The Threat of Coal Mine Expansion Towards Biodiversity in Kalimantan


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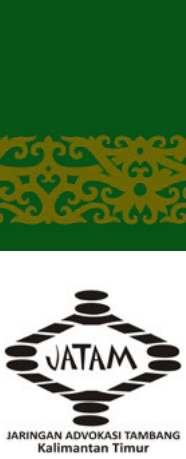
JATAM
JARINGAN ADVOKASI TAMBANG
Kalimantan Timur

In Consideration of Drastic Reduction on Coal Production and Prohibiting Mine Areas Expansion to Achieve Climate Goals and Biodiversity

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Preface

The 1945 Indonesia's Constitution article 28H states that a healthy and well environment is right for all of its citizens. Presently, the world is facing climate change that could threaten the ongoing lives of every living being on earth. In an effort to combat this, Indonesia, through the Directorate General of Climate Change Control, the Ministry of Environmental and Forestry targeted the attainment of greenhouse gas emissions in the year 2030 in accordance with what has already been stated in the *Long-term Strategy on Low Carbon and Climate Resilience 2050* (LTS-LCCR 2050) document. Next, Indonesia is ambitious to reach zero emission in 2060. The LTS-LCCR 2050 document was arranged after Indonesia became a country that ratified the Paris Agreement regarding climate change. The purpose of said document is for Indonesia to take part in contributing to the goal of national and global development by balancing aspects of economic growth, reducing emissions, justice, and climate resilience.

One of the ambitious target, in order to reach peak greenhouse gas emission, is net sink condition in the Forestry and Other Land Use (FoLU) sector with a reach of 540 Mton C02e in 2050. A net sink condition is a condition when forest and land sectors are able to absorb more carbon rather than release it. The FoLu sector is predicted to become the most significant contributor to the reduction of greenhouse gas emissions, which is to reach up to 60%, that is why it is expected it would be able to become the base to reach zero emission in 2060. There are six mitigation efforts in the FoLu sector, namely the development of industrial plantation forest, sustainable forest management, forest rehabilitation, reduction rate of deforestation and forest degradation, increased roles of biodiversity conservation, and management of peatlands, including mangroves. Challenges to the efforts to reduce the rate of deforestation and land degradation as well as management of mangroves lie with the presence of coal mines around the surrounding area of the mangrove ecosystem. Their presence has the potential to cause damage and degradation of mangrove ecosystems, resulting in the loss of carbon absorption and an

increase in carbon emission. This contradicts Indonesia's goal in its efforts to reduce greenhouse gas emissions.

Regarding aspects of biodiversity, T*he Post 2020 Global Biodiversity Framework* is being prepared by *The Convention on Biological Diversity* (CBD) to reach the rescue target of biodiversity in 2050 with milestones in 2030. This framework continues the *Aichi Biodiversity Target* that was structured in the previous decade but was not yet able to reach the target. In order to fulfill this target, several endeavors are needed; one of them is the limitation of fossil fuel energy usage. Coal is a fossil fuel that is utilized on a big scale. Efforts to preserve biodiversity can be conducted by ceasing the expansion of coal production areas and revoking coal mining exploration permits. As the third biggest coal producer country in the world, Indonesia is vulnerable to the environmental crisis as an impact of coal mining. Impacts caused by coal mining, among others, are habitat fragmentation, loss of flora and fauna, loss of aquatic habitat, land erosion, and forest fires. These impacts could hinder Indonesia from preserving biodiversity. Further explanation is dealt with in this research.

We hope this research could contribute toward the reduction of greenhouse gas emission achievement goals in Indonesia, preservation of biodiversity, as well as increasing investment opportunities for renewable energies as an alternative to fossil fuels.

Pius Ginting
Coordinator of AEER

Executive Summary

Indonesia is a country with the second-highest level biodiversity in the world, where Kalimantan island hosts one of it's main biodiversity hotspots. The island is a home for various critically endangered species such as Orangutan and Bekantan, native apes of Kalimantan. Ecosystem stability in Kalimantan has become significant to sustain human life, and it's biodiversity wealth provides lucrative potential for ecosystem services.

However, Kalimantan is also one of the biggest coal producers' sites in Indonesia. According to the Indonesia's Director General of Mineral and Coal 2020 Performance Report, almost 86% of the national coal production comes from Kalimantan.

Coal mining activities have become one of the many push factors for the cause of deforestation and reduction of wildlife habitat in Kalimantan. Land clearing activities have become the most determinant factor for deforestation by coal mining activities. It is estimated around 143,592 Ha natural forests and 8,765 Ha plantation forests in Kalimantan experienced deforestation and converted to mining sites. This becomes a real threat for biodiversity in Kalimantan.

This research is aimed to determine the level of threats from mine sites towards biodiversity in Kalimantan. We conducted data gathering on biodiversity through the *Global Biodiversity Information Facility* (GBIF) and *International Union for Conservation of Nature* (IUCN) database. Mining activities data was acquired through Minerba One Data Indonesia (MODI) and Geoportal sites hosted by Indonesia's Ministry of Energy and Mineral Resources (ESDM). Mine sites are then classified into different categories of threat using a scoring technique.

The result of this research can be utilised as a consideration factor for the drastic reduction of coal production and prohibition of mine sites expansion to achieve climate goals and sustainable biodiversity.

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INTRODUCTION

Chapter 1
Introduction

1.1. Background

Biodiversity is all diverse forms of living beings on this earth that consist of various species, genetics, and ecosystem (Rawat et al., 2015). Biodiversity is a critical factor in the survival of humanity's existence. Healthy ecosystems and biodiversity will provide various environmental services to improve human life quality (IPBES, 2020). The simplest example of the benefit of biodiversity is in regards to archipelago culinary wealth by using assorted ingredients such as chili, cinnamon, ginger, and numerous other natural ingredients. Moreover, environmental service is also present in the form of cultural services such as cultural wealth, splendor landscape, and its utilization for spiritual and traditional activities.

The natural wealth produced by the ecosystem has an adequate economic profit. For example, fiber and wood from various plants that can be used as construction and furniture material can potentially be a community's income source. A good water ecosystem will provide fish to be consumed while also becoming a source of a community's livelihood. Aside from that, with all the benefits generated by biodiversity and the ecosystem, there needs to be conducted preservation and enrichment efforts to maintain the role and functions of the ecosystem to advance with a flourish and significantly sustain human life.

Indonesia has 17,000 islands with diverse habitats and a highly complex biogeographic history resulting in various species of flora and fauna with high endemicity and robust adaptivity in numerous ecosystems. (Bruyn et al, 2014; Lohman et al, 2011). A considerable condition of biodiversity holds a range of potential that can be explored for pharmaceuticals and a multitude of other benefits to support human life. Indonesia holds 10% species of flowering plants, 12% species of mammals, 16% species of reptiles, and 17%

species of birds worldwide.

Indonesia has two biodiversity hotspots, namely Sundaland and Wallacea. A biodiversity hotspot is an area of highly concentrated biodiversity vulnerable to ecosystem threats such as deforestation. The island of Kalimantan is one of many islands that is considered to be a biodiversity hotspot. Kalimantan encompasses the Sundaland biodiversity hotspot. (Moss and Wilson 1998).

Kalimantan is one of the most significant, highly concentrated areas of biodiversity. Kalimantan became a habitat for 6% of flora and fauna worldwide (Wulffraat et al., 2016). The riches of flora in Kalimantan itself can rival the riches of flora in the African continent (MacKinnon et al., 1996). Kalimantan's location along the equator line implies a high intensity of rainfall and temperature. This condition, bolstered by the geological and climate history of Kalimantan, would propel for a high frequency of speciation, producing a diverse range of species. Kalimantan contains numerous types of ecosystems inhabited by various flora and fauna, starting from its water ecosystem to its mountainous areas. Several ecosystems exist in Kalimantan: beach ecosystems, mangrove, seagrass, swamp areas, turf, rain forests, and even mountain forests. (MacKinnon et al., 1996).

Kalimantan becomes a habitat for various vital species. Kalimantan has at least 267 tree species from the famili Dipterocarpaceae, which are trees with high economic value as it is the biggest producer of high-quality wood. Kalimantan has a tremendous endemicity level, with around 34% of plant species in Kalimantan being endemic (Mackinnon et al., 1996). Kalimantan possesses faunas that are a part of the Asiatic fauna group. Kalimantan becomes a habitat for many important faunas such as orangutan and bekantan (Wulffraat et al, 2016). Fauna diversity in Kalimantan holds a significant role in the sustainability of the ecosystem and habitat in Kalimantan, for one, its roles in forest regeneration by becoming agents for dispersion of seeds. Biodiversity, as well as the condition of Kalimantan's landscape play a role as the buffer of our existence. As such, they must be protected from threats.

Although it has significant conservation and biodiversity value, land use change is practiced in Kalimantan. Land openings for various industrial sectors as well as housing areas, the ever-growing human population implies the increase of land necessity as inhabitant areas as well as its necessities to fulfil the simultaneous ever-increasing human needs. The threats of land use change, as well as deforestation, constantly endanger many places (including Kalimantan) with the increase in human needs. From 2006 to 2016 (10 years), East Kalimantan itself has experienced deforestation up to 70,091.7 Ha, with an average as extensive as 70,091.7 Ha (Hultera, 2020) per year.

Forests in Indonesia are always loomed with threats of deforestation in many forms, such as illegal logging and forest conversion into palm oil agriculture (Ferraz et al., 2018). Propellant factors of deforestation, among others, are commodity production, shifting cultivation, and forest fires (Curtis et al., 2018). If referring to data of land cover from Auriga, it is apprehended that 143,592 Ha of natural forest and 8,765 Ha plantation forests in Kalimantan experienced land cover change into mine sites.

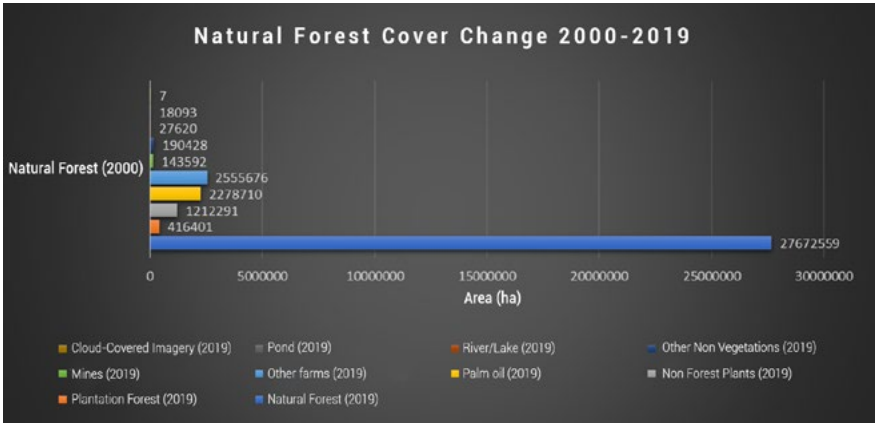


Figure 1. 1. Plantation Forest Cover Change Year 2000-2019
(Source: Auriga)

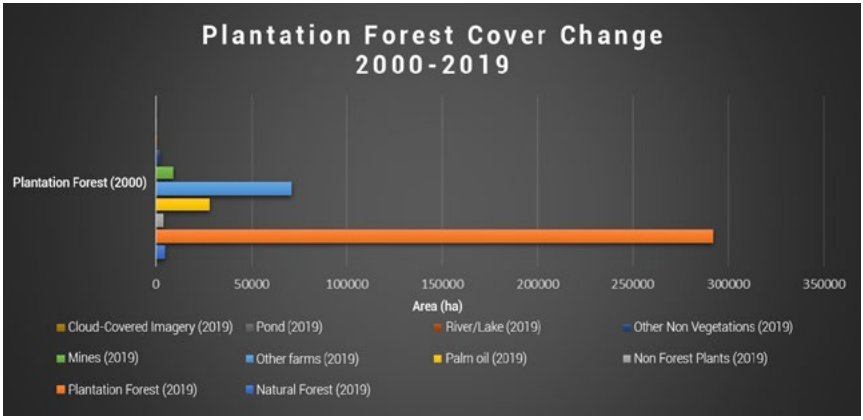


Figure 1. 2. Plantation Forest Cover Change Year 2000-2019
(Source: Auriga)

Deforestation due to land use change potentially reduces environmental services to sustain human life and other organisms. In developing countries, mining activities in the form of *surface mining* contribute to 7% of deforestation (Woodbury et al., 2019). *Surface mining* occurs when the expected mineral products are near the earth's surface. To conduct *surface mining*, land components, namely vegetations, soil, and *overburden*, must be removed for excavation of mineral and other mining products. Although in 2020, there was a drop in coal *demand* as big as 4% by virtue of the Covid-19 pandemic, which took part in lowering energy needs, this is estimated to rise after the entering into the new adaptation period that will restart the mobility of human activities (IEA, 2021).

Coal poses as fuel with the highest greenhouse gas emission. The utilization of coal as an electricity generator has negative impacts on the environment and health. Coal combustion as an electricity generator results in air, water, and noise pollution (loudness). Smoke from a coal power plant will pollute the air in the area, degrading the quality of air and damaging the health of the people in the area. Exposure to said pollution increases the risk for various respiratory diseases such as asthma, bronchitis, and lung cancer (Artun et al., 2016).

Indonesia prevails as the most prominent nation for coal exports in the world; a large portion of it comes from Kalimantan. East Kalimantan produced up to 187 million tons of coal in 2020. South Kalimantan produced up to 76 million tons of coal in 2018. The total coal production in Indonesia in 2020 reached up to 565 million tons. This indicates that mining plays a significant role in Kalimantan's economic progression. However, the received economic benefits must be paid with the well-being of the people and environment as well as a threat to biodiversity (Woodbury et al., 2019). Land function change for mining activities will eradicate habitats for the continuity of biodiversity, driving the degradation of biodiversity. In a case study in Australia, biodiversity in a 23 years post-mined site after the occurrence of mining activities still hadn't regained the same level of biodiversity as before the conduct occurred (Gould, 2011).

Various conservation activities in order to sustain the remaining biodiversity have been conducted. Selection for conservation areas that are intended to be conservation sites for biodiversity has been made numerous times. Conservation areas that have been set as conservation sites are still generally degraded by activities of illegal logging and habitat destruction (Jepson et al., 2002). Gaps between the planning and conservation practices drove for the conservation of biodiversity to be conducted in various aspects. One of them is by reducing habitat damages as a consequence of mining activities, especially coal mining.

Significant technology development opens new opportunities for renewable energy sources. With a more advanced technology, various renewable and environmentally friendly energy sources are getting introduced and can be utilized to meet global energy. Solar, wind, geothermal, biomass, and hydrogen energies are a few examples of renewable energy that can be chosen as alternative options. This renewable energy has renewable characteristics, which means this energy source can be utilized continuously without having to worry about its scarcity. Few characteristics of renewable energy:

1. Doesn't generate emissions and pollution

2. Not easily exhausted
3. Globally available
4. Doesn't add to global warming
5. Generate a small amount of waste
6. Stable energy cost
7. Provides a field of employment (Lee et al., 2007)

With more available options of renewable and environmentally friendly energy along with an even more adequately equipped technology to utilize them, coal energy sources should start getting replaced with renewable energy sources to suppress environmental damage, climate impact, and potential *biodiversity loss*.

This research discusses the impact of the coal industry on biodiversity in Kalimantan. Research regarding the impact of coal mines on Kalimantan became essential because of such high coal mine activities in this area, noticeable with the massive export of coal from Kalimantan. The government has targeted peak emission in 2030 and, going forth, will reduce until reaching *net-zero emission* in the year 2060. FoLU Net Sink 2030 target has been planned. Several regions with coal mine permits have included mangrove forest areas, as mentioned above; hence evaluation activities in the said area must be conducted to mitigate climate and save biodiversity.

CHAPTER 2
METHODOLOGY

Chapter 2
Methodology

2.1. Collection Method and Data Analysis

Information and data gathering of mines and biodiversity are conducted with secondary data gathering. Mines and steam power plant information are obtained from the Ministry of Energy and Mineral Resources (ESDM), including coal mine locations from ESDM's Geoportal.

Selected coal mines are areas area its size more than 10,000 ha and located within 25 kilometers radius of the nearest conservation sites. As the mines *shapefile* cannot freely be accessed from ESDM's Geoportal, hence the creation of the mines *shapefile* for analysis purposes is conducted by collecting coordinates of the edges of the mine. Information of the mine edges coordinates are then made to be a source of reference for the creation of the mine *shapefile* needed for the purposes of this research. Information regarding chosen coal mine companies is equipped with documents from AMDAL or ANDAL that can be accessed. A list of research mines can be seen in table 2.1.

