residential areas, recorded can reach 3.6 km. To distribute it, clean water is channeled to residential areas that can reach a distance of between 700-2,500 meters. Furthermore, the clean water installation is managed by the residents of Margahayu Village through community groups, including Tirta Pelita Kita.

In addition, the creation of a beef cattle breeding area, which was named Mini Ranch Jayatama. The ex-mining area was converted into a beef cattle barn area and an elephant grass growing area for livestock feed. The follow-up impact is the fulfillment of people's animal protein needs cheaply and affordable. The double effect of beef cattle farming is the growth of community activities for elephant grass plantations as the basic feed for cattle. This effect reduces disguised unemployment and can even be a side business for workers and employees in utilizing the remaining free time for elephant grass plantation activities.

Head of the Livestock and Animal Health Service (DPKH) of East Kalimantan, Munawar, explained that until 2021 in Margahayu, there will be a population of no less than 1,400 cows. This number comes from five farmer groups with an average ownership of 15 heads per group member. The five farmer groups are the prosperous Karya Farmers Group which was established in 2008 with ownership of 300 cows. The

Aman Maju Farmers Group was established in 2009 with ownership of 350 cows. Sumber Rejeki Farmer Group was established in 2009 with ownership of 250 cows. Karya Bersama Farmer Group was established in 2010 with ownership of 300 cows. Margahayu Makmur Farmer Group was established in 2012 with ownership of 200 cows (Figure 3).

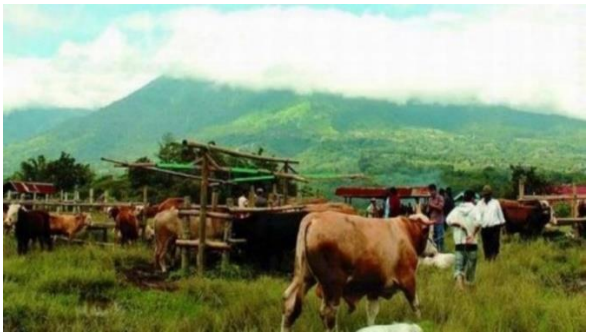


Figure 3. Mini-ranch from ex-mining pits in Margahayu, Kutai Kartanegara

The locals used their wisdom to restore the ex-mining land by reclamation. It is not only deemed as an activity to restore the original vegetation, but also to improve the contours of the land so that it is more acceptable to follow-up activities, such as small-scale farming, agriculture, and plantation. In this regard, the company in cooperating with the local government and communities successfully restored ex-mining land by reclamation activities of the former PT MHU concession to have produced no less than 300 hectares of reconditioned land and about 200 hectares have been used for cattle breeding development used by locals.

The results confirm the need for business permit of coal mining to engage locals in their activities and operations. By involving the locals, the decision making can be beneficial for all stakeholders. The results highlight the significance of inclusion of local interest-based participation as an important social infrastructure in reforestation and mine land reclamation in Margahayu, Kutai Kartanegara, East Kalimantan. The findings underlined the need for social infrastructure policies by mining companies by identifying vital local economies and mining profitability as outlined by Lockie et al. [11]. The mining industry need to gain social legitimacy to be accepted in the social environment by involving community participation before, during and after operation [12]. Conversely, reluctance of companies to integrate and involve local interest-based participation can result in local opposition to mining [11]. The findings are also consistent with Permana et al. [33] and Cao [14], underlining that the benefits to include the participation of local communities in restoring the function of the ex-mining land, due to their interest in rehabilitating spatial planning and ecological supports that are useful for their livelihoods after the mining operations were expired.

5. CONCLUSION

The results showed that ex-mining land reclamation in Margahayu, Kutai Kartanegara aims to restore land benefits with their functions, adjusted with local needs. The results underlined that understanding environmental conditions is very important in ex-mining reclamation, because ex-mining reclamation is expected to produce environmental conditions similar to the previous natural conditions and can be reused by locals according to their livehoods and interest. The success of ex-mining land reclamation in Margahayu is highly dependent on the ecological conditions of the reclamation area as the land is suitable for farming and agriculture. Thus, the differences in ecological and environmental characteristics are very likely to differ in the results obtained from reclamation in various areas in East Kalimantan. Therefore, the generalizability of this practice is very limited. As suggestion, it is hoped that the central government will pay more attention to conditions in the ex-mining field, so that the prosperity of the people around the mining area is protected.

