

Review of Environmental Damage due to Illegal Coal Mining in Bukit Soeharto Forest Park in East Kalimantan Province

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Submitted: 03-03-2023, Revised: 26-03-2023, Accepted: 28-03-2023

Abstract. Illegal coal mining activities cause environmental problems, especially in Bukit Soeharto Forest Park. The purpose of this study was to know the actual conditions land cover and environmental damage in Bukit Soeharto Forest Park for the 2015-2020 period. The research method will be analysed from mining land cover class (cover code 20141) using satellite citra and overlaying using ArcView and GIS computer program. The following conclusions can be drawn from the findings of the data file that area has been partially used incompatible with the function of the Forest Park area. The area that is still a compliant function of the Forest Park is 67.62% of the total area, which consists of secondary dry land forest, shrubs, secondary mangrove forest, swamp scrub, plantation forest and body water. The area of land use inconsistent with regional functions is 32.38% of the total area, where this area is used for mining, mixed dry land agriculture, plantations, open ground, settlements, and ponds. Therefore, it is necessary to establish a task force to save the Bukit Soeharto Forest from various threats of damage to the area.

1. INTRODUCTION

Bukit Soeharto Forest Park must be managed based on the principles of the management of the Nature Preservation Region, which has the primary capacity of safeguarding life emotionally supportive networks, protecting the variety of plant and creature species and the maintainable utilization of organic regular assets and their environments. Currently the function and use of the park area, The Bukit Soeharto Forest is under pressure as a place of business, a place to live, a place to farm and plantations and mining. It is related with the increasing needs of people's lives around the Bukit Soeharto area and the interests of the local government by carrying out the spirit regional autonomy in the context of increasing regional original income, thus for meet these needs, they tend to make use of natural resources which is in the neighbourhood around the Bukit Soeharto. However, as time went on, it turned out that the tofu was not functioning as it should and will cause natural harm [1], [2], [3], [4], [5] and have a positive impact on the development and economy of a nation [6], [7], [8], [9], [10], and [11]. Coal mining can have an impact on changes in land cover and morphology, increase population growth and regional development as a multiplier effect of economic growth [12], [13], [14], [15], [16], [4] and [17]. Forest damage due to conversion to mining areas in Indonesia is quite alarming. Most of the mining industry in Indonesia uses an open pit mining system which causes conversion of the cover above it. The open-pit mining method is carried out by removing the existing vegetation on

the ground surface and then taking coal to be carried to the next process. The mining industry which is growing very rapidly is also in line with the application for borrow-to-use forest area permits for non-forestry activities which are dominated by mining [18], [19], and [20].

The ease with which mining companies apply for borrow-to-use forest area permits is also suspected as one of the causes of forest cover loss in Indonesia. The total area of borrow-to-use forest area permits was 2.98 million hectares in the period 2008-2013 which was dominated by the mining industry [21]. Currently, the growth of Unlicensed Mining is growing not only for gold but also coal, it is even carried out in the vicinity of large-scale official mining areas, resulting in conflicts with the holders of these mining business permits. The development of mining without permits has reached a stage that is quite worrying because it has also led to the growth of trading in mining products on black markets (black market trading), which can be categorized as a violation of the evasion of official taxes on the sale of mining products [22], and [23]. Illegal coal mining activities that cause environmental damage are also managed in Regulation no. 32 of 2009 concerning Natural Insurance and the executives. In addition, laws and regulations related to illegal coal mining and environmental protection, one of which is Regulation no. 41 of 1999 concerning ranger service which has been revised by Regulation no. 19 of 2004 concerning Limitation of Unofficial law in Lieu of Regulation no. 1 of 2004 concerning revisions to Regulation no. 41 of 1999 concerning Ranger service into Regulation.

[24] explains that other impacts of mining without a coal permit are: (1) the occurrence of damage to road infrastructure and traffic vulnerabilities from the mining area to the coal delivery place, (2) the loss of government authority due to violations of laws and regulations without any sanctions. (3) the income from the farming/plantation business of the community around the mining location tends to decrease because the area of farming land and land productivity are decreasing. Meanwhile, according to [25], and [26] coal mining activities are long-term activities, involving technology high and capital intensive. In addition, the basic characteristics of the coal mining industry are clearing land and changing landscapes so that they can possibly cause impacts on the climate, social and economic community. Environmentally, the existence of mining coal has an impact on landscape changes, decreased soil fertility, the occurrence of threats to biodiversity, decreased water quality, decreased air quality and environmental pollution [27], [28], [29], and [30].