Table 2. 1. List of coal mines in Kalimantan

Company Name	Type of Permit	Province	Stage of Production	Area (Ha)
Antang Gunung Meratus	PKP2B	South Kalimantan	Production Operation	20.666,00
Arutmin Indonesia	IUPK	South Kalimantan	Production Operation	11.403,00
Asmin Bara Bronang	PKP2B	South Kalimantan	Production Operation	24.980,00

Company Name	Type of Permit	Province	Stage of Production	Area (Ha)
Batubara Selaras Sapta	PKP2B	East Kalimantan	Production Operation	39.010,00
Berau Coal	PKP2B	East Kalimantan	Production Operation	108.009,00
Berau Indobara Semesta	IUP	South Kalimantan	Production Operation	14.050,00
Borneo Indobara	PKP2B	South Kalimantan	Production Operation	24.100,00
Delma Mining Corporation	PKP2B	North Kalimantan	Production Operation	20.160,00
Firman Ketaun Perkasa	PKP2B	East Kalimantan	Production Operation	10.220,00
Gunung Bayan Pratama Coal	PKP2B	East Kalimantan	Production Operation	20.275,00
Indominco Mandiri	PKP2B	East Kalimantan	Production Operation	24.121,00
Insani Baraperkasa	PKP2B	East Kalimantan	Production Operation	24.477,60
Kalteng Coal	PKP2B	Central Kalimantan	Production Operation	24.988,00
Kaltim Prima Coal	IUPK	East Kalimantan	Production Operation	61.543,00
Kartika Selabumi Mining	PKP2B	East Kalimantan	Production Operation	15.000,00

Company Name	Type of Permit	Province	Stage of Production	Area (Ha)
Kideco Jaya Agung	PKP2B	East Kalimantan	Production Operation	47.500,00
Multi Harapan Utama	PKP2B	East Kalimantan	Production Operation	39.972,00
Nusantara Santan Coal	IUP	East Kalimantan	Production Operation	14.990,00
Nusantara Wahau Coal	IUP	East Kalimantan	Production Operation	14.890,00
Perkasa Inakakerta	PKP2B	East Kalimantan	Production Operation	19.050,00
Persada Berau Jaya Sakti	IUP	South Kalimantan	Production Operation	17.094,00
Santan Batubara	PKP2B	East Kalimantan	Production Operation	14.210,00
Singlurus Pratama Coal	PKP2B	East Kalimantan	Production Operation	21.699,00
Sumber Barito Coal	PKP2B	Central Kalimantan	Production Operation	24.993,00
Sumber Daya Energi	IUP	South Kalimantan	Production Operation	18.500,00
Sumber Kurnia Buana	PKP2B	South Kalimantan	Production Operation	10.920,00
Suprabari Mapanindo Mineral	PKP2B	Central Kalimantan	Production Operation	23.940,00

Company Name	Type of Permit	Province	Stage of Production	Area (Ha)
Tadjahan Antang Mineral	IUP	Central Kalimantan	Production Operation	10.372,00
Tambang Damai	PKP2B	East Kalimantan	Production Operation	24.391,00
Trubaindo Coal Mining	PKP2B	East Kalimantan	Production Operation	22.687,00

Biodiversity data at the species level are obtained from the *Global Biodiversity Information Facility* (GBIF) database. Status granting for vulnerable species and a list of endemic species are obtained from the information in the IUCN Red Data List as well as Ministry Regulation of Environment and Forestry Number P.20/MENLHK/SETJEN/KUM.1/6/2018. Biodiversity data at the ecosystemic level are conducted with the approach of information of land coverage from KLHK land coverage data in 2019.

To obtain biodiversity information in the surrounding areas of research mines locations, the mine location *shapefile* that was created was overlaid with biodiversity data that was obtained from GBIF to gain information on species encounters as well as land coverage within 25 kilometers radius around the mine sites. Afterward, status granting for discovered vulnerable species in the surrounding research mine locations is done based on species status data from the IUCN Red Data List as well as Ministry Regulation of Environment and Forestry Number P.20/MENLHK/SETJEN/KUM.1/6/2018

To estimate the threat of mining activities to biodiversity, a scoring technique was conducted using scoring parameters modified in the previous AEER publication research regarding the impact of coal power plants on biodiversity in Sumatra. There are 8 criteria for scoring stipulations regarding the threat of coal mining activities to biodiversity. Those criteria can be seen in table 2.2.

Table 2. 2. Scoring Criteria

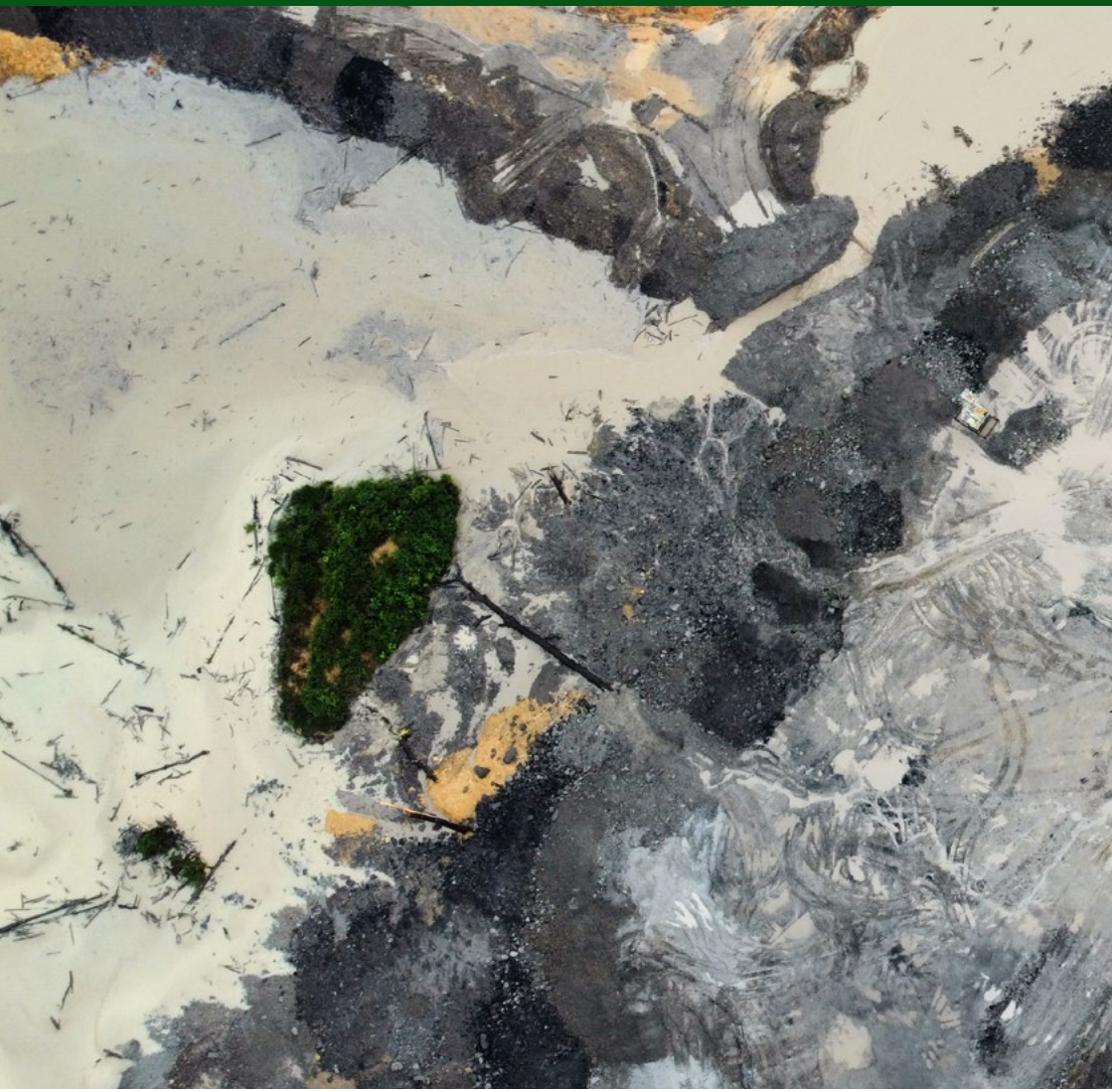
Number	Criteria	Condition	Skor
1	Are there species categorised as vulnerable (VU)?	More than 1	2
		Only 1	1
		None	0
2	Are there endangered species (EN)?	More than 1	2
		Only 1	1
		None	0
3	Are there critically endangered species (CR)?	More than 1	2
		Only 1	1
		None	0
4	Are there protected species based on KLHK regulation?	More than 1	2
		Only 1	1
		None	0
5	Are there endemic species?	More than 1	2
		Only 1	1
		None	0
6	Are there species with high economic and cultural value?	More than 1	2
		Only 1	1
		None	0

Number	Criteria	Condition	Skor
7	Area of Mine Site	More than or equal to 36,000 ha	2
		Less than 36,000 ha	1
8	Are there unique, vulnerable, or even protected ecosystems around the mine site?	Primary dryland forest/ primary mangrove forest/primary peat swamp forest/ agriculture	2
		Secondary dryland forest/secondary mangrove forest/ secondary peat swamp forest/agriculture	1
		Aside from that	0

After the scoring process of mine sites is conducted, the total scores are summed for each mining area. The total score will then be divided into three categories of threats to biodiversity, that is:

1. High (Red): >10
2. Moderate (Yellow): 5-10
3. Low (Green): <5

Mapping is conducted to provide spatial information descriptions of research areas. Mapping must be conducted to identify land coverage and ecosystem in the surrounding coal mine sites. Mapping is done with the software device ArcGis. Data used for spatial analysis are mine locations data from ESDM's Geoportal and 2019 land coverage data from KLHK.



CHAPTER 3
RESULT

Chapter 3
Result

3.1. Scoring Result

Based on the scoring result, there are 20 mining companies that put into the high threat category. Those companies are PT Batubara Selaras Sapta, PT Kaltim Prima Coal, PT Multi Harapan Utama, PT Singlurus Pratama Coal, PT Berau Coal, PT Insani Baraperkasa, PT Kideco Jaya Agung, PT Borneo Indobara, PT Gunung Bayan Pratama Coal, PT Perkasa Inakakerta, PT Persada Berau Jaya Sakti, PT Arutmin Indonesia, PT Berau Indobara Semesta, PT Firman Ketaun Perkasa, PT Kartika Selabumi Mining, PT Sumber Daya Energi, PT Tambang Damai, PT Indominco Mandiri, PT Nusantara Santan Coal, and PT Tadjahan Antang Mineral. In the moderate category, there are 9 mining companies. Scoring result table can be seen in table 3.1.

Table 3. 1. Coal Mine Scoring Result

Company Name	Type of Permit	Province	Stage of Production	Area (Ha)	Score
Batubara Selaras Sapta	PKP2B	East Kalimantan	Production Operation	39.010,00	15
Kaltim Prima Coal	IUPK	East Kalimantan	Production Operation	61.543,00	15
Multi Harapan Utama	PKP2B	East Kalimantan	Production Operation	39.972,00	15
Singlurus Pratama Coal	PKP2B	East Kalimantan	Production Operation	21.699,00	15
Berau Coal	PKP2B	East Kalimantan	Production Operation	108.009,00	14
Lanna Harita	PKP2B	East Kalimantan	Production Operation	12.343,00	14

Company Name	Type of Permit	Province	Stage of Production	Area (Ha)	Score
Insani Baraperkasa	PKP2B	East Kalimantan	Production Operation	24.477,60	14
Kideco Jaya Agung	PKP2B	East Kalimantan	Production Operation	47.500,00	14
Borneo Indobara	PKP2B	South Kalimantan	Production Operation	24.100,00	13
Gunung Bayan Pratama Coal	PKP2B	East Kalimantan	Production Operation	20.275,00	13
Perkasa Inakakerta	PKP2B	East Kalimantan	Production Operation	19.050,00	13
Persada Berau Jaya Sakti	IUP	South Kalimantan	Production Operation	17.094,00	13
Arutmin Indonesia	IUPK	South Kalimantan	Production Operation	11.403,00	12
Berau Indobara Semesta	IUP	South Kalimantan	Production Operation	14.050,00	12
Firman Ketaun Perkasa	PKP2B	East Kalimantan	Production Operation	10.220,00	12
Kartika Selabumi Mining	PKP2B	East Kalimantan	Production Operation	15.000,00	12
Sumber Daya Energi	IUP	South Kalimantan	Production Operation	18.500,00	12
Tambang Damai	PKP2B	East Kalimantan	Production Operation	24.391,00	12
Tuhup Coal Mining	IUP	Central Kalimantan	Production Operation	11.260,00	12
Indominco Mandiri	PKP2B	East Kalimantan	Production Operation	24.121,00	11

Company Name	Type of Permit	Province	Stage of Production	Area (Ha)	Score
Nusantara Santan Coal	IUP	East Kalimantan	Production Operation	14.990,00	11
Tadjahan Antang Mineral	IUP	Central Kalimantan	Production Operation	10.372,00	11
Amanah Putra Borneo	IUP	South Kalimantan	Production Operation	11.440,00	11
Antang Gunung Meratus	PKP2B	South Kalimantan	Production Operation	20.666,00	10
Santan Batubara	PKP2B	East Kalimantan	Production Operation	14.210,00	10
Suprabari Mapanindo Mineral	PKP2B	Central Kalimantan	Production Operation	23.940,00	10
Trubaindo Coal Mining	PKP2B	East Kalimantan	Production Operation	22.687,00	10
Ratah Coal	PKP2B	East Kalimantan	Exploration	36.490,00	10
Asmin Bara Bronang	PKP2B	Central Kalimantan	Production Operation	24.980,00	8
Kalteng Coal	PKP2B	Central Kalimantan	Production Operation	24.988,00	7
Nusantara Wahau Coal	IUP	East Kalimantan	Production Operation	14.890,00	7
Sumber Kurnia Buana	PKP2B	South Kalimantan	Production Operation	10.920,00	7
Sumber Barito Coal	PKP2B	Central Kalimantan	Production Operation	24.993,00	6
Delma Mining Corporation	PKP2B	North Kalimantan	Production Operation	20.160,00	4

Company Name	Type of Permit	Province	Stage of Production	Area (Ha)	Score
Borneo Prima	IUP	Central Kalimantan	Production Operation	15.000,00	4

Mining companies that are included in the high categories have the highest threat level towards biodiversity at ecosystemic and species levels. These mining companies threaten the existence of protected, endemic, as well as high economic and cultural value species, whether inside or around the area. According to GBIF data, several species with high susceptibility are discovered (*Vulnerable, Endangered, or Critically Endangered*) in areas of mining in high threat levels category.

3.2. Mines in Central Kalimantan

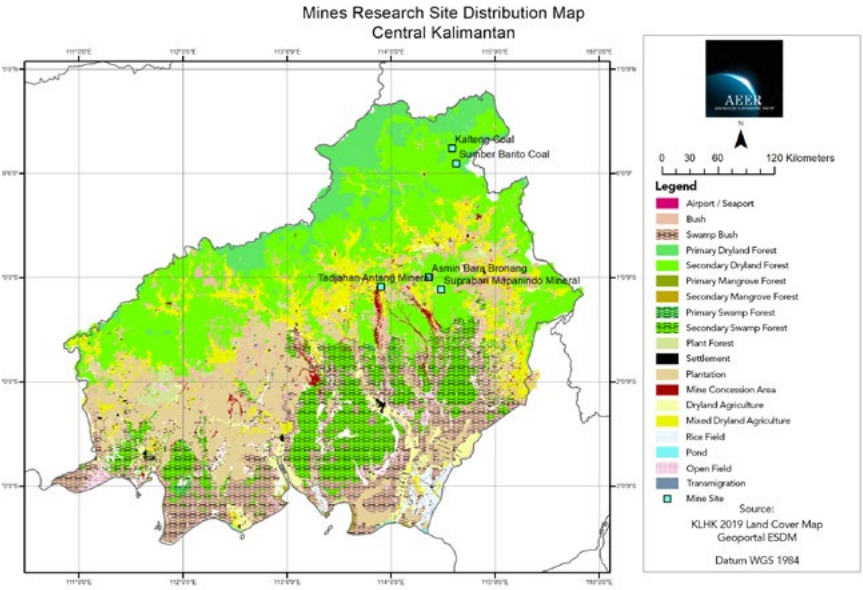


Figure 3. 1. Distribution map of research mines in Central Kalimantan

3.2.1. PT Sumber Barito Coal (Category: Moderate)

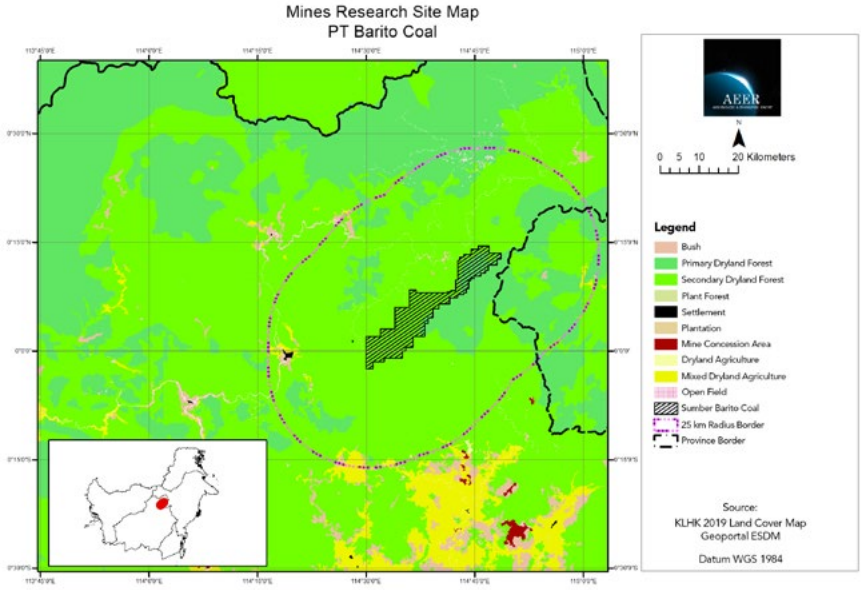


Figure 3. 2. Map of PT Sumber Barito Coal

PT Sumber Barito Coal is a mining company with a PKP2B (Coal Contract of Work) type of permit with an area of 24,993 Ha in Murung Raya, Central Kalimantan. This company has a moderate level of threat with a score of 6. According to the GBIF data in this area, one species with IUCN *vulnerable* status has been registered on this site. That species is *Argusianus argus* (Great Argus). There are 3 KLHK protected species which are *Argusianus argus* (Great Argus), *Psilopogon chrysopogon* (Golden-Whiskered Barbet), and *Pitta sordida* (Hooded Pitta). Land coverage around this mine site consists of shrubs, primary dryland forest, secondary dryland forest, plantation forest, settlement, dry field agriculture, mixed dry field agriculture, and clearing. Moreover, there exists a conservation site Bukit Sapat Hawung Preserve around this mine site.

According to the KESDM official website Minerba Online Data Indonesia (MODI) and the official website of PT Adaro Mineral Indonesia, there are two

companies that take hold of PT Sumber Barito Coal's shares directly. First is PT Alam Tri Daya Indonesia, which is a subsidiary company of PT Adaro Mineral Indonesia, with a controlling stake of 99%. The second biggest Stakeholder is Coal Trade Services International PTE Ltd, with a controlling stake of 1%. The stakeholder map of PT Sumber Barito Coal can be seen in Figure 3.3.