The limitation of this study is that the analysis was carried out qualitatively, and in a limited area in one village. Future studies are expected to be able to further examine the implementation and compliance of the coal mining industry with reclamation standards and national policies. Furthermore, the research area also needs to be expanded due to the large number of mining holes in East Kalimantan that are not being restored.

REFERENCES

[1] Handayani, I.G.A.K.R., Sulistiyono, A., Leonard, T., Gunardi, A., Najicha, F.U. (2018). Environmental management strategy in mining activities in forest area accordance with the based justice in Indonesia. Journal of Legal, Ethical and Regulatory Issues, 21(2): 1-8.

[2] Fel, G.M. (2019). Detail Perizinan Kaltim yang Lebih Luas dari Daratan Provinsi dan Membuat Murka Pimpinan KPK. Kaltim Kece, 17.

[3] Kartikasari, R., Rachmansyah, A., Leksono, A. S. (2019). Impact of coal mining in forest area to carbon emission in Kutai Kartanegara, East Kalimantan. Jurnal Pengelolaan Sumberdaya Alam dan Lingkungan (Journal of Natural Resources and Environmental Management), 9(4): 1066-1074. https://doi.org/10.29244/jpsl.9.4.1066-1074

[4] Shi, X., He, F. (2012). The environmental pollution perception of residents in coal mining areas: A case study in the Hancheng Mine Area, Shaanxi Province, China. Environmental Management, 50(4): 505-513. https://doi.org/10.1007/s00267-012-9920-8

[5] Li, H., Xu, W., Dai, M., Wang, Z., Dong, X., Fang, T. (2019). Assessing heavy metal pollution in paddy soil from coal mining area, Anhui, China. Environmental Monitoring and Assessment, 191(8): 1-11. https://doi.org/10.1007/s10661-019-7659-x

[6] Syarief, E. (2021). Electronic land certificates: Its goals and challenges. Research Horizon, 1(4): 120-125. https://doi.org/10.54518/rh.1.4.2021.120-125

[7] Yu, X., Mu, C., Zhang, D. (2020). Assessment of land reclamation benefits in mining areas using fuzzy comprehensive evaluation. Sustainability, 12(5): 2015. https://doi.org/10.3390/su12052015

[8] Hao, B.Y., Kang, L.X. (2014). Mine land reclamation and eco-reconstruction in Shanxi province I: Mine land reclamation model. The Scientific World Journal, 2014: 483862. https://doi.org/10.1155/2014/483862

[9] Azis, A.A. (2019). Mangkir Berjamaah dari Kewajiban Reklamasi dan Pascatambang. Kaltim Kece, 5.

[10] Moffat, K., Zhang, A. (2014). The paths to social licence to operate: An integrative model explaining community