Environmental damage as a negative impact of unlicensed coal mining will technically be difficult to avoid. Therefore, coal mining that causes degradation should be fundamentally important in rebuilding arranging [31] and to carry out CSR projects in the coal mining area, a feasible vocations structure is required [32]. While integrated post-mining landscapes are highly recommended for sustainable land use [33] but understanding of proper mining management in coal mining activities without permits is very weak, resulting in uncontrolled environmental damage which then has an adverse consequence on the encompassing local area. There has even been a limited scale high quality gold mining guideline in Ghana and Indonesia, as at present executed, neglects to satisfactorily safeguard oceanic environments [34]. The set of rules and policies that regulate people's mining businesses including those regarding licensing, guidance, obligations, and sanctions have so far not gone well. Unlicensed coal mining is carried out within the company's concession areas which in turn creates conflicts with the company and the government. Unlicensed coal mining in its implementation does not have a mature mine planning, causing waste of mining resources. In addition, unlicensed coal mining is also an arena for profit seekers and is very vulnerable to conflicts between local communities and migrants [35], [36], and [37].

Unlicensed coal mining has been going on for a long time and has intensified since the era of regional autonomy was enacted. Until now there is no right solution to overcome the problem of coal mining without a permit. Regulations and laws related to minerals and coal clearly contain both administrative and criminal sanctions, but coal mining activities without permits continue. Efforts to overcome illegal coal mining in Indonesia are the main and very important thing to create good mining activities and as per material regulations and guidelines. Therefore, the public authority to tackle illegal coal mining practices formed special teams as contained in several regulations issued by the president [38].

Illegal coal mining activities should be minimized by the issuance of Regulation No. 4 of 2009 concerning Mineral and Coal Mining, where mining activities by the community have been accommodated by the existence of community mining permits. However, it turns out that this has not been effective in reducing the emergence of mining activities without permits. Therefore, it is necessary to have a concept of sustainable development and use where the concept is: integrates socio-cultural, environmental and development aspects to welfare of mankind on this earth. With other individualized structures make efficient use of possible existing resources through the enhancement and conversion of value added by prioritize environmental values and social justice and continue to provide opportunities for future generations. This concept also emphasizes the importance of engineering management, social insight and

environmental approach integrated [39].

Furthermore, several important issues in mining are strategy vulnerability, illicit mining, clashes with nearby networks, clashes between the mining area and different areas. Likewise, what happened in Bukit Soeharto Forest Park, East Kalimantan Province and several other locations in Indonesian province, that many were mining without a grant, bringing about misfortunes for both the local area and the State and Meanwhile, according to [40], it is stated that development, humans, and conservation are a deadly conflict because they cause environmental damage. To achieve this goal, all components of the country, including the field of criminal regulation authorization, must be carried out. Law in a society aims to create an order and harmony in life [41]. Based on the points, it is necessary to have a study of environmental damage due to illegal coal mining in Bukit Soeharto Forest Park in East Kalimantan Province.

2. MATERIAL AND METHODS

STUDY AREA

Field research will be carried out in the East Kalimantan Province, namely in the Bukit Soeharto Forest Park, North Penajam Paser Regency and Kutai Kartanegara Regency, which enter or are in direct contact with the location of the State Capital and are also carried out in various agencies related to data or information that needs to be carried out. taken as the Forestry and Environment Service of East Kalimantan Province, Forest Area Consolidation Center, Mulawarman University Academics, Regional Development Planning, Research and Development Agency of East Kalimantan Province, Mulawarman University Tropical Forest Rehabilitation Center, Regional Technical Implementation Unit Bukit Soeharto and others (FIGURE 1).

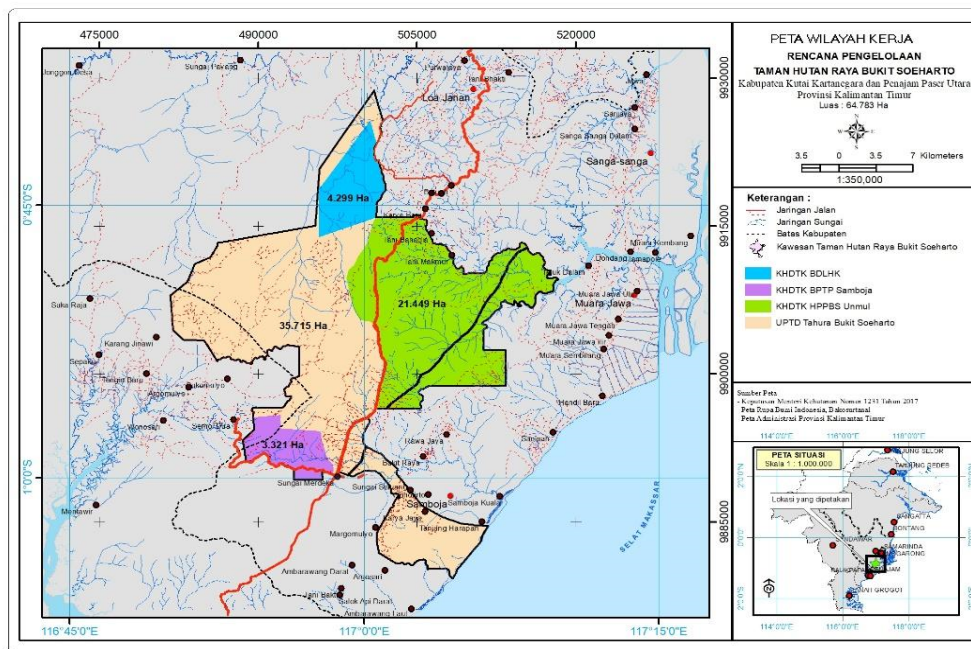


FIGURE 1. Research location

Procedures

The data collection method is using a study technique to gather essential information and auxiliary information. Essential information collection uses field observation data using satellite image in 2015 until 2020 years then the area measurement is carried out using ArcView and GIS program as well as using drones [42]. Meanwhile, secondary data

comes from literature studies, books on previous research reports, books related to this research and information from interviews with several sources.