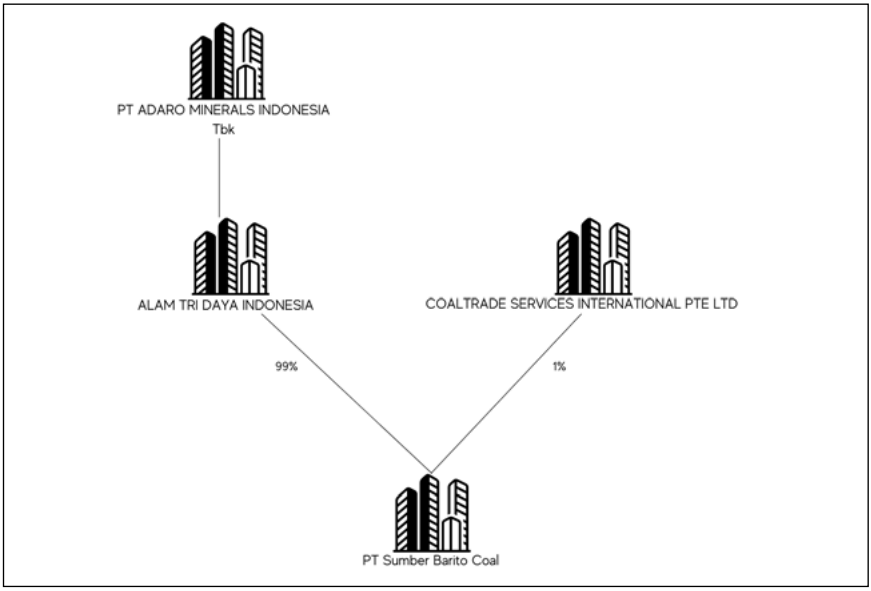


Figure 3. 3. Stakeholder map of PT Sumber Barito Coal

3.2.2. PT Kalteng Coal (Category: Moderate)

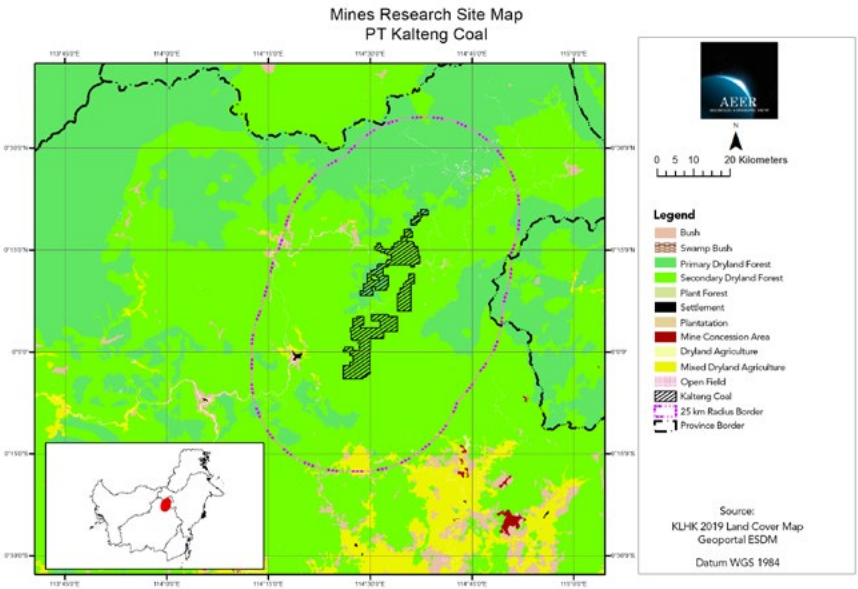


Figure 3. 4. Map of PT Kalteng Coal

PT Kalteng Coal is a mining company with PKP2B type of permit with an area of 24,988 Ha in Murung Raya, Central Kalimantan. This company has a moderate level of threat with a score of 7. According to GBIF data, there are two species with IUCN *vulnerable* status that have been registered on this site. Those species are *Argusianus argus* (Great Argus) and *Buceros rhinoceros* (Rhinoceros hornbill). There are 6 KLHK protected species: *Argusianus argus, Buceros rhinoceros, Harpactes kasumba* (Red-naped trogon), P*silopogon chrysopogon*, *Spilornis cheela* (Crested serpent eagle), and *Pitta sordida*. Land coverage around this mine site consists of shrubs, primary dryland forest, secondary dryland forest, plantation forest, settlement, dry field agriculture, mixed dry field agriculture, and clearing. Moreover, there exists a conservation site in the form of Bukit Sapat Hawung Preserve around this mine site. Land coverage of dryland and plantation forest around the mine has the potential to be a suitable habitat for Great Argus and Rhinoceros Hornbill. Great Argus is a species of pheasant that lives in the rainforests of Kalimantan and Sumatra

at the height of 1000-1200 mdpl (Nijman, 1998). Rhinoceros hornbill has a habitat preference of primary forest to the secondary forest at the height of 1400 mdpl (Wells and Sharpe, 2019).

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are two companies that hold PT Kalteng Coals shares directly. First is Alam Tri Daya, which is a subsidiary company of PT Adaro Mineral Indonesia, with a controlling stake of 99%. The second Stakeholder is Coal Trade Services International PTE Ltd., with a controlling stake of 1% Stakeholder's map of PT Kalteng Coal can be seen in Figure 3.5.

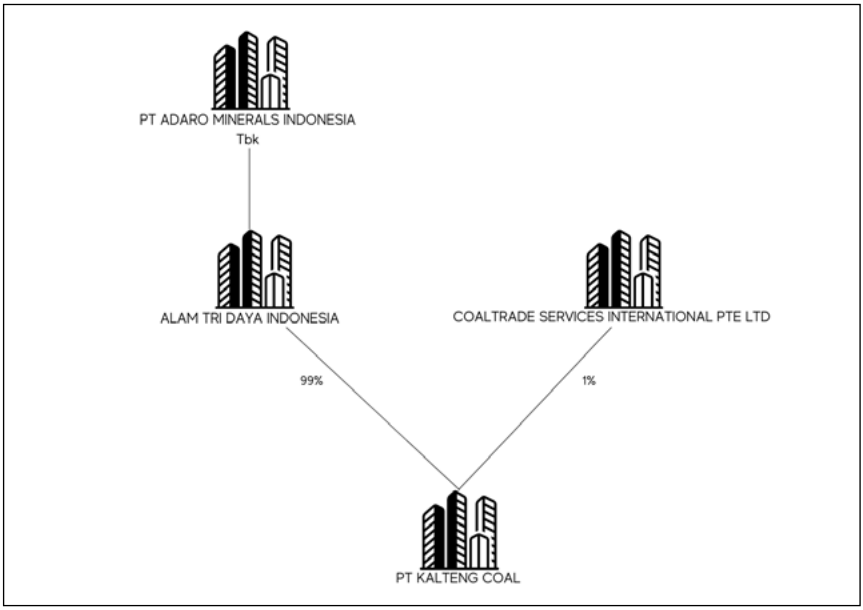


Figure 3. 5. Stakeholder Map of PT Kalteng Coal

3.2.3. PT Asmin Bara Bronang (Category: Moderate)

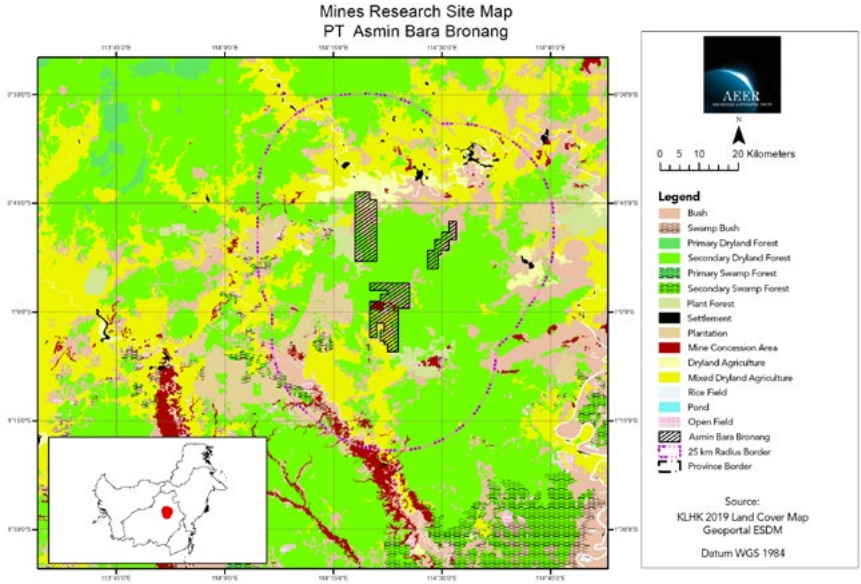


Figure 3. 6. Map of PT Asmin Bara Bronang

PT Asmin Bara Bronang is a mining company with PK2PB type of permit with an area of 24,980 Ha in Kapuas Regency and Murung Raya, Central Kalimantan. This company has a moderate threat level with a score of 8. According to GBIF data in this area, there are 3 species with IUCN vulnerable status that have been registered in this area. Those species are *Anthracoceros malayanus* (Black Hornbill), *Argusianus argus*, *Nothaphoebe foetide*, and *Shorea laevis* (Bangkirai). There are 17 KLHK protected species which are A*ethopyga siparaja* (Crimson sunbird), *Anorrhinus galeritus* (Bushy-crested hornbill), *Anthracoceros malayanus*, *Anthreptes rhodolaemus* (Red-throated sunbird), *Ardea alba* (Great egret), *Argusianus argus*, *Aviceda jerdoni* (Baza jerdon), *Chlidonias hybrida* (Whiskered tern), *Chloropsis kinabaluensis* (Bornean leafbird), *Haliastur indus* (Brahminy kite), *Platylophus galericulatus* (Crested jayshrike), *Psilopogon chrysopogon*, *Psilopogon rafflesii* (Red-crowned barbet), *Psittacula longicauda* (Long-tailed parakeet), *Rhipidura*

javanica (Malaysian pied fantail), and *Spilornis cheela*.

Land coverage around this mine site consists of shrubs, shrub swamp, secondary dryland forest, secondary peat swamp forest, plantation forest, settlement, farm, dry field agriculture, mixed dry field agriculture, dam, and clearing. Moreover, there exist conservation sites in the forms of Pararawen Preserve and Raya Lapuk Jaru Forest Park around this mine site.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are three companies that hold PT Asmin Bara Bronang shares directly. First is PT Tuah Turangga Agung, a subsidiary company of PT United Tractor Tbk, with a controlling stake of 75.4%. The second Stakeholder is PT Andalan Teguh Berjaya with a controlling stake of 15.4%, and Third Stakeholder is PT Mandira Sanni Pratama with a controlling stake of 9.2%. The stakeholder map of PT Asmin Bara Bronang can be seen in Figure 3.7.

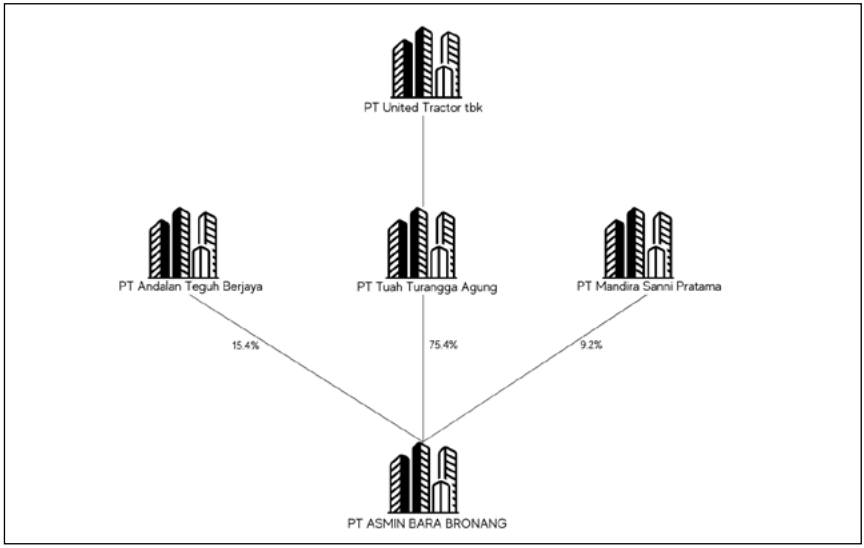


Figure 3. 7. Stakeholder Map of PT Asmin Bara Bronang

3.2.4. PT Suprabari Mapanindo Mineral (Category: Moderate)

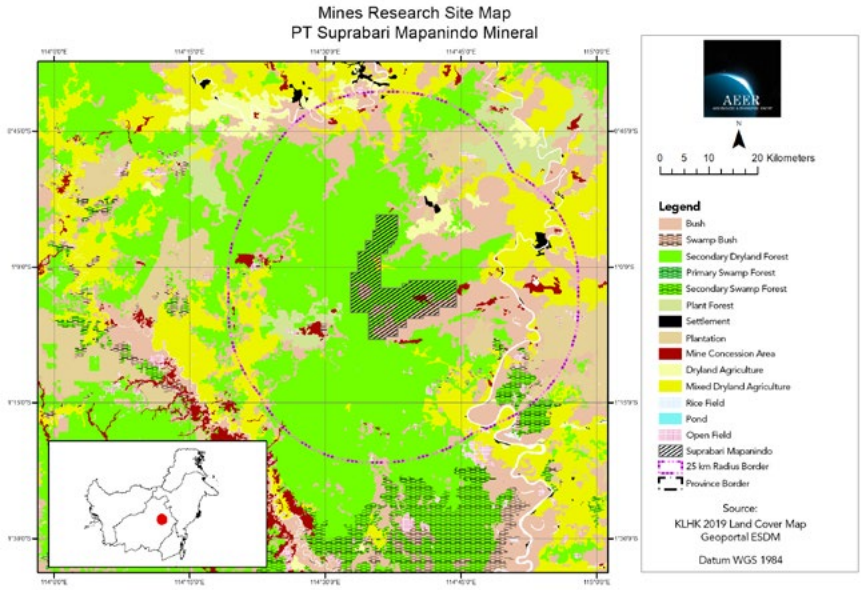


Figure 3. 8. Map of PT Suprabari Mapanindo Mineral

PT Suprabari Mapanindo Mineral is a mining company with a PKP2B type of permit with an area of 23,940 Ha in North Barito, Central Kalimantan. This company has a moderate threat level with a score of 10. According to GBIF data in this area, there are two species with IUCN vulnerable status and three with endangered status that has been registered in this area. *Hopea beccariana* and *Shorea mecistopteryx* hold *vulnerable* status, *Shorea bracteolata*, *Hopea semicuneata*, and *Shorea faguetiana* hold endangered status. *Agathis borneensis*, *Platysmurus leucopterus*, *Psittacula longicauda*, and *Rhipidura javanica* is KLHK protected species registered to be around this mine site. Based on land coverage identification in this area, there is land coverage in the forms of shrubs, shrub swamp, secondary dryland forest, secondary peat swamp forest, plantation forest, settlement, farm, mixed dryland field, field, and clearing. Moreover, there exists a conservation site in the form of Alam Pararawen Preserve around this mine site. Although primary ecosystems

such as primary dryland forest as well as primary mangrove forest were not found, nonetheless secondary ecosystems that do exist around this mine site, namely secondary dryland forest and secondary peat swamp forest, have the role of habitat for flora and fauna around this mine site.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are two companies that hold PT Suprabari Mapanindo Mapanindo shares directly. First is PT Tuah Turangga Agung, a subsidiary company of PT United Tractor Tbk, with a controlling stake of 80.1%. The second Stakeholder is ICRA Pty. Ltd, with a controlling stake of 19.9%. The stakeholder map of PT Suprabari Mapanindo Mineral can be seen in Figure 3.9.

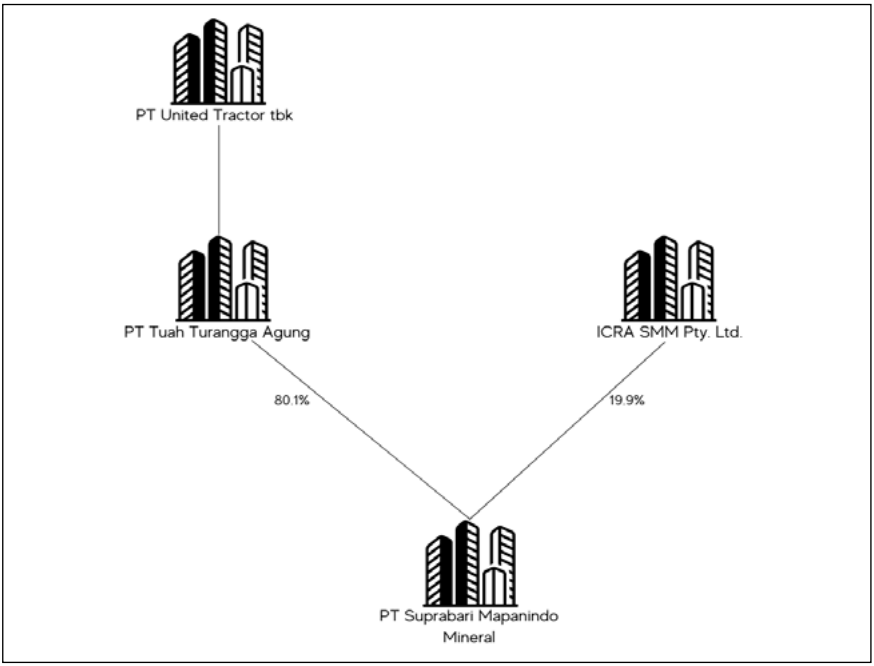


Figure 3. 9. Stakeholder map of PT Suprabari Mapanindo Mineral

3.2.5. PT Tadjahan Antang Mineral (Category: High)

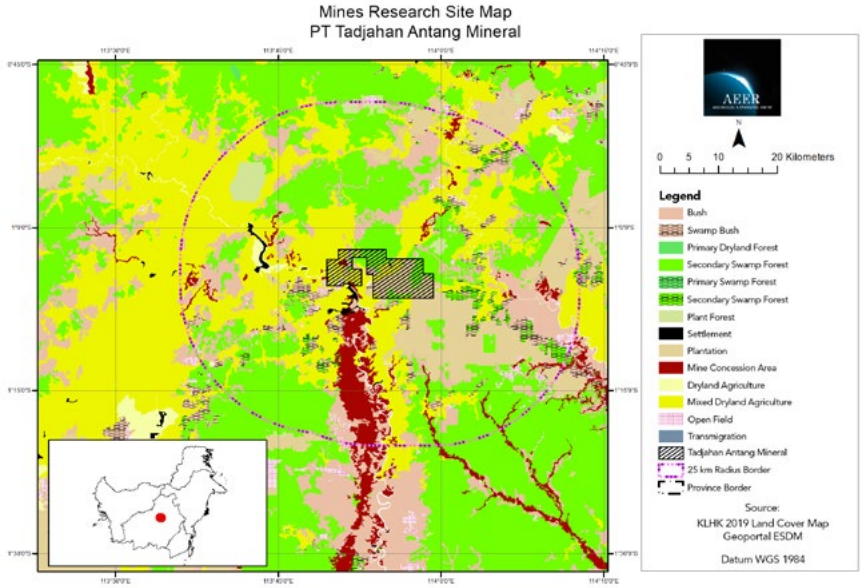


Figure 3. 10. Map of PT Tadjahan Antang Mineral

PT Tadjahan Antang Mineral is a mining company with an IUP type of permit with an area of 10,372 Ha in Gunung Mas Regency, Central Kalimantan. This company has a high threat level with a score of 11. Around this area, there are 3 species with IUCN vulnerable status, namely *Shorea laevis*, *Shorea mecistopteryx*, and *Buceros rhinoceros*. Apart from those, *Teijsmanniodendron latiffii* with IUCN *endangered* status was also found. It has been discovered that three Kalimantan endemic species are found around this area. These are plant species which are *Pentace curtisii* (Melunak bukit), *Rasbora trifasciata, Rasbora lacrimula*. *Psilopogon pulcherrimus*, *Rhipidura javanica*, and B*uceros rhinoceros* are protected species by KLHK around this mine site. Based on land coverage identification in this area, there is land coverage in the forms of shrubs, shrub swamp, secondary dryland forest, secondary peat swamp forest, plantation forest, settlement, farm, dry field agriculture, mixed dry field agriculture, and clearing. Moreover, there exists a conservation site

in the form of Raya Lapak Jaru Forest Park around this mine site. Although primary ecosystems such as primary dryland forest and primary mangrove forest were not found in this area, secondary ecosystems that exist around this mine site, namely secondary dryland forest and secondary peat swamp forest, have the role of habitat for flora and fauna around this mine site.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are three companies that hold PT Tadjahan Antan Mineral shares directly. First is Hong Kong Manshi Investment Company Limited, with a controlling stake of 49%. The second Stakeholder is PT Bukit Mas Makmur, with a controlling stake of 45%. The third Stakeholder is PT Sinergi Bara Energi, with a controlling stake of 6%. The stakeholder map of PT Tadjahan Antang Mineral can be seen in Figure 3.11.