acceptance of mining. Resources Policy, 39: 61-70. https://doi.org/10.1016/j.resourpol.2013.11.003
[11] Lockie, S., Franettovich, M., Petkova-Timmer, V., Rolfe, J., Ivanova, G. (2009). Coal mining and the resource community cycle: A longitudinal assessment of the social impacts of the Coppabella coal mine. Environmental Impact Assessment Review, 29(5): 330-339. https://doi.org/10.1016/j.eiar.2009.01.008
[12] Cesar, S. (2021). Corporate social responsibility fit helps to earn the social license to operate in the mining industry. Resources Policy, 74: 101814. https://doi.org/10.1016/j.resourpol.2020.101814
[13] Ocelík, P., Lehotský, L., Černoch, F. (2021). Beyond our backyard: Social networks, differential participation, and local opposition to coal mining in Europe. Energy Research & Social Science, 72: 101862. https://doi.org/10.1016/j.erss.2020.101862
[14] Cao, X. (2007). Regulating mine land reclamation in developing countries: The case of China. Land Use Policy, 24(2): 472-483. https://doi.org/10.1016/j.landusepol.2006.07.002
[15] Huda, N.M., Heriyanto, D.S.N., Wardhana, A.F.G. (2021). The urgency of the constitutional preview of law on the ratification of international treaty by the Constitutional Court in Indonesia. Heliyon, 7(9): e07886. https://doi.org/10.1016/j.heliyon.2021.e07886
[16] Dutu, R. (2016). Challenges and policies in Indonesia's energy sector. Energy Policy, 98: 513-519. https://doi.org/10.1016/j.enpol.2016.09.009
[17] Deswanto, R.B., Siregar, S.V. (2018). The associations between environmental disclosures with financial performance, environmental performance, and firm value. Social Responsibility Journal, 14(1): 180-193. https://doi.org/10.1108/SRJ-01-2017-0005
[18] Subagyo, P. J. (2002). Hukum Lingkungan: Masalah dan Penanggulangannya. Jakarta: Rineka Cipta.
[19] Qu, J., Fan, M. (2010). The current state of water quality and technology development for water pollution control in China. Critical Reviews in Environmental Science and Technology, 40(6): 519-560. https://doi.org/10.1080/10643380802451953
[20] Sheoran, V., Sheoran, A.S., Poonia, P. (2010). Soil reclamation of abandoned mine land by revegetation: a review. International Journal of Soil, Sediment and Water, 3(2): 13.
[21] Venkateswarlu, K., Nirola, R., Kuppusamy, S., Thavamani, P., Naidu, R., Megharaj, M. (2016). Abandoned metalliferous mines: ecological impacts and potential approaches for reclamation. Reviews in Environmental Science and Bio/Technology, 15(2): 327-354. https://doi.org/10.1007/s11157-016-9398-6
[22] Nurtjahya, E., Franklin, J.A., Agustina, F. (2017). The Impact of tin mining in Bangka Belitung and its reclamation studies. In Sriwijaya International Conference on Engineering, Science and Technology (SICEST 2016), 101: 6.
[23] Feng, Y., Wang, J.M., Bai, Z.K., Reading, L. (2019). Effects of surface coal mining and land reclamation on soil properties: A review. Earth-Science Reviews, 191: 12-25. https://doi.org/10.1016/j.earscirev.2019.02.015
[24] Russo, G., Carotenuto, G., Fiorilli, V., Volpe, V., Chiapello, M., Van Damme, D., Genre, A. (2019). Ectopic activation of cortical cell division during the accommodation of arbuscular mycorrhizal fungi. New Phytologist, 221(2): 1036-1048. https://doi.org/10.1016/j.earscirev.2019.02.015
[25] Nehnevajova, E., Ramireddy, E., Stolz, A., Gerdemann-Knörck, M., Novák, O., Strnad, M., Schmülling, T. (2019). Root enhancement in cytokinin-deficient oilseed rape causes leaf mineral enrichment, increases the chlorophyll concentration under nutrient limitation and enhances the phytoremediation capacity. BMC Plant Biology, 19(1): 1-15. https://doi.org/10.1186/s12870-019-1657-6
[26] Das, P.K. (2018). Phytoremediation and nanoremediation: emerging techniques for treatment of acid mine drainage water. Defence Life Science Journal, 3(2): 190-196. https://doi.org/10.14429/dlsj.3.11346
[27] Ting, W.H.T., Tan, I.A.W., Salleh, S.F., Wahab, N.A. (2018). Application of water hyacinth (Eichhornia crassipes) for phytoremediation of ammoniacal nitrogen: A review. Journal of Water Process Engineering, 22: 239-249. https://doi.org/10.1016/j.jwpe.2018.02.011
[28] GoogleMaps. (n.d.a). Location of Margahayu village in Kalimantan. https://www.google.com/maps/place/Marga+Rahayu,+Kec.+Loa+Kulu,+Kabupaten+Kutai+Kartanegara,+Kalimantan+Timur/, accessed on 07 June 2022.
[29] Denzin, N.K. (1970). The Research Act in Sociology: A Theoretical Introduction to Sociological Methods. Butterworths London.
[30] Noble, H., Heale, R. (2019). Triangulation in research, with examples. Evidence-Based Nursing, 22(3): 67-68. http://dx.doi.org/10.1136/ebnurs-2019-103145
[31] GoogleMaps. (n.d.b). Location of Kutai Kartanegara. https://www.google.com/maps/place/Kabupaten+Kutai+Kartanegara,+Kalimantan+Timur/, accessed on 07 June 2022.
[32] Development Planning Agency at Sub-National Level of East Kalimantan (Bappeda Kaltim). (2019). Kebijakan Umum Anggaran 2020. https://bappeda.kukarkab.go.id/dokumens/D-fa0a17d19ec59cb6f36ab9f8d2b1032c.pdf, accessed on 08 June 2022.
[33] Permana, I., Dewi, R., Budhiana, J., Mariam, I., Novianty, L., Utami, R.N., La Ede, A.R. (2021). Socio-Cultural approach on disaster risk management of Sirnaresmi customary Village, West Java. Research Horizon, 1(4): 136-142. https://doi.org/10.54518/rh.1.4.2021.136-142