Data Analysis

To analyse the condition of environmental damage in the Bukit Soeharto Forest Park conservation area, land cover information from the Service of Climate and Ranger service in 2015 and 2020 are used with a scale of 1:250,000. Environmental damage will be analysed from the mining land cover class (cover code 20141) with the technique of overlapping/overlying using a GIS computer program. From the overlapping process, it will be known that the mining land cover class has not changed from 2015-2020 or has decreased because it is covered with vegetation or increased due to the opening of new mines. The extent of this subtraction and or addition can be calculated, and the results will be introduced as tables and diagrams. To validate this mining land cover class, drone photos will be used. Drones will be flown to take photos of mine land cover unchanged from 2015-2020, mines that have become vegetated in 2020 and mines that will only be visible in 2020.

3. RESULTS AND DISCUSSION

Bukit Soeharto Forest Park (Tahura) which is in Kutai Kartanegara Regency and a small part in Paser Regency, was originally a Nature Tourism Park which was established in 1991. The area of this area is 61,850 ha, and 19 October 2004 has been designated as a Forest Park. In 2009 the area of the Bukit Soeharto Tahura was 67,776 ha, but since March 16, 2017, it has changed to 64,814.98 ha (Based on SK.1231/MenLHK-PKTL /KUH/PLA-2/3/2017 dated March 16, 2017). Geographically, it is located between 000 41' 00" 010 00' 00" south latitude and 1160 55' 00" 1170 03' 00" east longitude. Administratively, the government is divided into 2 regencies, namely Kutai Kartanegara and North Panajam Paser Regency, East Kalimantan Province. In general, the condition of the Bukit Soeharto Forest Park field varies from mild undulating to steep hills with a slope of 3% to 30%.

The conservation area of Bukit Soeharto Forest Park with an area of 64,814.98 Ha, administratively most of the government (56,129.77 Ha: 86.6%) is located within the Government of Kutai Kartanegara Regency which includes 4 (four) Districts, namely: Samboja, Muara Jawa, Loa Janan and Loa Kulu, while the rest covering an area of 8,685.21 Ha (13.4%) is included in the administrative area of North Penajam Paser Regency, namely Sepaku District.

By being designated as Forest Park, the Bukit Soeharto Forest area must be managed based on the management rules of the Nature Preservation Region, which has the primary capacity of safeguarding life emotionally supportive networks, protecting the variety of plant and creature species and practical utilization of organic regular assets and their environments (Ecclesiastical Guidelines). Climate and Ranger service of the Republic of Indonesia Number: P.35 of 2016 concerning Systems for Readiness of the board Plans for Nature Stores and Nature Preservation Regions).

Hence, in its administration, the Bukit Soeharto Forest Park is isolated into the board blocks as per the Guideline of the Pastor of Climate and Ranger service Number P.76 of 2015 concerning Measures for Public Park The executives Zones and the board Squares for Nature Stores, Untamed life Asylums, Great Woods Parks and Nature The travel industry Parks. What's more, the square division likewise alludes to the Guideline of the Chief General of Normal Assets and Biological system Preservation Number: P.11 of 2016. The division of the executives' blocks is acclimated to the physical, financial, and social states of the local area. The organizing of the Bukit Soeharto Forest Park the board block is an aide in setting up a drawn-out administration plan for the following 10 years.

Based on Law no. 5 of 1990, Forest parks of Bukit Soeharto is a conservation area for the administration of nature stores and nature preservation regions. Therefore, the Bukit Soeharto Forest parks area is also a protected forest ecosystem, including plants and animals, so it is located not far from settlements because it can become a tourist area. The Bukit Soeharto Forest Park area has a complete sort of woodland biological system from the coast to the slopes, which incorporates, among others: blended marsh Dipterocarp Backwoods, heath timberland, swamp woods, waterfront woods, and which is degraded into shrubs and reeds. This area has the potential for flora, fauna, nature tourism and environmental education. Meanwhile, the condition of the ecosystem of this forest area is already highly degraded, fragile, and threatened due to various factors, both internal and external, where the existence of this area is very disturbed due to human activities. According to [43], the Bukit Soeharto Forest Park is a protection region decided

in view of the Decree of the Minister of Forestry 1231 of 2017 with an area of 64,814.98 Ha of the all-out region there is mining land use with an area of 956 Ha, ranches covering an area of 52 Ha, settlements or developed land covering an area of 173 ha and farming with an area of 16,915 ha. Where there are 21.29% of the absolute area of the Bukit Soeharto Grand Forest Park and cushion regions utilized for mining, blended dry land farming, dry land agribusiness, empty/open land, settlements, lakes/fisheries, and ranches