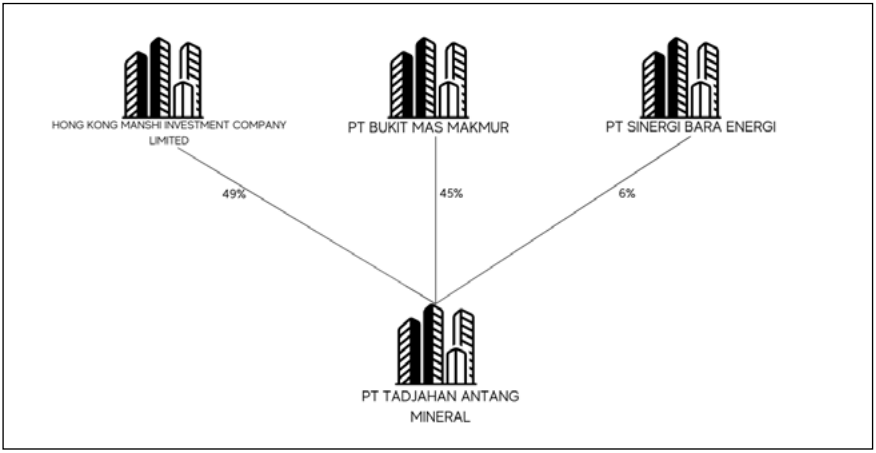


Figure 3. 11. Stakeholder Map of PT Tadjahan Antang Mineral

3.2.6. PT Tuhup Coal Mining (Category: High)

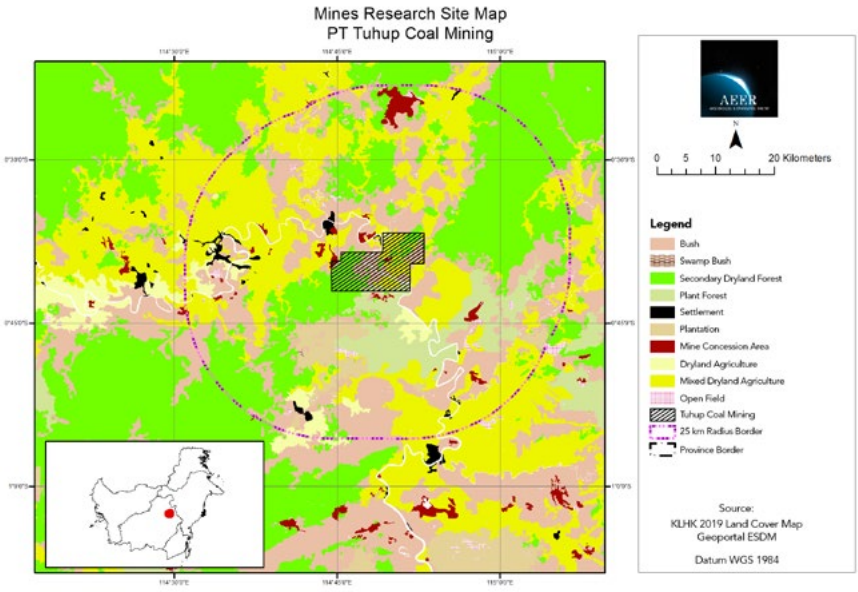


Figure 3. 12. Map of PT Tuhup Coal Mining

PT Tuhup Coal Mining is a mining company with an IUP type of permit with an area of 11,260 Ha in Murung Raya Regency, Central Kalimantan. This mining company has a high threat level with a score as high as 12. According to GBIF data in this area, there are 3 species with a susceptibility level of *vulnerable* and 3 species with a susceptibility level of endangered. Species with vulnerable levels found in this area are *Anthracoceros malayanus*, *Buceros rhinoceros*, and *Shorea laevis*. Species with endangered levels found in this area are *Berenicornis comatus*, *Shorea bracteolata*, and *Shorea faguetiana*. If referencing data of species that are being protected by KLHK, there are 12 protected species in this area. Moreover, there are 2 endemic species around this mine site, namely *Bagrichthys macropterus* and *Betta obscura*.

Based on land coverage identification in this area, there is land coverage in the forms of shrubs, shrub swamp, secondary dryland forest, plantation forest, settlement, farm, dry field agriculture, mixed dry field agriculture,

and clearing. Moreover, there exists a conservation site in the form of Alam Pararawen Preserve around this mine site. Land coverage such as secondary dryland forests can potentially become a habitat for wildlife in this surrounding area. Although the potential for secondary dryland forest as a habitat is not as suitable as primary dryland forest as it was impacted by the disruption that's occurred in this ecosystem before, the existence of such forests must still be maintained to ensure the ongoing lives of the wildlife inside.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are two companies that hold PT Tuhup Coal Mining shares directly. Firstly is PT Ocean Metal Indo, with a controlling stake of 80%. The second Stakeholder is PT Air Batu Sejahtera, with a controlling stake of 20%. The stakeholder map of PT Suprabari Mapanindo Mineral can be seen in Figure 3.13.

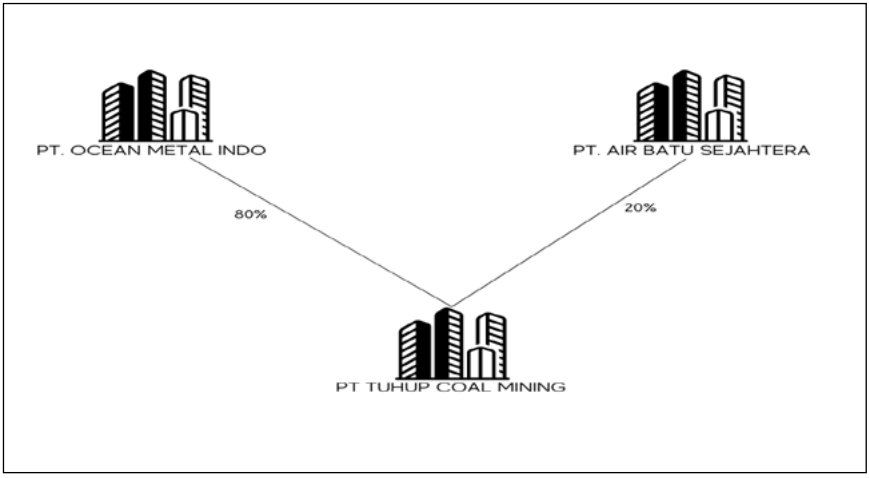


Figure 3. 13. Stakeholder Map of PT Tuhup Coal Mining

3.2.7. PT Borneo Prima (Category: Low)

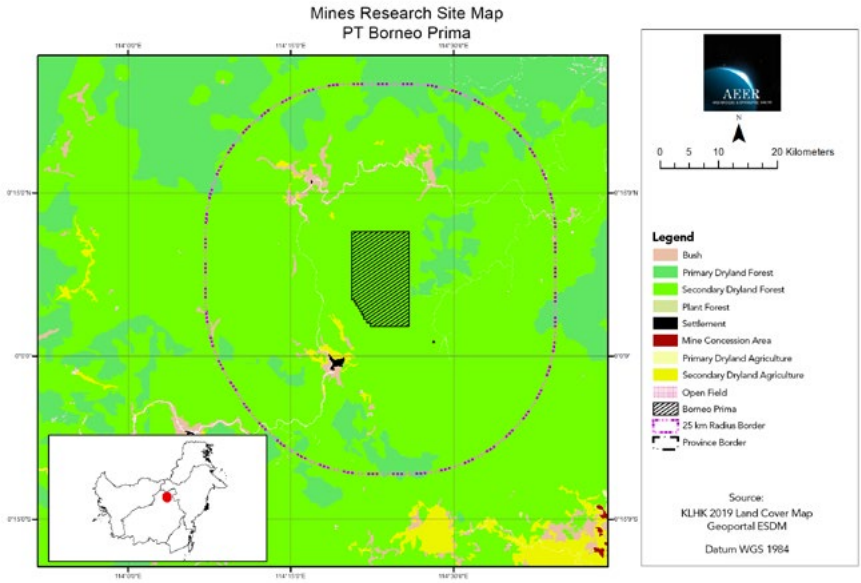


Figure 3. 14. Map of PT Borneo Prima

PT Borneo Prima is a mining company with an IUP type of permit with an area of 15,000 Ha in Murung Raya Regency, Central Kalimantan. PT Borneo Prima has a low threat level towards biodiversity with a score of 4. According to GBIF data in this area, any species with susceptibility levels of *vulnerable, endangered*, or even *critically endangered* were not found. If referencing data of species being protected by KLHK, there are 1 species that are being protected in this surrounding mine site which is *s*. No endemic species were found around this mine site.

Based on land coverage identification in this area, there is land coverage in the forms of shrubs, primary dryland forest, secondary dryland forest, plantation forest, settlement, mixed dry field agriculture, and clearing. Moreover, there exists a conservation site in the form of Alam Bukit Sapat Hawung Preserve around this mine site. Land coverage such as primary dryland forests can potentially become a habitat for wildlife in this surrounding area. This

ecosystem must be kept to ensure degradation from mining activities for the ongoing lives of biodiversity around this mine site.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are three companies that hold PT Pacific Samudra Perkasa shares directly. First is PT Pacific Samudra Perkasa, with a controlling stake of 50%. The second Stakeholder is IMR Holding Ag, with a controlling stake of 49%. The third Stakeholder is Andi Zulfikar, with a controlling stake of 1%. The stakeholder map of PT Borneo Prima can be seen in Figure 3.15.

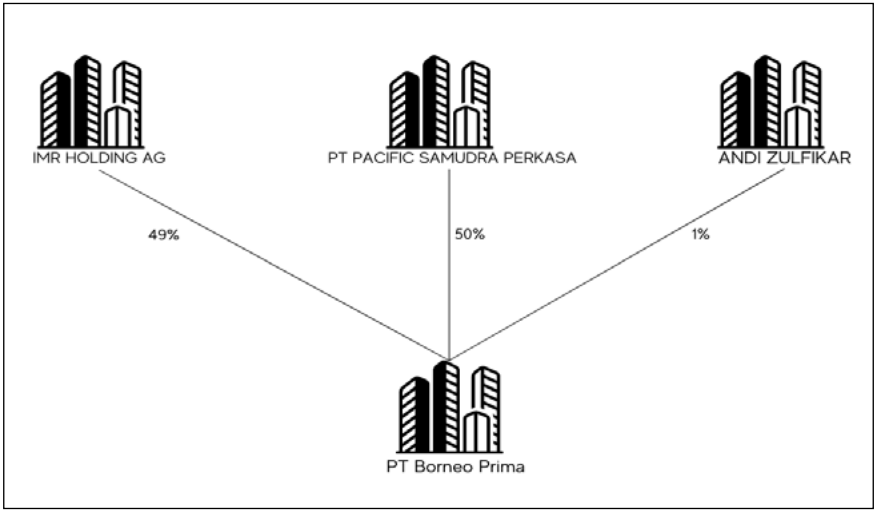


Figure 3. 15. Stakeholder Map of PT Borneo Prima

3.3. Mines in East Kalimantan

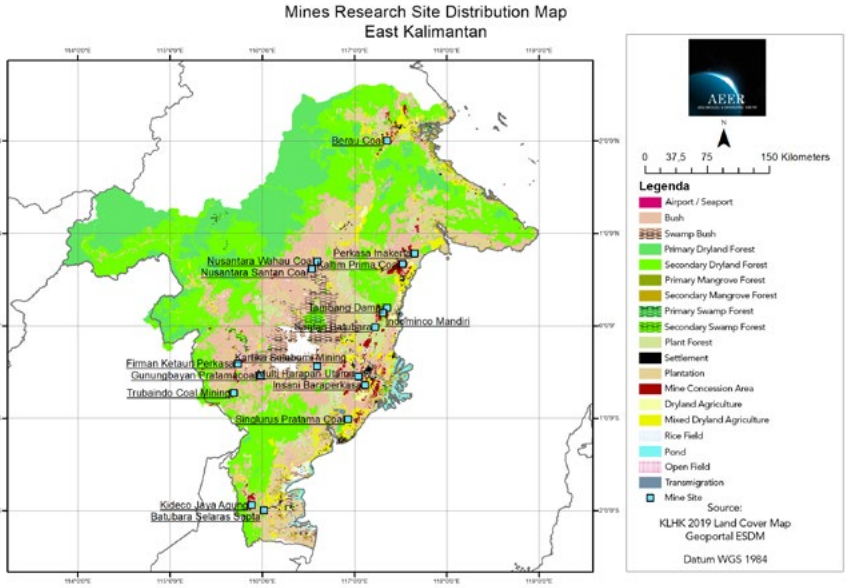


Figure 3. 16. Distribution Map of Research Mines in East Kalimantan

3.3.1. PT Berau Coal (Category: High)

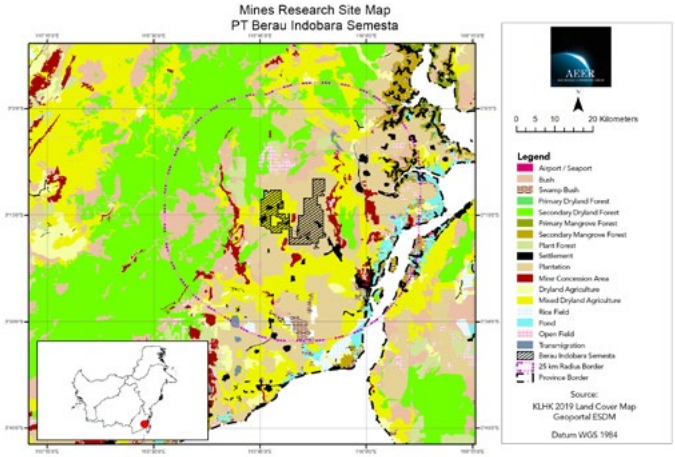


Figure 3. 17. Map of PT Berau Coal

PT Berau Coal is a mining company with a PKP2B type of permit with an area of 108,009 Ha in Berau Regency, East Kalimantan. This company has a high threat level with a score of 14. According to GBIF data, species with the status of IUCN *vulnerable* around this area are *Shorea laevis*, *Hopea sangal*, *Alpinia ligulata*, *Gonystylus affinis*, *Dipterocarpus crinitus*, *Tetramerista glabra*, *Acridotheres javanicus*, *Teijsmanniodendron sinclairii*, *Anthracoceros malayanus* (Black Hornbill), *Buceros rhinoceros*, *Callicarpa superposita* (Beauty Berry), *Helarctos malayanus* (Sun Bear), *Leptoptilos javanicus* (Lesser Adjutant), *Macaca fascicularis* (Crab-eating Macaque), *Nisaetus nanus* (Wallace's Hawk-Eagle), *Presbytis frontata* (White-fronted Surili), and *Presbytis rubicunda* (Maroon Leaf Monkey). Species with the status of IUCN endangered are *Chelonia mydas* (Green Sea Turtle), *Ciconia stormi* (Storm Stork), *Nasalis larvatus* (Proboscis Monkey), *Shorea gratissima*, *Hopea cernua*, *Dipterocarpus tempehes*, *Shorea faguetiana*, *Shorea bracteolata*, D*ipterocarpus grandiflorus*, and *Pterocarpus indicus* (Narra). If referencing data of species that are being protected by KHLK, there are 36 protected species that have been registered to be in this surrounding mine site. Apart from those, there are 5 endemic species such as *Macaranga beccariana*, *Macaranga winkleri, Acridotheres javanicus*, *Pangasius rheophilus*, and *Acridotheres javanicus* in this surrounding mine site. Moreover, it has been registered a few species with high economic and cultural value, for instance, as a source of fiber and wood, as well as several fruit plants that can be consumed.

Based on land coverage identification in this area, there is land coverage in the forms of air/sea ports, shrubs, shrub swamp, primary dryland forest, secondary dryland forest, primary mangrove forest, secondary mangrove forest, primary peat swamp forest, secondary peat swamp forest, plantation forest, settlement, farm, dry field agriculture, mixed dry field agriculture, field, dam, clearing, and transmigration area. Moreover, a conservation site exists in the form of KKPD (Derawan Small Islands and Surrounding Marine Conservation Areas). Based on land coverage identification, it is discovered land coverage that has a significant potential to be a fauna habitat. Mining activities around this fauna habitat can cause the degradation of wildlife habitats.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are three companies that hold PT Berau Coal shares directly. First is PT Armadian TriTunggal, with a controlling stake of 89.9%. The second Stakeholder is Raffles International Capital Ptre. Ltd., with a controlling stake of 10%. The third Stakeholder is Aries Investment Limited, with a controlling stake of 0.1%. The stakeholder map of PT Borneo Prima can be seen in Figure 3.18.

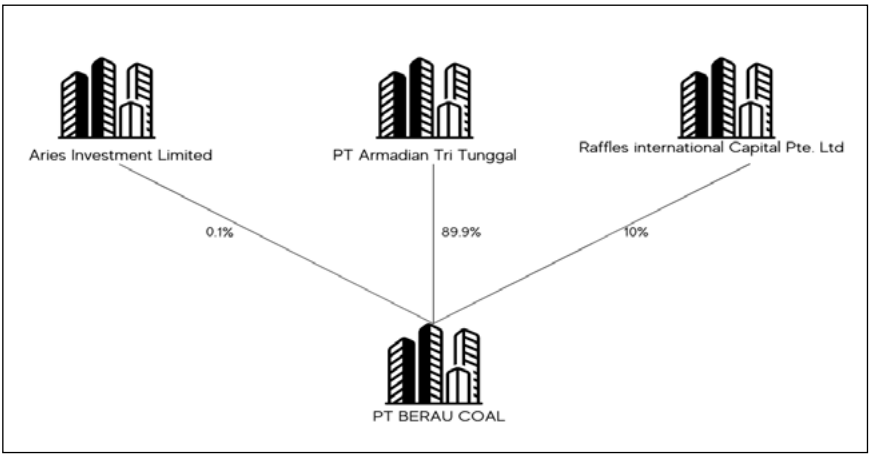


Figure 3. 18. Stakeholder Map of PT Berau Coal

3.3.2. PT Kaltim Prima Coal (Category: High)

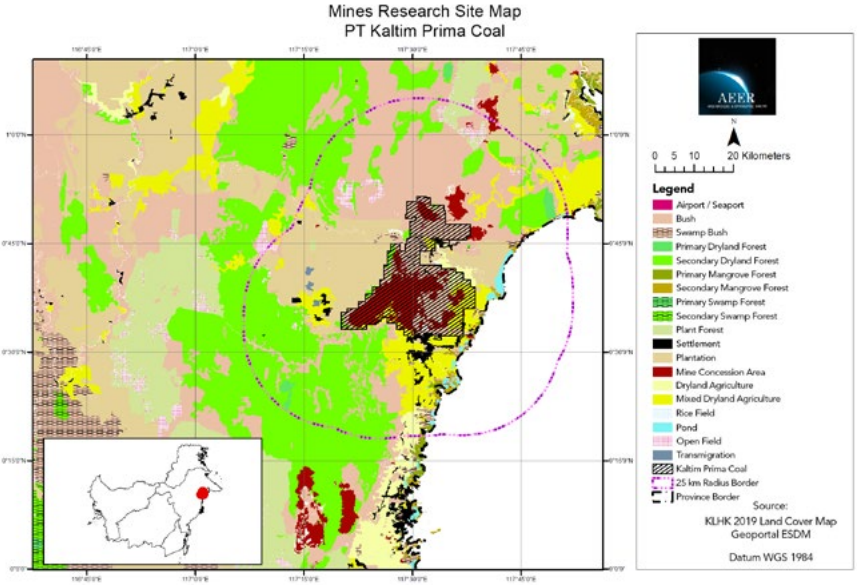


Figure 3. 19. Map of PT Kaltim Prima Coal

PT Kaltim Prima Coal is a mining company with an IUPK type of permit with an area of 61,543 Ha in Kutai Timur Regency, East Kalimantan. This company has a high threat level with a score of 15. According to GBIF data, 15 species with *vulnerable* susceptibility levels, 5 species with *endangered* susceptibility levels, and 1 species with critically endangered susceptibility levels have been registered around this area. Species that are included in the vulnerable susceptibility levels are *Alpinia ligulata*, *Anthracoceros malayanus, Argusianus argus*, *Buceros rhinoceros*, *Centropus rectunguis* (Short-toed Coucal), *Goniopora planulata*, *Leptoptilos javanicus*, *Lophura ignita* (Crested Fireback), *Mulleripicus pulverulentus* (Great slaty woodpecker), *Nisaetus nanus*, *Pavona danai*, *Rhyticeros undulatus* (Wreathed Hornbill), *Setornis criniger* (Hook-billed Bulbul), *Spilornis kinabaluensis* (Mountain Serpent Eagle), and *Teijsmanniodendron scaberrimum*. Species that are included in the endangered susceptibility levels are *Berenicornis comatus* (White-crowned

Hornbill), *Chloropsis sonnerati* (Greater green Leafbird), *Shorea gratissima, Ciconia stormi* (Storm Stork), and *Nasalis larvatus*. The species with a *critically endangered* susceptibility level is *Pongo pygmaeus* (Bornean Orangutan). Species that are included in the *endangered* levels, if referencing data of species that are being protected by KLHK, there are 56 protected species around this mine site. Apart from those, there are 3 endemic species that have been registered to be around this area, which are *Dicaeum trochileum* (Scarlet-headed Flowerpecker), *Nasalis larvatus*, and *Pongo pygmaeus*. This indicates that the area surrounding this mine site is suitable habitat for said species to live in. With mining activities occurring in this area, habitat degradation for mentioned protected species will impact the population size of those species due to the declining quality and quantity of available habitats.

Based on land coverage identification around this mine site, it is discovered land coverage in the forms of air/sea ports, shrubs, shrub swamp, primary dryland forest, secondary dryland forest, primary mangrove forest, secondary mangrove forest, secondary peat swamp forest, plantation forest, settlement, farm, dry field agriculture, mixed dry field agriculture, field, dam, clearing, and transmigration area. Moreover, there exists a conservation site in the form of National Kutai Park around this mine site. Based on the received land coverage information, mine activities in this area can potentially cause the degradation of important habitats such as primary dryland and mangrove forests. Furthermore, degradation of dam areas can also potentially cause declining quality and quantity of dam products that could obstruct the locals' economy.

If referencing from the AMDAL document of PT Kaltim Prima Coal that was released in 2010 regarding the increased production of coal that reaches up to 70 million tons per year, it was yet again, discovered several important faunas that will receive negative impacts as a consequence of mining activities around this mine site. These faunas are *Pongo pygmaeus*, *Pteropus hypomelanus*, *Lonchura fuscans*, *Cacomantis merulinus*, *Hylobates muelleri, Macaca fascicularis*, and *Macaca nemestrina*. Apart from those, there is *Crocodilus sp* in the mangrove section around this mine site. Mining impacts

will give negative contributions to faunas surrounding the mine site in the aftermath of the reduction in the number of habitats of said faunas to find food and reproduce to maintain their populations.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are four companies that hold PT Kaltim Prima Coal shares directly. First is PT Bhira Investment Ttd. with a controlling stake of 30.046%. The second Stakeholder is PT Sitrade Coal, with a controlling stake of 26%. The third Stakeholder is PT Bumi Resources, with a controlling stake of 25.004%. The fourth Stakeholder is Mountain Netherlands Investments, with a controlling stake of 19%. The stakeholder map of PT Kaltim Prima Coal can be seen in Figure 3.20.

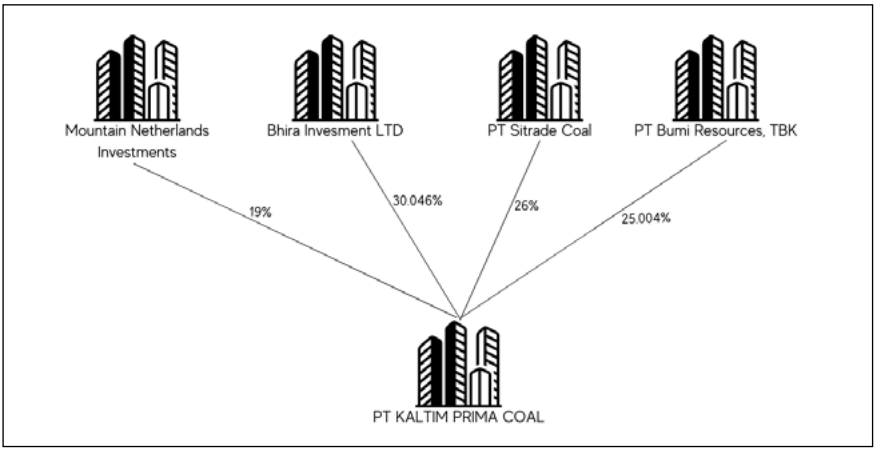


Figure 3. 20. Stakeholder Map of PT Kaltim Prima Coal

3.3.3. PT Kideco Jaya Agung (Category: High)

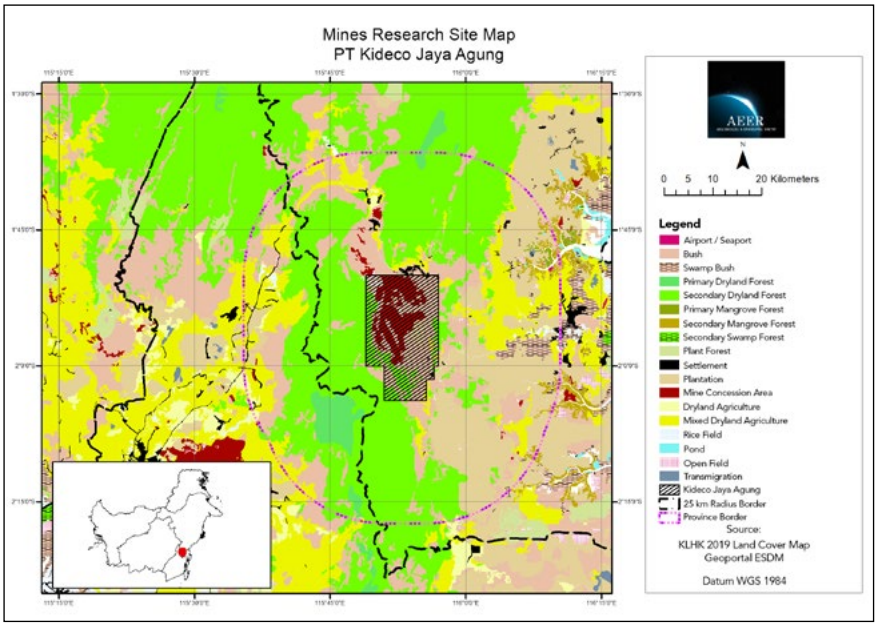


Figure 3. 21. Map of PT Kideco Jaya Agung

PT Kideco Jaya Agung is a mining company with PKP2B type of permit with an area of 47,500 Ha in East Kalimantan. This company has a high threat level with a score of 14. 7 species with high economic value are discovered, such as plants from the Shorea genus known for their excellent wood quality. *Pterospermum fuscum*, *Hylobates muelleri*, *Betta dimidiata*, *Acridotheres javanicus*, *Pectenocypris korthausae*, and *Hylobates albibarbis* are endemic species that are found around this mine site according to GBIF data. There are 5 species around this mine site that are included as species that are being protected by KLHK. Those species are *Buceros rhinocer*, E*usideroxylon zwageri*, *Harpactes diardii, Hylobates albibarbis*, and *Hylobates muelleri.* According to GBIF data, 8 species around this mine site are included in the IUCN *red list* as *vulnerable* category, namely *Buceros rhinoceros*, *Durio dulcis*, *Aquilaria beccariana*, *Hopea sangal*, *Betta dimidiata*, *Acridotheres javanicus*, *Heliopora coerulea*, *Sus barbatus*. Apart from those, 4 species are included in

the endangered category, namely *Pterospermum fuscum*, *Hylobates muelleri*, *Madhuca spectabilis*, and *Hylobates albibarbis*.

Based on the result of land coverage identification, it is discovered land coverage in the forms of air/sea ports, shrubs, shrub swamp, primary dryland forest, secondary dryland forest, primary mangrove forest, secondary mangrove forest, mixed dry field agriculture, field, dam, transmigration area, and clearing. Moreover, there exist conservation sites in the form of Alam Teluk Adang Preserve and Raya Lati Petangis Forest Park around this mine site. Based on land coverage information that was received, there are dryland forests and secondary dryland forests that have high biodiversity potential to be habitats for various species. Therefore, mining activities in this area will cause the degradation of the ecosystems, as mentioned earlier.

If referencing from the Environmental Impact Analysis (ANDAL) document of PT Kideco Jaya Agung regarding its increased production of coal of around 40 million tons per year that was released in 2009, around this mine site, there were still found several protected faunas that experienced the impact of mining activities. These faunas are *Nasalis larvatus*, *Helarctos malayanus*, *Felis badia*, *Neofelis nebulosa*, *Hylobates muelleri*, *Cervus unicolor*, *Ictinaetus malayensis*, and *Rhyticeros undulatus*. However, mining activities were still maintained with the excuse that faunas could migrate to different, more apt habitats when mining activities were boosted around these habitats.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are three companies that hold PT Kideco Jaya Agung shares directly. First is PT Indika Inti Corpindo, with a controlling stake of 51%. The second Stakeholder is Indika Energy, with a controlling stake of 40%. The third Stakeholder is Samtan Co. Ltd, with a controlling stake of 9%. The stakeholder map of Kideco Jaya Agung can be seen in Figure 3.22.

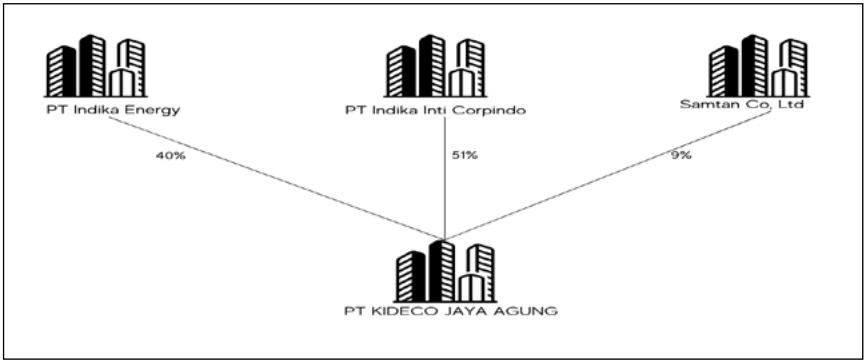


Figure 3. 22. Stakeholder Map of PT Kideco Jaya Agung

3.3.4. PT Multi Harapan Utama (Category: High)

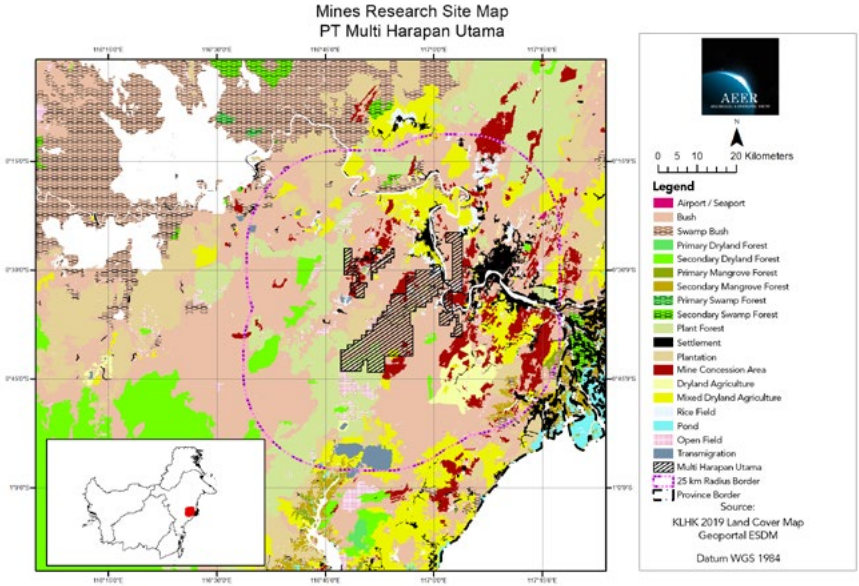


Figure 3. 23. Map of PT Multi Harapan Utama

PT Multi Harapan Utama is a mining company with PKP2B type of permit with an area of 39,972 Ha in Kutai, East Kalimantan. This company has a high threat level with a score of 15. According to GBIF data, it's been registered numerous species with *vulnerable*, *endangered*, and *critically endangered* susceptibility levels around this mine site. Species with *vulnerable* susceptibility levels are *Acridotheres javanicus*, *Anisoptera laevis*, *Anthracoceros malayanus, Argusianus argus*, *Centropus rectunguis*, *Cotylelobium lanceolatum*, *Cyornis caerulatus* (Sunda Blue Flycatcher), *Dipterocarpus gracilis*, *Durio dulcis*, *Helarctos malayanus* (Sun Bear), *Hopea beccariana*, *Hopea sangal*, *Leptoptilos javanicus, Macaca fascicularis*, *Madhuca sericea*, *Maxomys whiteheadi, Nisaetus nanus, Notochelys platynota* (Malayan Flat-shelled Turtle), *Rhyticeros undulatus, Shorea guiso*, *Shorea laevis*, *Shorea macrobalanos*, and *Tetramerista glabra*. Species with endangered susceptibility levels are *Aquilaria microcarpa, Ciconia stormi*, *Cryptocarya lucida*, *Dipterocarpus tempehes, Hopea cernua, Hopea pedicellata*, *Hylobates muelleri* (Müller's gibbon), *Polyplectron schleiermacher* (Bornean Peacock-Pheasant), and *Shorea bracteolata*. The species with a critically endangered susceptibility level around this mine site is *Aquilaria Malaccensis* (Gaharu tree). If referencing data of protected species by KLHK, it's been registered around 36 species around this area. Furthermore, 13 endemic species are in this surrounding area. The existence of protected and endemic species around this area indicates suitable habitats for the dwellings of mentioned species. Mining activities in this area can degrade protected and endemic species in the surrounding area, which will impact the decline of these species' population size.