Within the Bukit Soeharto area there are 3 (three) Special Purpose Forest Areas, namely: (a). Research and Development Forest covering an area of 3,504 Ha, is managed by the Research and Development Center for Natural Resources Conservation Technology Samboja through decree Minister of Forestry Number 290/decision-II/1991 dated June 5, 1991, in conjunction with decree Minister of Forestry Number 201/decision-II/2004 dated June 10, 2004. (b). Education and Training Forest covering an area of 4,320 Ha, managed by the Forestry Education and Training Center Samarinda through a decree Minister of Forestry Number 8815/decision-II/2002 dated 24 September 2002 which is in the Loa Haur sub-watershed. (c). The Mulawarman University Education Forest covers an area of 20,271 Ha (\pm 30% of the total area of the Bukit Soeharto Area), managed by the Tropical Forest Rehabilitation Centre of Mulawarman University through a decree Minister of Forestry Number 160/MinForest-II/2004 dated June 4, 2004.

The types of ecosystems in the Bukit Soeharto Forest Park are mixed dipterocarp forest, lowland heath forest, coastal forest, shrubs, and weeds. Forest Park of Bukit Soeharto is a place for the distribution of several types of flora, including *Acasia mangium*, Sengon (*Albizia paraserianthes*), and Mahogany (*Swietenia mahagoni*). The original flora is dominated by Meranti (*Shorea spp.*), and part of it is research forest in the form of nurseries of various types of plants such as Mahang (*Macaranga hypoleuca*), Ulin (*Eusideroxylon zwageri*), Charcoal wood (*Diospyros borneensis*), and Kempas (*Koompassia malaccensis*), Palaman (*Diospyros borneensis*), Resak (*Vatica spp.*), Bayur (*Pterospermum spp.*), Gmelina (*Gmelina arborea*), Rubber (*Hevea brasiliensis*), Rattan (*Calamus spp.*), Sugar palm (*Arenga pinnata*), and Ketapang (*Terminalia catappa*).

Bukit Soeharto forest park is a place for the distribution of several types of fauna, including: Sun bear (*Helarctos malayanus*), Banteng (*Bos javanicus*), Clouded leopard (*Neofelis nebulosa*), Hedgehog (*Hystrix brachyura*), Gibbon (*Hylobates*), Hornbill (*Barenicarnus comatus*), Monkey (*Macaca fascicularis*), Pangolin (*Manis javanica*), Sambar deer (*Cervus unicolor*), Kuau great (*Lophura spp*), lizard (*Varanus salvator*), Squirrel (*Gallasciurus notatus*), Weasel (*Cynogale sp*), Wild boar (*Sus barbatus*), swamp cucak bird (*Pynonotus zeylanicus*), and others.

Bukit Soeharto has several areas that can be used as recreational areas, namely: Tanah Merah Samboja beach tourism object, Samboja reservoir tourism, Samboja Stone Wall natural tourism, Mulawarman University Education Forest, and the Wanariset Samboja Orangutan Reintroduction Center. Coal reserves are also found in the Bukit Soeharto Park, which has an estimated potential of 150 million tons. In a very dry dry season, forest fires often occur due to natural causes by burning coal seams, causing the loss of primary forest since 1991 it is reported that the Bukit Soeharto area is a young secondary forest vegetation type with shrubs and reeds. The existing tree species are the result of reforestation and have changed from their original vegetation.

Coal mining can have an impact on changes in land cover and morphology [4]. Data on land cover in the Bukit Soeharto area should be visible in the table underneath

TABLE 1. Land closure in Bukit Soeharto Forest Park

No	Land cover	Area (Ha)	Percentage (%)
1	Dry land forest	9,774.89	15.08
2	Shrubs	32,356.52	49.92
3	Secondary mangrove forest	649.04	1.00
4	Swamp bush	500.11	0.77
5	Mixed dry land farming	15,528.55	23.96
6	Plantation forest	396.14	0.61
7	Plantation	759.76	1.17
8	Open ground	3,127.60	4.82
9	Settlement	188.93	0.29
10	Coal mining	1,379.09	2.13

11	Pond	3.03	0.005
12	Body of water	151.3	0.23
Total		64,814.98	100

Based on the table above, it can be explained that it lands closure has an area of 64,814.98 hectares with 12 types of land cover. The most extensive land cover was 32,356.52 ha in the form of shrubs (49.9%), then 15,528.55 ha in the form of mixed dry land farming (23.96) and 9,774.89 ha in the form of dry land forest (15,081%). Land cover in the form of open ground covering a region of 3,127.60 ha (4.82%) and coal mining covering an area of 1,379.09 ha with a percentage of 2.13%. Meanwhile, the other land cover in the form of secondary mangrove forest was 649.04 ha (1%), plantation 1.17%, and the percentage of land cover in the form of plantation forest, settlement, pond, and body of water was 0.61%; 0.29%, 0.23%, and 0.005%. While as indicated [42] the region as indicated by the capacity of the tofu region, to be specific bushes, marshes and water, adds up to 53,340.95 hectares or 78.71% of the area. In the meantime, the utilization of the region that isn't as per the capacity of the area is mining, blended dry land horticulture, dry land agribusiness, open/void land, settlements, lakes/fisheries, and ranches adding up to 14,425.05 Ha or 21.29% of the all-out region. The description related to land cover on Bukit Soeharto should be visible in the picture beneath