Based on land coverage identification around this mine site, it's discovered land coverage in the forms of air/sea ports, shrubs, shrub swamp, secondary dryland forest, primary mangrove forest, secondary mangrove forest, secondary peat swamp forest, plantation forest, settlement, agriculture, dry field agriculture, mixed dry field agriculture, field, dam, clearing, and transmigration area. Moreover, there exists a conservation site in the form of Raya Bukit Soeharto Forest Park around this mine site. Based on land coverage information that's received, it's been discovered an ecosystem of primary mangrove forest that has high biodiversity potential for its role as a species

habitat. The existence of mines surrounding this ecosystem could potentially degrade the quality and quantity of habitats for the species that lives inside said ecosystem. Apart from those, it's also discovered land coverage in the form of dams as a source of income for locals that could be damaged as an impact of mining activities around the area.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are two companies that hold PT Multi Harapan Utama shares directly. First is PT Pakarti Putra Sang Fajar with a controlling stake of 90%. The second Stakeholder is PT Agata Nugraha Nastari, with a controlling stake of 10%. The stakeholder map of PT Multi Harapan Utama can be seen in Figure 3.24.

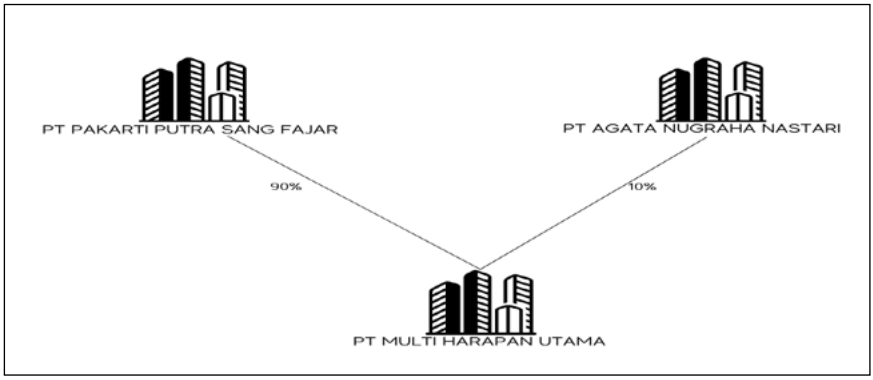


Figure 3. 24. Stakeholder Map of PT Multi Harapan Utama

3.3.5. PT Batubara Selaras Sapta (Category: High)

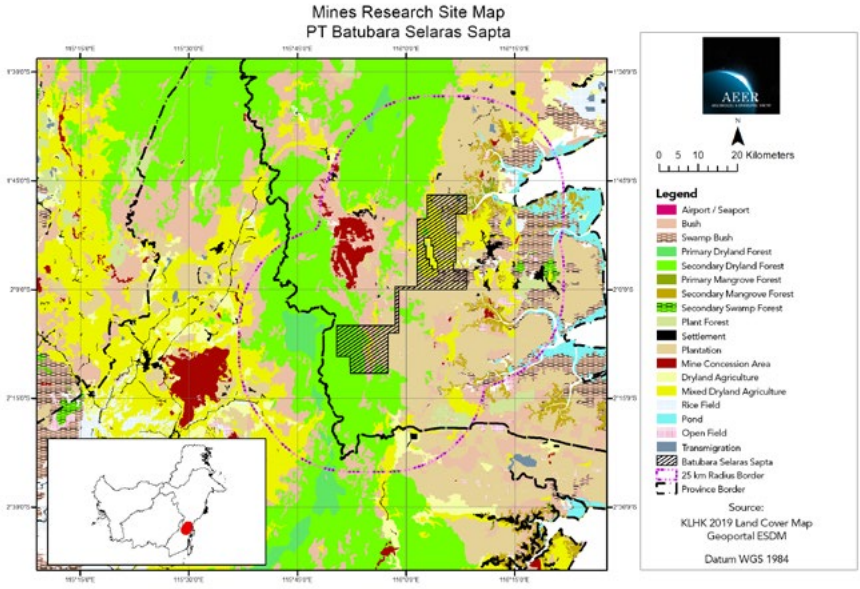


Figure 3. 25. Map of PT Batubara Selaras Sapta

PT Batubara Selaras Sapta is a mining company that has PKP2B type of permit with an area of 39,010 Ha in Pasir Regency, East Kalimantan. This company has a high threat level with a score of 15. According to GBIF data, endemic species in accordance with IUCN to be found surrounding this area are *Hylobates muelleri*, *Microhyla borneensis*, *Nasalis larvatus*, and *Pterospermum fuscum*. Species that are being protected by KLHK to be found in this mine site are 13 species. *Eretmochelys imbricata* is a species with IUCN C*ritically endangered* status that is at this surrounding mine site,

Based on land coverage identification, it's discovered land coverage in the forms of air/sea ports, shrubs, shrub swamp, primary dryland forest, secondary dryland forest, primary mangrove forest, secondary mangrove forest, secondary peat swamp forest, plantation forest, settlement, agriculture, dry field agriculture, mixed dry field agriculture, field, dam, clearing, and transmigration area. Moreover, there exist conservation sites in the forms of

Alam Teluk Adang Preserve, Alam Teluk Apar Preserve, and Raya Lati Petangis Forest Park around this mine site. Primary dryland and primary mangrove forests have a high potential to be wildlife habitats in this surrounding area. With the occurrence of mining activities, habitat degradation could happen to primary dryland and mangrove forest around this area. This could implicate the declining quality and quantity of habitats surrounding this mine site, which will affect the reducing biodiversity in this area.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are five companies that hold PT Batubara Selaras Sapta shares directly. First is Tjhin Khiauw Sen, with a controlling stake of 60%. The second Stakeholder is Fam Fendy Hartono, with a controlling stake of 15%. The third Stakeholder is Phoa Hermanto Sundjojo, with a controlling stake of 10%. The fourth Stakeholder is Ian Pich Siagian, with a controlling stake of 10%. The fifth Stakeholder is Yulis Suhadi, with a controlling stake of 5%. The stakeholder map of PT Batubara Selaras Sapta can be seen in Figure 3.26.

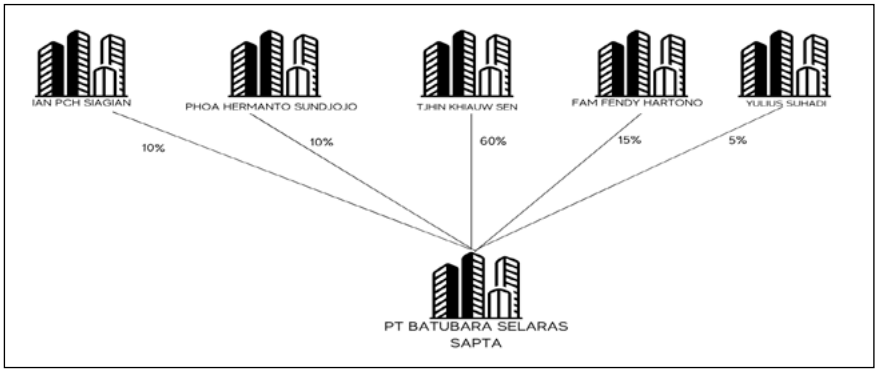


Figure 3. 26. Stakeholder Map of PT Batubara Selaras Sapta

3.3.6. PT Indominco Mandiri (Category: High)

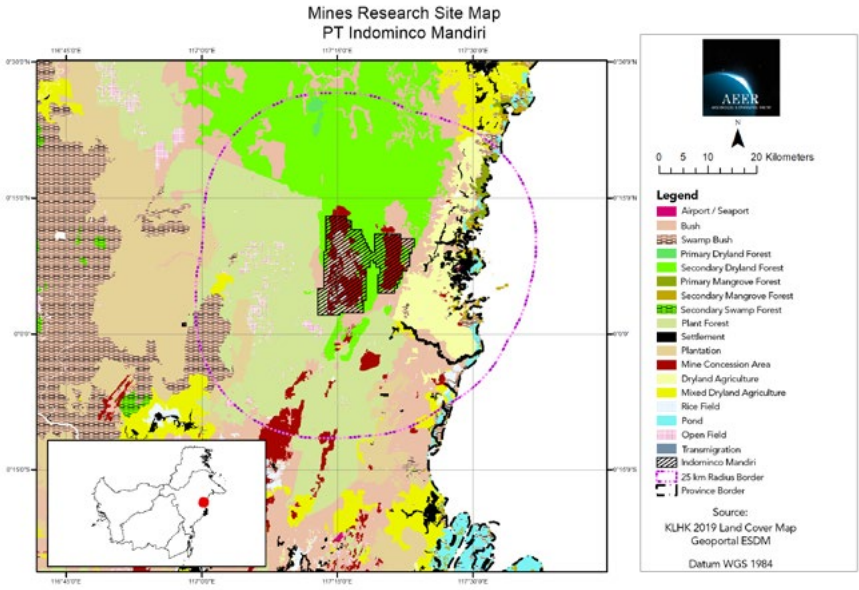


Figure 3. 27. Map of PT Indominco Mandiri

PT Indominco Mandiri is a mining company with PKP2B type of permit with an area of 24,121 Ha in East Kutai, East Kalimantan. This company has a high threat level with a score of 11. According to GBIF and IUCN data, 10 species with vulnerable susceptibility levels are discovered, namely *Acropora elegans, Acropora kirstye*, *Acropora tenella*, *Argusianus argus*, *Buceros rhinoceros, Leptoptilos javanicus*, *Lophura ignita, Mulleripicus pulverulentus*, *Rhyticeros undulatus*, and *Spilornis kinabaluensis.* Apart from those, 1 species with an endangered susceptibility level is found to be surrounding this mine site, that is Ciconia stormi. If referencing data of protected species by KLHK, it's been registered 34 protected species around this mine site. It's discovered 1 endemic species surrounding this area, namely *Rasbora rutteni*. The existence of these protected species indicates that there are suitable vital habitats for the continuity of mentioned species around this area. Mining activities in this surrounding area can potentially cause degradation of species' habitats and

could impact the population size reduction for said species.

Besides disrupting land species' activities, PT Indominco Mandiri's mining also endangers water biomes at this surrounding mine site. The impacts that will occur according to ANDAL (2018) PT. Indominco Mandiri, if coal mining is conducted, is the declining water quality that is around this mine site. The construction of an *in-pit crusher conveyor* (IPCC) impacts the exposure to acidic water (AAT). Other activities that could be dangerous are land mine-clearing activities that could cause an increase in sedimentation in rivers. The consequence of the increase in sedimentation will be the declining water quality that will affect its biomes. Organic substances from the remainder of tree loggings will cause water decay and affect the contents dissolved in oxygen. Increased sedimentation will also cause turbidity that will tribulate light entry into waters.

In 2020, Jaringan Advokasi Tambang East Kalimantan discovered that waste from settling ponds distributed to Palakan river that meets with Santan river has a pH that exceeds the threshold of quality standard. pH that is found at these *settling ponds*, river body of Palakan river, and the estuary of Palakan river have values of 2.57; 2.73; and 2.69. These are very dangerous to the water ecosystem. PT Indominco Mandiri has violated regulations regarding water pollution based on East Kalimantan Provincial Regulation No. 02 the Year 2011 and Government Regulation No. 82 the Year 2001 regarding Water Quality Management and Water Population Control. The increased water acidification complicates shelled organisms accessing carbonate ions, which is essential for producing their hard exoskeletal shells. Marine calcifying organisms span the food chain from autotrophs

to even heterotrophs, including organisms such as coccolithophores, coral, foraminifera, echinodermata, crustacea, and mollusca. As explained above, calcite and aragonite are stable on water surfaces because carbonate ions are at a saturated concentration in normal conditions. However, when water's pH decreases, carbonate ion concentration also decreases, and when carbonate is less saturated, the structure created from carbonate calcium becomes

vulnerable to dispersion. Hence, even if there's no change in the calcification rate, the dissolving calcareous materials rate still increases (Nienhuis et al., 2010). In the case of the Santan river, difficulty in discovering Mussels is suspected due to water acidification caused by mine waste of PT Indominco Mandiri.

Based on land coverage identification that's conducted around this area, it is discovered land coverage in the forms of air/sea ports, shrubs, shrub swamp, primary dryland forest, secondary dryland forest, primary mangrove forest, secondary mangrove forest, plantation forest, settlement, agriculture, dry field agriculture, mixed dry field agriculture, field, dam, and clearing. Moreover, this mine site is located around the Kutai National Park conservation site. It has been discovered ecosystems in the form of dryland forests and mangrove forests that have high potential as flora and fauna habitat around this mine site. Mining activities around this area can degrade the mangrove ecosystem that surrounds it. This can damage the quality of flora and fauna habitats that inhabit the said ecosystem.

In an interview conducted by AEER in 2021 at Desa Santan Ulu, Central Santan, Santan Ilir, and Kadere Bay, located in the surrounding area of PT Indominco Mandiri, locals still experienced encounterance with protected faunas in the surrounding mine site. These protected faunas still encountered by locals are python snakes, monkeys, crocodiles, sun bears, hornbill, Bornean white-bearded gibbon, clouded leopard, wild boar, pangolins, proboscis monkey, orangutan, and deer. The encounterance between locals and these protected faunas indicates the existence of these fauna habitats in this surrounding mine site.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are two companies that hold PT Indominco Mandiri shares directly. First is PT Indo Tambangraya Megah, with a controlling stake of 99.9%. The second Stakeholder is PT Kitadin, with a controlling stake of 0.01%. The stakeholder map of PT Indominco Mandiri can be seen in Figure 3.28.

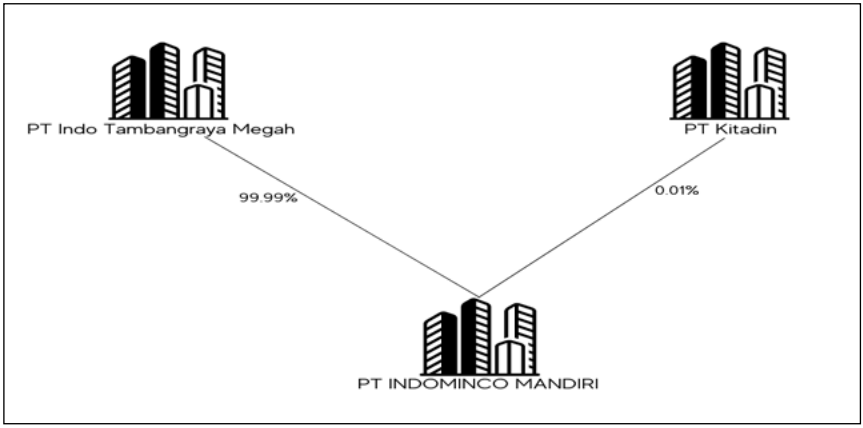


Figure 3. 28. Stakeholder Map of PT Indominco Mandiri

3.3.7. PT Trubaindo Coal Mining (Category: Moderate)

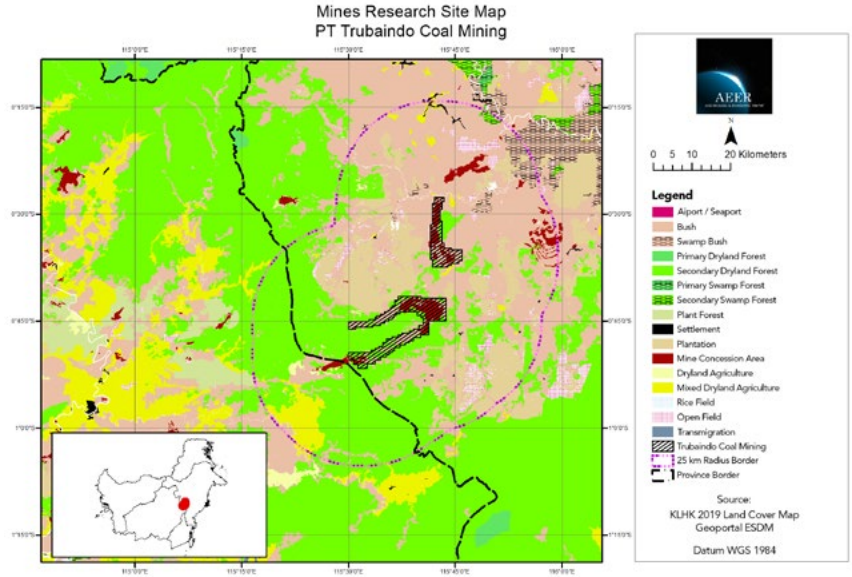


Figure 3. 29. Map of PT Trubaindo Coal Mining

PT Trubaindo Coal Mining is a coal mining company with a PKP2B type of

permit with an area of 22,687 Ha in West Kutai, East Kalimantan. This company has a moderate threat level with a score of 10. Around this mine site, there are 2 species with *endangered* susceptibility levels, namely *Dipterocarpus tempehes* and *Shorea bracteolata*. However, 15 species are registered on the list of protected species by KLHK in this mine site. These species are A*ccipiter trivirgatus* (crested goshawk), *Aethopyga siparaja*, *Anthracoceros albirostris, Haliastur indus*, *Harpactes diardii*, *Loriculus galgulus*, *Nisaetus cirrhatus* (changeable hawk-eagle), *Psilopogon monticola*, *Psilopogon mystacophanos* (red throated-barbet), *Psilopogon pulcherrimus, Psilopogon rafflesii* (red-crowned barbet), *Psittinus cyanurus* (blue-rumped parrot), *Rhipidura javanica*, and *Spilornis cheela* (crested serpent eagle). Apart from those, two endemic species are registered in this mine site, namely *Rasbora johannae* and *Rasbora trifasciata*. The existence of endemic and protected species around this area indicates suitable habitats for mentioned species in this surrounding area. Mining activities have the potential to cause degradation of endemic and protected species' habitats that are in this surrounding mine site.