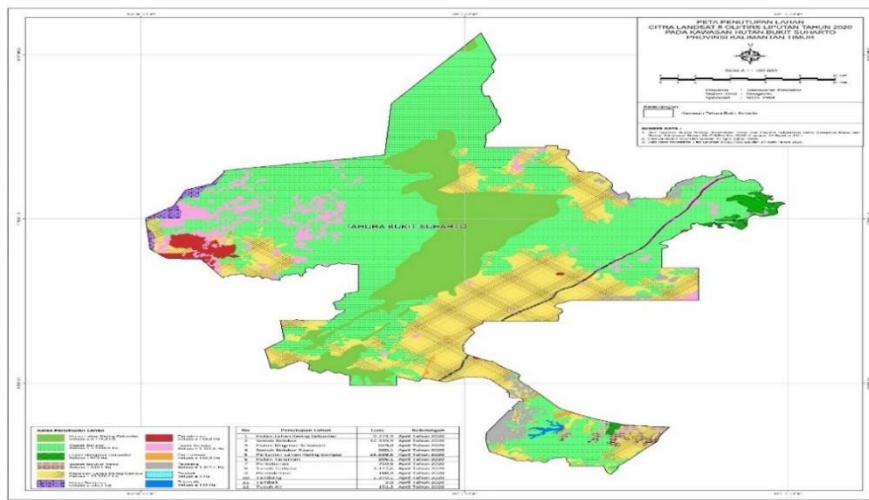


FIGURE 2. Map of land cover analysis results in the Bukit Soeharto Forest Park

The available data shows that the condition of the forested area in the Bukit Soeharto Forest Park is only one-sixth of the existing area, and this is because the Bukit Soeharto area is not virgin or primary forest because this area is a former forest concession rights area. forest fires (log over area). However, if you look at the existing land use figures such as plantations, agriculture, and others, it shows that the area has been under pressure by the surrounding community to fulfil the need for land as a place for farming and business. Reeds and shrubs as the largest area are areas of former large forest fires that occurred in 1983 and 1997 where a lot of vegetation was lost due to fires.

The government has made efforts to eliminate mining without permits through law enforcement or accommodate by making laws and regulations that can encourage small-scale mining without permits to become licensed. Law Number 4 of 2009 concerning Mineral and Coal Mining accommodates people's mining in the provisions for determining People's Mining Areas as well as in People's Mining Permits which are supported by Government Regulation Number 22 of 2010 concerning Mining Areas [44].

In view of the consequences of the planning did, the regions that are as per the capacity of the Bukit Soeharto are: Secondary dry land forest, shrubs, secondary mangrove forest, swamp scrub, plantation forest and water/body of water covering an area of 43,828.02 Ha (67.62%). Meanwhile, the use of areas that are not as per the capacity of the Bukit Soeharto Forest Park are: Mining, mixed dry land agriculture, plantations, open/vacant land, settlements, and ponds with an area of 20,986.96 Ha (32.38%) of the total area. This area is predicted to interfere with conservation functions and interests, which are feared to disrupt the ecosystem in the Bukit Soeharto conservation area. While the last

condition shows that the capacity of the utilization of this woodland region has been seriously upset, corrupted, delicate and undermined because of different elements, both inward and outer. Furthermore, it would seem up to this point, Mount Suharto is as yet encountering harm and changes in land cover [42].

Coal mining activities in the Bukit Soeharto area also show an increase every year, this can be seen from the data on the area of land openings used for mining in the Bukit Soeharto from 2015 to 2020. The related agencies have not been optimal in preventing and carry out law enforcement on coal mining activities in the Bukit Soeharto Forest Park because there is no synchronization of implementation in the field. According to [45] and [17], the development of uncontrolled mining without permits will have negative impacts, including: (1) environmental damage as a result of weak mastery of mining techniques and processing of minerals, limited mastery of mining waste handling methods, weak understanding of reclamation and protection of mining area environment, (2) high-interest illegal banking practices by illegal capital owners, in cases where unlicensed mining business actors do not have capital and or run out of business capital, (3) illicit trade monopoly practices, as a result of the implementation of an individual investment system that oriented to the way of mining product collateral/guarantee as a means of payment of business capital loans, (4) violation of the official tax system as a result of avoiding sales tax on mining products, (5) neglecting health protection, as a result of weak knowledge about the use of substances or chemicals certain substances containing toxins/pollutants for processing certain minerals (especially metals) and anticipating possible effects on health, (6) possible security disturbances, as a logical consequence of economic and social developments in mining areas without permits. This is in line with the statement by [40] that development, humans, and conservation are a deadly conflict because they cause environmental damage. Meanwhile, according to [28] stated that mining activities that increasingly uncontrollable which causes various impacts on society and life around the mine, among others; natural damage, elevated degree of contamination (soil, water, and air), also causes disturbance to the more extensive local area as harm to houses and public offices, especially due to dynamite blasting activities to open mine sites. Disturbed parts of local area life, when seen from the side of Basic freedoms, especially those relating to financial, social, and social privileges, certainly very in touch with the impact of this coal mining.