Based on land coverage identification that's been conducted, land coverage is discovered in the forms of shrubs, shrub scrubs, secondary dryland forest, secondary peat swamp forest, settlement, agriculture, dry field agriculture, mixed dry field agriculture, and clearing. Moreover, this mine site is located around the Alam Padang Lalay Preserve conservation site. Although it was not found in primary ecosystems around the mine site, secondary ecosystems such as secondary dryland forests have an important role as wildlife habitats around this mine site. With the occurrence of mining activities surrounding this ecosystem, subsequently, this ecosystem can experience degradation due to extractive activities conducted at this mine site. Degradation in this ecosystem can implicate the declining quality as well as quantity of habitats in the said ecosystem, which will impact the reduction of biodiversity around this mine site.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are two companies that hold PT Trubaindo Coal Mining shares directly. First is PT Indo Tambangraya Megah, with a controlling stake of

99.9%. The second Stakeholder is PT Kitadin, with a controlling stake of 0.01%. The stakeholder map of PT Trubaindo Coal Mining can be seen in Figure 3.30.

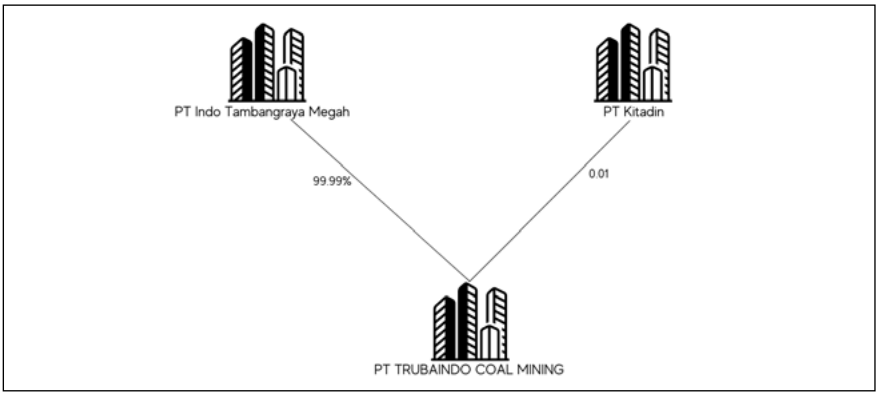


Figure 3. 30. Stakeholder Map of PT Trubaindo Coal Mining

3.3.8. PT Singlurus Pratama (Category: High)

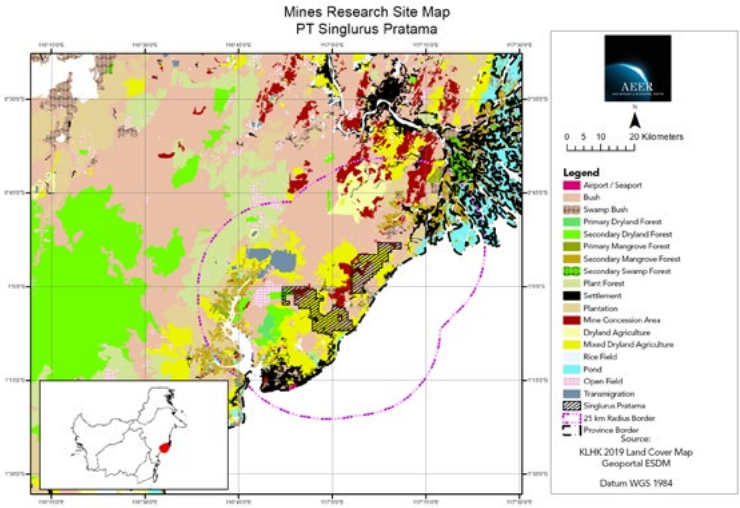


Figure 3. 31. Map of PT Singlurus Pratama Coal

PT Singlurus Pratama Coal is a mining company with a PKP2B type of permit

with an area of 21,699 Ha in East Kalimantan. This company has a high threat biodiversity level with a score as high as 15. It's been registered around 38 species with vulnerable susceptibility levels, 12 species with *endangered* susceptibility levels, and 2 species with *critically endangered* susceptibility levels around this site. Species with vulnerable susceptibility levels in this site are *Acridotheres javanicus*, *Acropora tenella*, *Alpinia ligulata*, *Alseodaphne elmeri* (big leaf tegula), *Anisoptera marginata Anthracoceros malayanus, Argusianus argus*, *Buceros rhinoceros*, *Centropus rectunguis*, *Cotylelobium lanceolatum*, *Ctenolophon parvifolius*, *Dipterocarpus gracilis*, *Durio dulcis*, *Durio graveolens, Etlingera aurantia*, *Helarctos malayanus*, *Hemipristis elongata* (snaggletooth shark), *Hopea beccariana*, *Hopea sangal*, *Leptoptilos javanicus*, *Lophura ignita*, *Madhuca sericea* (melikuran), *Maxomys whiteheadi*, *Mulleripicus pulverulentus*, *Nisaetus nanus*, *Nothaphoebe foetida*, *Quercus gaharuensis*, *Rhyticeros undulatus*, *Rollulus rouloul* (crested partridge), *Setornis criniger*, *Shorea guiso*, *Shorea laevis*, *Shorea macrobalanos*, *Shorea poyandra, Sus barbatus*, *Tetramerista glabra*, *Treron capellei* (large green pigeon), and *Vatica pauciflora* (vatica pauciflora). Species with *endangered* susceptibility levels in this site are *Anisoptera costata, Aquilaria microcarpa*, *Dipterocarpus grandiflorus*, *Dipterocarpus tempehes*, *Etlingera balikpapanensis* (balikpapan ginger), *Hopea cernua*, *Hopea pedicellata*, *Hylobates muelleri*, *Nasalis larvatus, Polyplectron schleiermacheri*, and *Tachypleus tridentatus.* Species with critically endangered susceptibility levels are *Hopea rudiformis* and *Sphyrna lewini* (scalloped hammerhead). Apart from those, there are as many as 60 protected species based on a list of protected species by KLHK around this mine site. At this site, 12 endemic species and a few with high economic value are registered. The presence of mines around mentioned species threatens biodiversity through habitat degradation and pollution generated from mining activities. Harmful mining activities towards the material cycle around this site can influence the availability of natural resources of habitats that can be utilized for mentioned species to survive. This could implicate the decrease in population for endemic and protected species around this site.

Based on land coverage identification that's conducted around this site, it is discovered land coverage in the forms of air/sea ports, shrubs, shrub scrubs,

primary dryland forest, secondary dryland forest, primary mangrove forest, secondary mangrove forest, secondary peat swamp forest, plantation forest, settlement, agriculture, dry field agriculture, mixed dry field agriculture, field, dam, clearing, and transmigration area. Moreover, there exists a conservation site in the form of Raya Bukit Soeharto Forest Park around this mine site. It has been discovered some ecosystems that can become vital habitats, namely primary dryland forest and primary mangrove forest surrounding this site. The presence of mines could threaten the ecosystem's quality as wildlife habitats. Ecosystem degradation will reduce habitat quality and potentially reduce the population size of the wildlife ecosystems.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are four companies that hold PT Singlurus Pratama Coal shares directly. First is Lanna Resources Public Co. Ltd., with a controlling stake of 65%. The second Stakeholder is PT Indocoal Pratama Jaya, with a controlling stake of 15%. The third Stakeholder is PT Harita Jayaraya, with a controlling stake of 12%. The fourth Stakeholder is PT Ambhara Karya Perdana, with a controlling stake of 9%. The stakeholder map of PT Singlurus Pratama Coal can be seen in Figure 3.32.

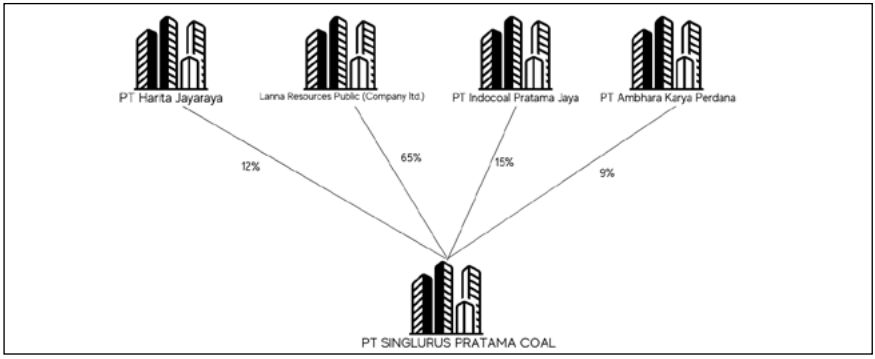


Figure 3. 32. Stakeholder Map of PT Singlurus Pratama Coal

3.3.9. PT Gunung Bayan Pratama Coal (Category: High)

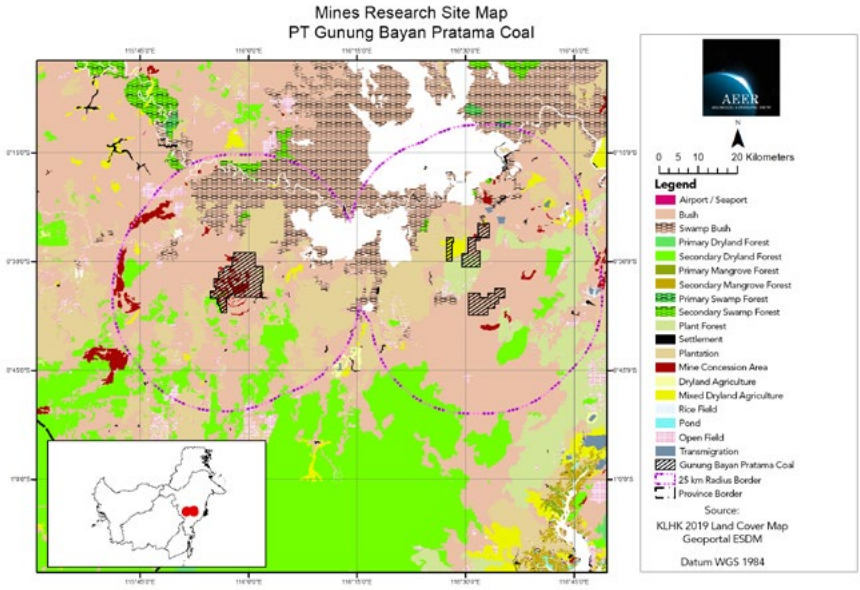


Figure 3. 33. Map of PT Gunung Bayan Pratama Coal

PT Gunung Bayan Pratama Coal is a mining company with PKP2B type of permit with an area of 20,275 Ha in Kutai Kartanegara, East Kalimantan. This company has a high threat level with a score as high as 13. 13 species with *vulnerable* susceptibility levels and 3 species with endangered susceptibility levels are registered around this mine site. Species with vulnerable susceptibility levels are *Acridotheres javanicus*, *Anisoptera laevis, Anthracoceros malayanus*, *Argusianus argus*, *Buceros rhinoceros*, *Egretta eulophotes Leptoptilos javanicus*, *Lophura ignita*, *Mulleripicus pulverulentus, Nisaetus nanus*, *Rhyticeros undulatus*, *Rollulus rouloul*, and *Treron capellei.* Species with endangered susceptibility levels around this mine site are *Callicarpa anomala*, *Ciconia stormi,* and *Plagiostachys crocydocalyx*. If referencing from the list of protected species by KLHK, it's been registered that as many as 54 protected species are at this surrounding mining company. Apart from those, 5 endemic species are registered around this mine site, namely *Acridotheres javanicus*, *Dicaeum trochilaeum*, *Macaranga*

winkleri, *Mallotus sumatranus*, and *Rasbora trifasciata*. Mining activities at this company could disrupt the presence of endemic and protected species around this mine site.

Based on land coverage identification that's conducted around this company, it is discovered land coverage in the forms of shrubs, shrub scrubs, secondary dryland forest, primary peat swamp forest, secondary peat swamp forest, plantation forest, settlement, agriculture, dry field agriculture, mixed dry field agriculture, clearing, and transmigration area Moreover, there exist conservation sites in the forms of Alam Muara Kaman Sedulang Preserve, Alam Padang Lalay Preserve, and Raya Bukit Soeharto Forest Park. Primary peat swamp forest that has the potential to become wildlife habitats for flora and fauna around this mine site is present. No ecosystem area was found in the form of primary dryland and mangrove forests. However, secondary dryland forests are discovered, and that can still be used for wildlife as a habitat. Although the potential of secondary dryland forest is not as high as primary dryland forest as a consequence of disruptions that have occurred in this site before, biodiversity contained in the ecosystem becomes a propelling degradation factor to habitats in that ecosystem.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are four companies that hold PT Gunung Bayan Pratama Coal shares directly. First is PT Metalindo Prosestama, with a controlling stake of 97.39%. The second Stakeholder is PT Kaltim Bara Santosa, with a controlling stake of 1.56%. The third Stakeholder is Dato Low Tuck Kwong, with a controlling stake of 0.79%. The fourth Stakeholder is Engki Wibowo, with a controlling stake of 0.26%. The stakeholder map of PT Gunung Bayan Pratama Coal can be seen in Figure 3.34.

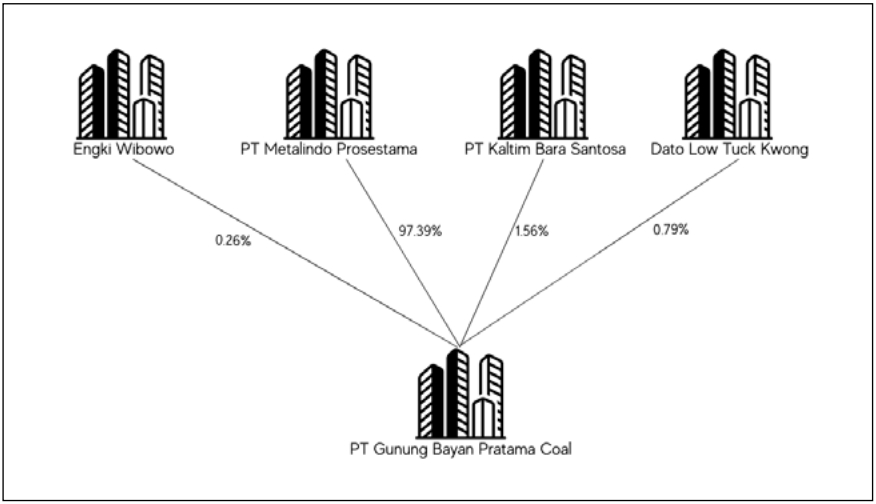


Figure 3. 34. Stakeholder Map of PT Gunung Bayan Pratama Coal

3.3.10. PT Tambang Damai (Category: High)

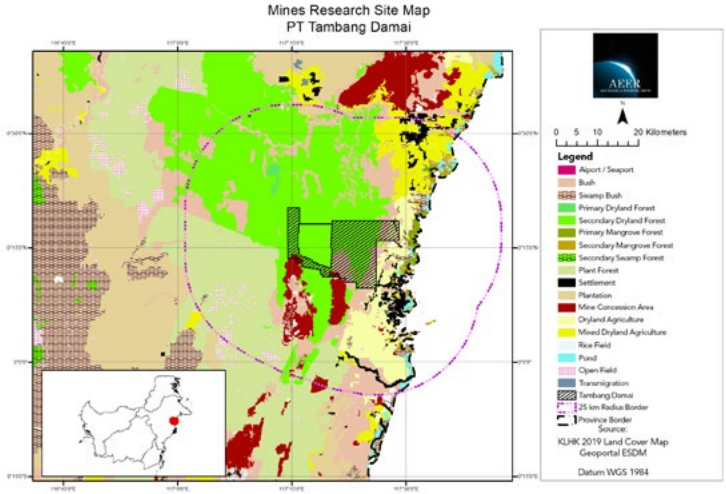


Figure 3. 35. Map of PT Tambang Damai

PT Tambang Damai is a mining company with a PKP2B type of permit with an

area of 24,391 Ha in East Kalimantan. This company has a high biodiversity threat level with a score as high as 12. According to GBIF data, 12 species with vulnerable susceptibility levels and 3 species with *endangered* susceptibility levels are registered. Species with *vulnerable* susceptibility levels around at mine site are *Alpinia ligulata*, *Anthracoceros malayanus*, *Argusianus argus, Buceros rhinoceros*, *Centropus rectunguis, Leptoptilos javanicus*, *Lophura ignita*, *Mulleripicus pulverulentus, Rhyticeros undulatus*, *Setornis criniger, Spilornis kinabaluensis*, and *Teijsmanniodendron scaberrinum*. Species with endangered susceptibility levels at this mine site are *Berenicornis comatus, Ciconia stormi,* and *Shorea gratissima*. If referencing from the list of protected species by KLHK, it's been registered that 45 protected species are around this site. Apart from those, 1 endemic species was found around this mine site, namely *Rasbora rutteni*. The presence of protected species around this mine site indicates there are habitats to be living space for mentioned species around this mine site. Those habitats' quality and the amount must be maintained to protect said species from the threat of extinction. The occurrence of mining activities around the species' habitats could damage and eliminate the habitats of these protected species. This will implicate the population decline of said species as a consequence of the reduction in the number of suitable habitats to inhabit.

Based on land coverage identification around this mine site, it is discovered land coverage in the forms of air/sea ports, shrubs, shrub scrubs, primary dryland forest, secondary dryland forest, primary mangrove forest, secondary mangrove forest, plantation forest, settlement, agriculture, dry field agriculture, mixed dry field agriculture, field, dam, and clearing. Moreover, this mine site is located around a conservation site of Kutai National Park. Land coverage in the forms of dryland and mangrove forests can potentially become habitats for species around this area. This land coverage potential as a habitat must be maintained from disruptions and external degradation that could happen, one of them being from its surrounding mining activities.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are two companies that hold PT Tambang Damai shares directly. First is PT Damai Mining, with a controlling stake of 99.9%. The second Stakeholder is PT Harumindo Bara Perdana, with a controlling stake of 0.01%. The stakeholder map of PT Tambang Damai can be seen in Figure 3.36.