Indonesia is one of the nations that has an abundance of normal assets, one of which is coal has considerable economic value and is spread over various islands in Indonesia. On the other hand, Coal mining business activities have a negative and positive impact on social conditions the community around the company [46]. The government has made efforts to eliminate mining without permits through law enforcement or accommodate by making laws and regulations that can encourage small-scale mining without permits to become licensed. Regulation Number 4 of 2009 concerning Mineral and Coal Mining accommodates people's mining in the provisions for deciding Individuals' Mining Regions as well as in People's Mining Permits which are supported by Unofficial law Number 22 of 2010 concerning Mining Regions [44]. According to [47], Mining without a permit is a criminal act as regulated in Article 158 and Article 160 of the Mineral and Coal Law. However, law enforcement against mining without permits is a dilemma for law enforcement officers because the existence of mining without permits relates to the social and financial issues of the needy individuals living around mining regions. Even 77% (seventy seven percent) of mining without a permit encountered an expansion in government assistance because of mining exercises without a license.

Therefore, it is necessary to have a policy that specifically regulates security and law enforcement against the destruction of forest areas such as coal mining activities in the Bukit Soeharto. Examples of policies that can be taken are the formation of a Task Force that specifically carries out security and law enforcement in its area. The implementation of the policy is carried out thoroughly by the relevant agencies, both the Central Government and the Regional Government. Considering the existence of the Bukit Soeharto Forest Park, which is in the vicinity of the State Capital, it is vital to focus on both the Focal and Local Government.

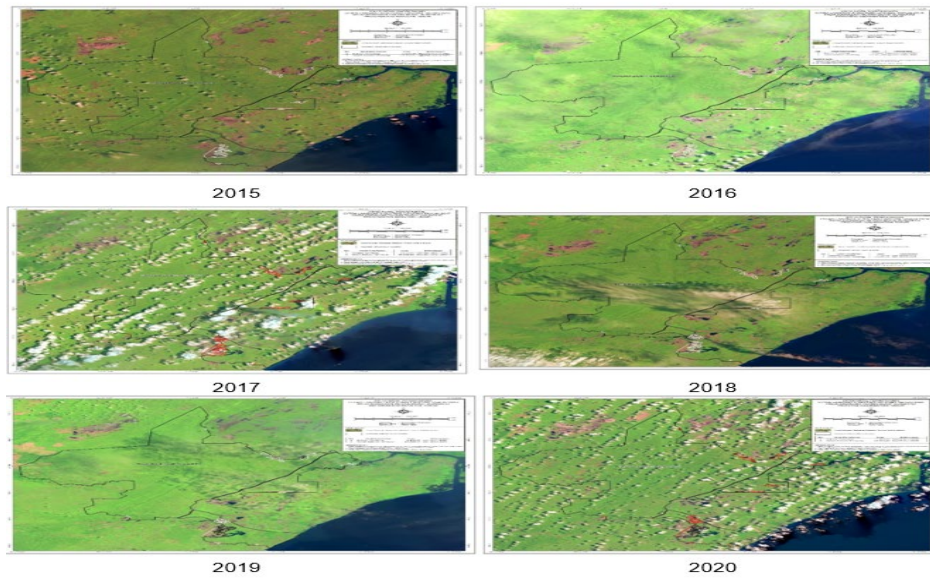


FIGURE 3. Map of Land Cover Change for 2015-2020

Illegal coal mining is an activity that has been completed for many years and has become entrenched in the community and has also become the main livelihood, because it has been supporting the community for hundreds of years. The community factor is a major obstacle, where officers find it difficult to stop this illegal mining activity. Community and stakeholder support assumes a significant part in breaking the chain of illegal coal mining. Without good cooperation between the community, stakeholders, and managers of the Bukit Soeharto Forest, it will show the magnitude of illegal coal mining being carried out as if without supervision because many cases are not reported and are not handled by criminal violations that have been carried out by illegal coal mining actors legally. Moreover, to community support, restricted HR are one of the causes of the difficulty of eradicating illegal coal mining in the Bukit Soeharto area, this can also be due to the limited number of officers in the field who work professionally. This will certainly hinder the activities of securing and protecting the Bukit Soeharto area.

As a result of the damage that occurred, it was stated that the destruction of the Bukit Soeharto Forest Park resulted in at least 20 animal species becoming extinct. Animals such as porcupines, civets, and hornbill (large birds) can no longer be found in this area, in addition, research searches for clouded leopards, which are the main predators in the food chain in Kalimantan, only left 10 individuals in Bukit Soeharto in 2009. The damage to the Bukit Soeharto area is also caused by forest fires that always occur every year in this area, both intentional fires due to land clearing for farming purposes for the community and unintentional (due to natural factors burning coal in the soil surface). Timber theft or illegal logging is also a factor in destroying the Bukit Soeharto area, which often occurs in the area, considering that the potential for existing timber is still quite large. Damage to the Bukit Soeharto area caused by illegal community mining (illegal coal mining) with the discovery of evidence of excavators used for mining activities and the presence of several puddles that are thought to be used for coal excavation, from the results of the analysis conducted that there is mining activity in the area which is no longer in accordance with the land use. According to [47], mining without permits causes environmental damage, impacts on state revenues, and impacts on social conflicts. The law enforcement policy is the application of utilitarianism and punishment policies as the ultimum remedium.

TABLE 2. Changes in land cover of the Bukit Soeharto Forest Park

No	Year	Interpretation results	Area (Ha)	Adverb of time
1	2015	Mine opening	1,036.14	August 2015
		Other than mine opening	63,762.25	August 2015
2	2016	Mine opening	1,056.61	August 2016
		Other than mine opening	63,741.78	August 2016

3	2017	Mine opening	1,175.07	October 2016
		Other than mine opening	63,623.32	October 2016
4	2018	Mine opening	1,182.38	May2018
		Other than mine opening	63,616.01	May2018
5	2019	Mine opening	1,291.40	July 2019
		Other than mine opening	63,506.99	July2019
6	2020	Mine opening	1,347.37	April 2020
		Other than mine opening	63,451.02	April 2020

In light of the information above, it shows that in the period from 2015 to 2020, there have been land clearings used for coal mining activities in the Bukit Soeharto Forest of about 311.23 hectares. Every year there is an increase in the area cleared for coal mining activities. The highest increase in land clearing used in coal mining at Bukit Soeharto occurred from 2016 to 2017 which was around 118.46 hectares. Meanwhile, the lowest increase in land clearing for coal mining in Bukit Soeharto occurred in 2017 to 2018 which was 7.31 hectares (**Fig.3**). While the last condition shows that the capacity of the utilization of this woodland region has been seriously upset, corrupted, delicate and undermined because of different elements, both inward and outer. Furthermore, it would seem up to this point, Mount Suharto is as yet encountering harm and changes in land cover [42].

Considering the information above, the area of land clearing as coal mining mostly occurs around the outskirts of the Bukit Soeharto boundary. In the outer part of the Bukit Soeharto area, there are several licensed coal mining companies. The existence of a coal mining company that borders the Bukit Soeharto area influences coal mining activities in the Bukit Soeharto area. For example, the use of the company's hauling road is used by the perpetrators to transport coal out of the Bukit Soeharto. So that there needs to be more maximum supervision of these locations to prevent the widening of land clearing for coal mining in the Bukit Soeharto area.

The visualization of the forms of environmental damage that occurred in the Bukit Soeharto Forest Park attached:

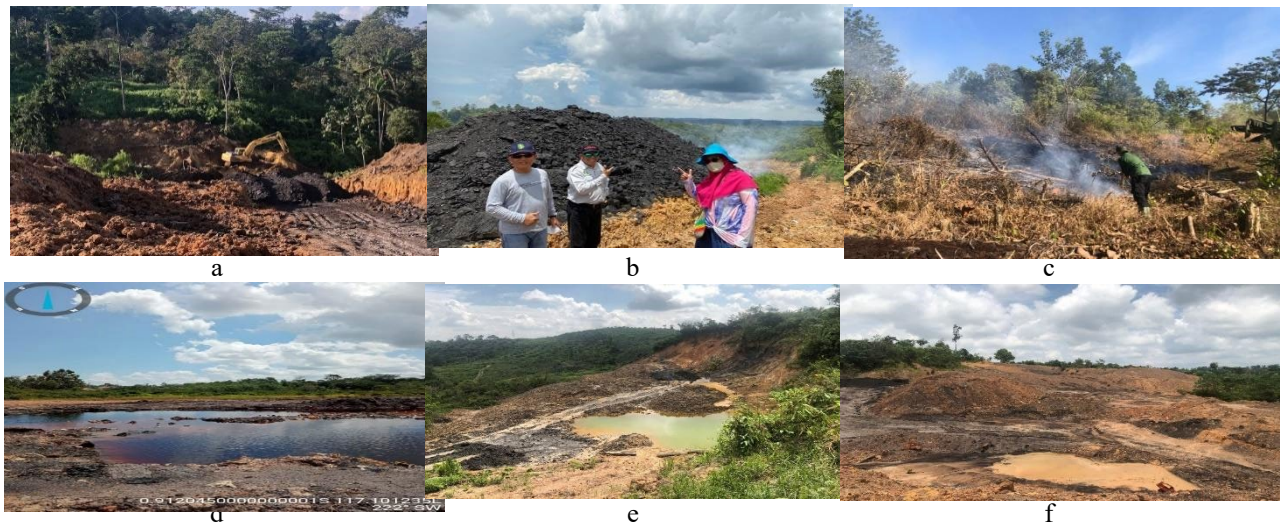


FIGURE 4. (a) Vegetation and surface soil damage by illegal mining using heavy equipment, (b) fire occurred on coal stockpile in degraded land by illegal mining, (c) burning vegetation to prepare coal extraction activity, (d) acid mine drainage on artificial pond due to coal mining activity, (e) accelerated soil erosion on steep post coal mining area, (f) lose topsoil due to coal mining activity.

From the results of research in the field, it was found that some damage to the area resulted in incompatibility with the function of the area, as shown in the land cover table above. Based on these data, it shows that 49.921% is a bush area. The Bukit Soeharto Forest Park area is fed by 7 (seven) watersheds, respectively, from the largest to the smallest, namely the Loa Haur watershed, the Seluang watershed, the Tiram watershed, the Bangsal watershed, the Serayu watershed, the Semoi watershed and the Salok Cempedak watershed. Bukit Soeharto functions hydrologically as a water system for Balikpapan, Samarinda, Kutai Kertanegara, to Penajam Paser Utara. This is in line with research conducted by [5] which states that the negative impact of mining can cause water pollution, reduced biota water,

changes in soil structure which are feared to cause landslides or floods when it rains tall. In addition, mining activities also will cause environmental imbalance, such as reduced water biota in rivers, pollution water and even the formation of holes due to dredging in this activity. If this activity lasts for a long time, then it is feared that it will cause problems bigger [10], [12] and [2] are deforestation, loss of widely varied vegetation, decreased land for rural exercises, contamination of certain streams, and residue or air contamination [3].

TABLE 3. The use of the area in accordance with its function in the Bukit Soeharto Forest Park

No.	Land cover	Area (Ha)
1	Secondary dryland forest	9,774.89
2	Shrubs	32,356,52
3	Secondary mangrove forest	649.04
4	Swamp bush	500.11
5	Plantation forest	396.14
6	Body of water	151,32
Total		43,828,02

Based on the table above of the mapping carried out the areas that are in understanding with the capacity of the Bukit Soeharto area are: Secondary dry land forest, shrubs, secondary mangrove forest, swamp scrub, plantation forest and water/body of water covering an area of 43,828.02 Ha (67.62%). A critical condition if an area only has an area according to its function, almost half of the area. This needs to be addressed by increasing land rehabilitation activities and monitoring in the field to address land clearing activities completed by the local area.

TABLE 4. The utilization of the area is not in accordance with its function in the Bukit Soeharto Forest Park

No	Land cover	Area (Ha)
1	Coal mining	1.379,09
2	Mixed dry land farming	15.528,55
3	Plantation	759,76
4	Open ground	3.127,60
5	Settlement	188,93
6	Ponds	3,03
Total		20.986,96

Meanwhile, the use of areas that are not as per the capacity of Bukit Soeharto are: Mining, mixed dry land agriculture, plantations, open ground, settlements, and ponds with an area of 20,986.96 Ha (32.38%) of the total area. Bukit Soeharto Forest Park. This area is predicted to interfere with conservation functions and interests, which are feared to disrupt the ecosystem in the Bukit Soeharto conservation area. The disturbance of this forest area is caused by several factors that result in one or a combination of the following: (a). Increasing the area of open and damaged areas; (b). decreased diversity and population of flora and fauna; (c). The decline in the quality and quantity of wildlife habitat and (d). the decline in the natural aesthetic value of the Bukit Soeharto Forest. Based on the above explanation, the use of the area that isn't as per the capacity of the Bukit Soeharto is for mining, mixed dry land agriculture, plantations, open/vacant land, settlements, and ponds with an area of 20,986.96 Ha (32.38%) of the Bukit Soeharto area. As indicated by [43] in Bukit Soeharto there is an area of 2.2 hectares which has a capacity as a cushion zone. In the meantime, 21.29% of the support region is utilized for mining, blended dry land farming, dry land horticulture, empty/open land, settlements, lakes/fisheries and ranches. This area will interfere with the functions and interests of conservation which results in damage to the ecosystem. Which will have an impact on decreasing the diversity of greenery, diminishing the quality and amount of untamed life living space, and diminishing the regular stylish worth of the Bukit Soeharto Forest Park

4. CONCLUSION

It is necessary to establish a task force to save the Bukit Soeharto Forest from various threats of damage to the area such as land clearing for coal mining, plantations, agriculture, settlements and so on which was issued directly by the Leader of the Republic of Indonesia. So that coordination between related agencies, both Central and Regional, can run well and there is budgetary support from the Government. This is in line with [46] which states that one of the things that can be done to reduce environmental damage by mineral and coal mining operations is to tighten regulations associated with coal mining. In addition, every mining company has an obligation to carry out reclamation of ex-mining areas and surrounding areas that are disturbed due to mining activities [48].

5. ACKNOWLEDGMENTS

This research is supported by the college of Faculty of Forestry Mulawarwan University and Mr. Andis who has helped us during the research.

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