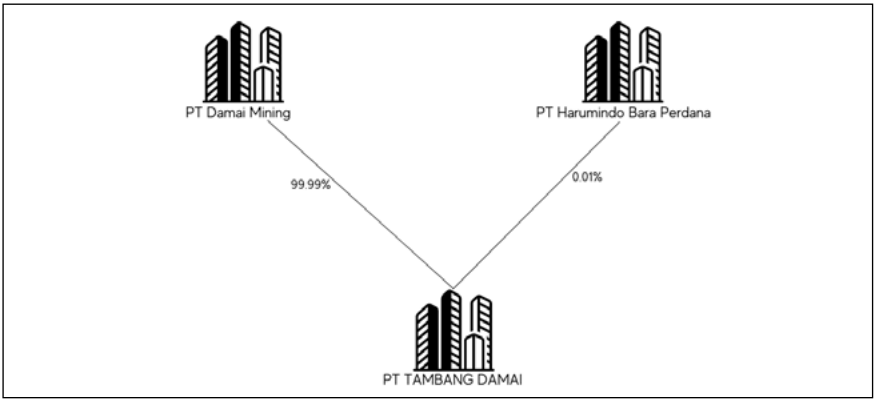


Figure 3. 36. Stakeholder Map of PT Tambang Damai

3.3.11. PT Perkasa Inakakerta (Category: High)

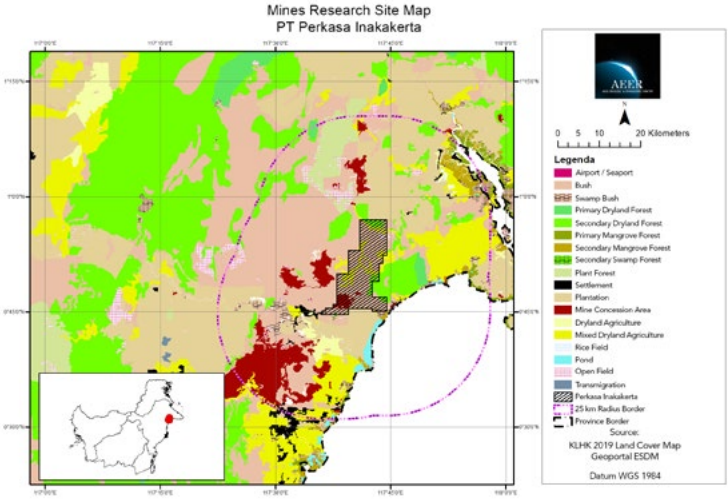


Figure 3. 37. Map of PT Perkasa Inakakerta

PT Perkasa Inakakerta is a mining company with PKP2B type of permit with an area of 19,050 Ha in East Kutai, East Kalimantan. This company has a high biodiversity threat level with a score of 13. According to GBIF and IUCN notes, 13 species with vulnerable susceptibility levels and 2 species with endangered susceptibility levels were found around this area. Species with vulnerable susceptibility levels at this mining are *Acridotheres javanicus, Alpinia ligulata*, *Alveopora daedalea*, *Argusianus argus, Beilschmiedia wieringae*, *Buceros rhinoceros*, *Goniopora planulata*, *Heliopora coerulea, Leptoptilos javanicus*, *Lophura ignita*, *Nisaetus nanus*, *Pavona danai*, and *Rhyticeros undulatus*. According to the list of protected species by KLHK, it's been registered as many as 31 protected species at this surrounding mine site. Apart from those, 2 endemic species were discovered around this mine site, namely *Acridotheres javanicus* and *Eryhtropitta ussheri*. The presence of protected species at this surrounding mine site indicates that there are habitats to become living spaces for said species. These habitats' quality and the amount must be maintained to protect said species from the threat of extinction. Mining activities conducted around these species' habitats could damage and eliminate habitats of the protected species. This will implicate the species' population decline due to suitable habitats amount reduction to inhabit.

Based on land coverage identification at this surrounding mining company, it is discovered land coverage in the forms of air/sea ports, shrubs, shrub scrubs, primary dryland forest, secondary dryland forest, primary mangrove forest, secondary mangrove forest, secondary peat swamp forest, plantation forest, settlement, agriculture, dry field agriculture, mixed dry field agriculture, field, dam, and clearing. Moreover, this mine site is located around a conservation site of Kutai National park. Land coverage was discovered in the forms of dryland forest and mangrove forest around the mine site. Dryland forests and mangrove forests are essential land coverage for biodiversity as they have the potential for habitats for diverse groups of species. The presence of coal mining activities around this ecosystem will cause habitat degradation in said ecosystems and implicate the decline of biodiversity in impacted areas.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are two companies that hold PT Perkasa Inakakerta shares directly. First is PT Bayan Resources, with a controlling stake of 75%. The second Stakeholder is PT Bayan Energy, with a controlling stake of 25%. The stakeholder map of PT Perkasa Inakakerta can be seen in Figure 3.38.

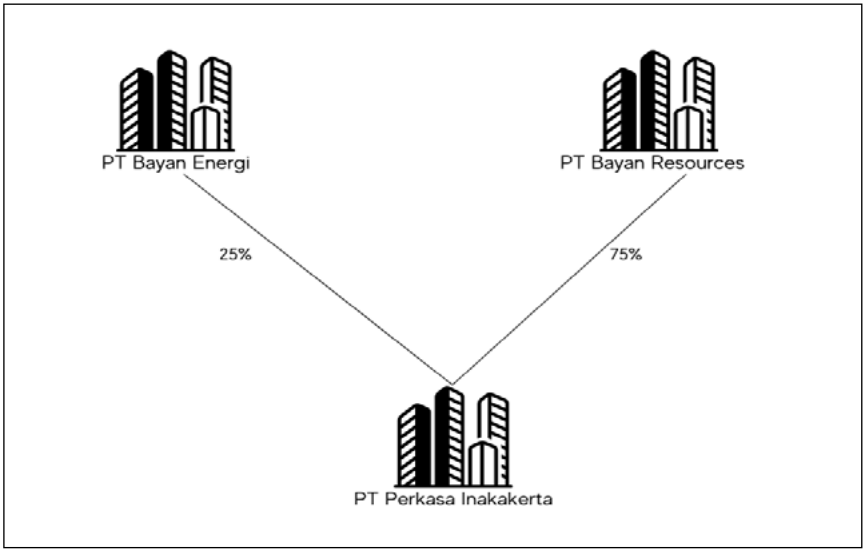


Figure 3. 38. Stakeholder Map of PT Perkasa Inakakerta

3.3.12. PT Kartika Selabumi Mining (Category: High)

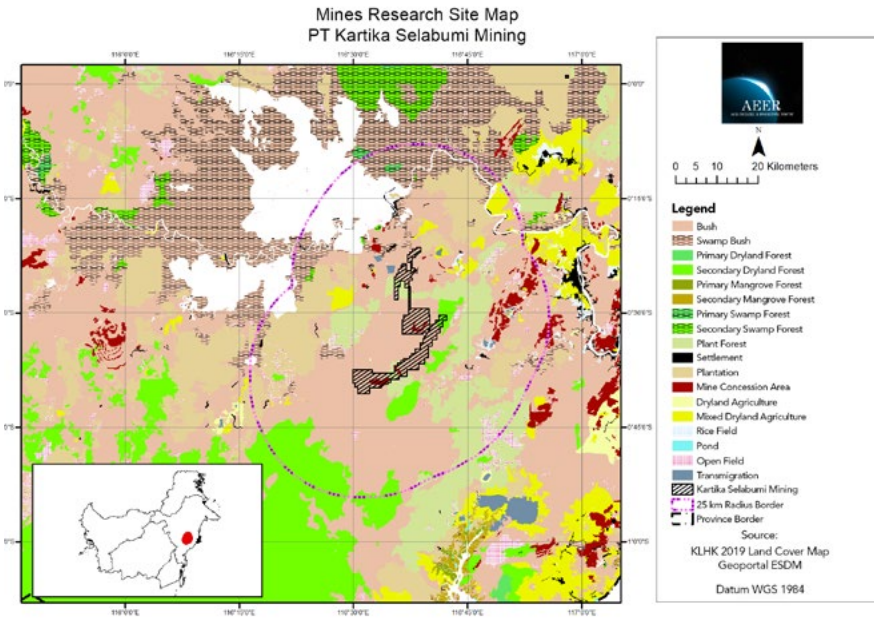


Figure 3. 39. Map of PT Kartika Selabumi Mining

PT Kartika Selabumi Mining is a mining company with PKP2B type of permit with an area of 15,000 Ha in Kutai Kartanegara, East Kalimantan. This mining company has a high biodiversity threat level with a score as high as 12. In this area, it's registered 2 species with vulnerable susceptibility levels, namely *Anisoptera laevis* and *Leptoptilos javanicus*, as well as 1 species with endangered susceptibility level, namely *Ciconia stormi*. No species were found with *critically endangered* susceptibility levels in this surrounding area. If referencing from the list of protected species by KLHK, 17 protected species are registered in this surrounding area. Apart from those, there are 4 endemic species found around this mine site. These species are *Macaranga winkleri*, *Mallotus sumatranus*, *Puntigrus pulcher*, and *Rasbora johannae*. The presence of endemic species in this surrounding area indicates there are endemic species habitats at this surrounding mine site, and these endemic species are not found outside the region of Kalimantan. Mining activities around

these species' habitats will damage endemic species habitats that are in its surrounding area and potentially reduce the population size of said species.

Based on land coverage identification that's conducted around this mine site, it is discovered land coverage in the forms of shrubs, shrub scrubs, secondary dryland forest, primary dryland forest, secondary peat swamp forest, plantation forest, settlement, agriculture, dry field agriculture, mixed dry field agriculture, field, clearing, and transmigration area. Moreover, there exists a conservation site in the form of Alam Muara Kaman Sedulang Preserve around this mine site. The presence of peat swamp forest as land coverage has a vital role as a habitat for species that live at the surrounding mine site. Although available land coverage of dryland forest around the mine site is secondary forest, these ecosystems must be maintained to protect species that inhabit said ecosystems. Mining activities around these ecosystems potentially disrupt ecosystems' equilibrium and could cause habitat degradation for living species inside it.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are two companies that hold PT Kartika Selabumi Mining shares directly. First is PT Marino Mining International, with a controlling stake of 99%. The second Stakeholder is Ny. Tjandra Sari with a controlling stake of 1%. The stakeholder map of PT Kartika Selabumi Mining can be seen in Figure 3.40.

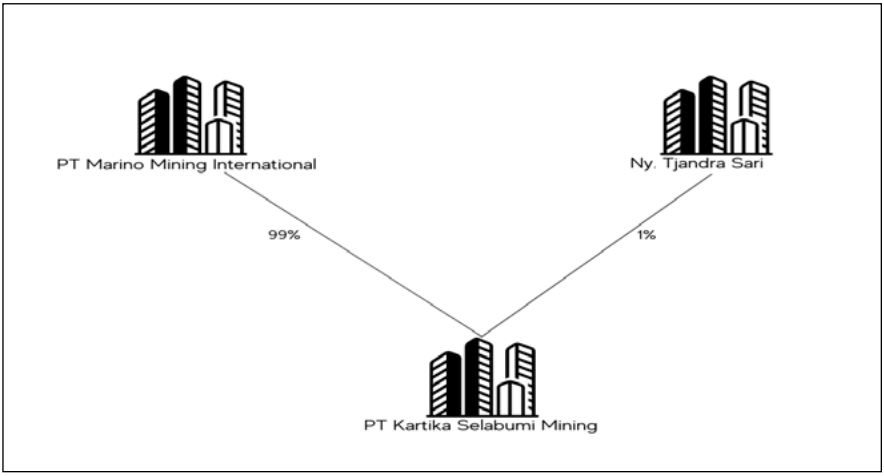


Figure 3. 40. Stakeholder Map of PT Kartika Selabumi Mining

3.3.13. PT Nusantara Santan Coal (Category: High)

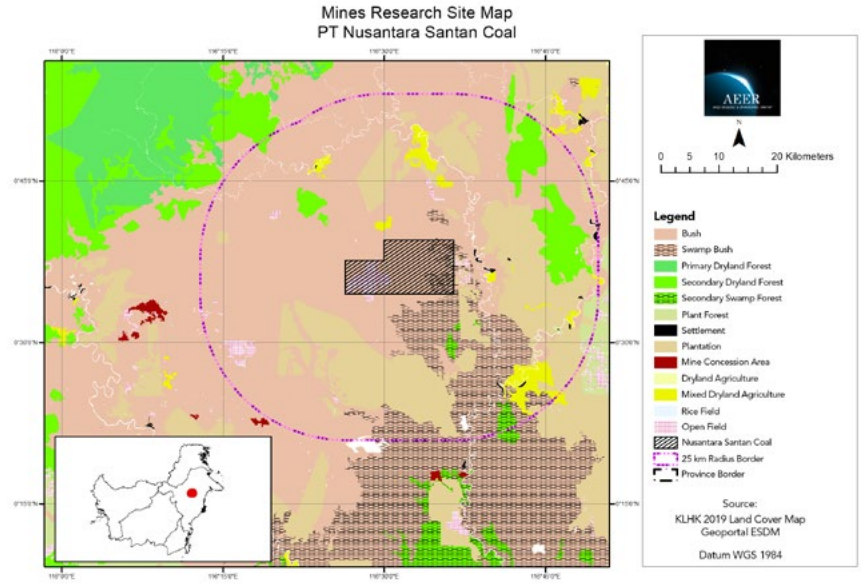


Figure 3. 41. Map of PT Nusantara Santan Coal

PT Nusantara Santan Coal is a mining company with an IUP type of permit with an area of 14,990 Ha in East Kutai, East Kalimantan. This mining company has a high biodiversity level, scoring as high as 11. According to GBIF and IUCN data, 5 species with *vulnerable* susceptibility levels and 1 species with *endangered* susceptibility levels were found. Species with vulnerable susceptibility levels at this surrounding mine site are *Alpinia ligulata*, *Durio dulcis*, *Endiandra ochracea*, *Hopea sangal*, and *Shorea laevis*. The species with an endangered susceptibility level at this surrounding mine site is *Leiocassis rudicula*. If referencing from the list of protected species by KLHK, 5 protected species were found at this surrounding mine site. These species are *Agathis borneensis*, *Crocodylus porosus*, *Psilopogon henricii*, *Psittacula longicauda*, and *Spilornis cheela*. Apart from those, 2 endemic species were also found around this mine site, namely *Leiocassis rudicula* and *Syzygium magnoliifolium*. This indicates that there are suitable habitats to be inhabited by said species around this mine site. The presence of these species must be maintained by preserving habitats' quality and reducing disruptions that could occur in these species' habitats. Mining activities that this company conducts can potentially threaten the sustainability of these species to survive in their habitats.

Based on land coverage identification conducted at this surrounding mining company, land coverage is discovered in the forms of shrubs, shrub scrubs, secondary dryland forest, plantation forest, settlement, agriculture, mixed dry field agriculture, and clearing. Moreover, this mine site is located around the conservation sites of Alam Muara Kaman Sedulang Preserve and Kutai National Park. Ecosystems in the form of secondary dryland forests and secondary peat swamp forests become significantly essential to protect, especially with the existence of *Leiocassis rudicula*, which is a type of endemic catfish of Kalimantan. Mining activities that are conducted by this company potentially damage ecosystem processes that occur on a landscape scale. This could implicate essential ecosystems that have a role as habitats for various species at this surrounding mine site.

3.3.14. PT Nusantara Wahau Coal (Category: Moderate)

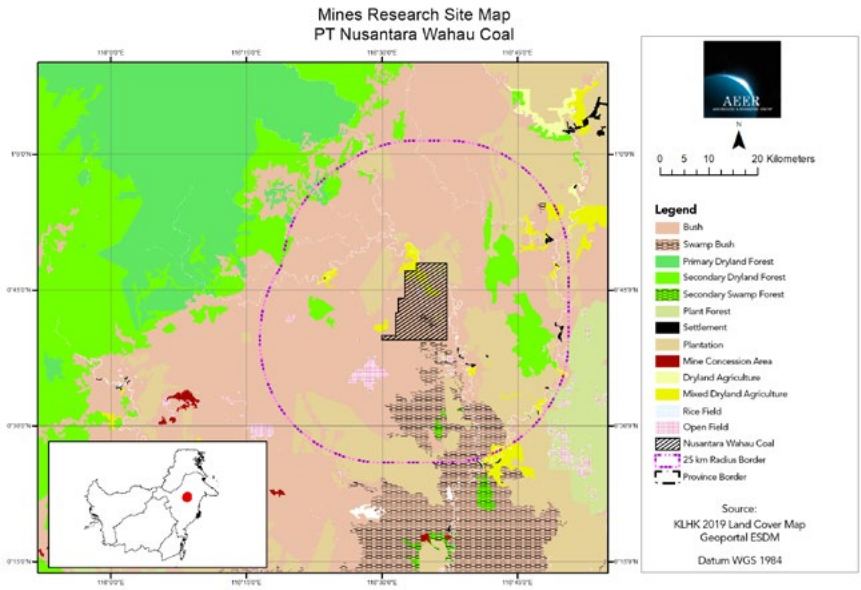


Figure 3. 42. Map of PT Nusantara Wahau Coal

PT Nusantara Wahau Coal is a coal mining company with an IUP type of permit with an area of 14,890 Ha in East Kutai, East Kalimantan. This company has a moderate biodiversity threat level with a score of 7. Around this mining company, it is discovered that 1 species with *vulnerable* susceptibility level, namely *Hopea sangal*. Apart from that, 1 endemic species was also found around this mine site, namely *Syzygium magnoliifolium*. It's also registered a tree species, *Dillenia excelsa*, that has decent economic utilization value that has the potential to be used for the prosperity of locals around this mine site. Sap from *Dillenia excelsa* can be used as a source of herbal medicine as well as its wood can be used as a construction material.

Based on land coverage identification that's conducted around this mining company, land coverage is discovered in the forms of shrubs, shrub scrubs, primary dryland forest, secondary dryland forest, secondary peat swamp forest, and plantation forest, settlement, agriculture, mixed dry field

agriculture, and clearing. Moreover, there exist conservation sites in the form of Alam Muara Kaman Sedulang Preserve and Kutai National park around this mine site. Ecosystems of dryland forests have the potential to become habitats for available species at the surrounding mine site. When disrupted as a consequence of the ongoing mining activities, biodiversity around this site will experience a decline because of the reduced habitable habitat for the species around the mine site.

There is no data for the owner/Stakeholder of PT Nusantara Wahau Coal at KESDM, Minerba Online Data Indonesia (MODI) official website.

3.3.15. PT Santan Batubara (Category: Moderate)

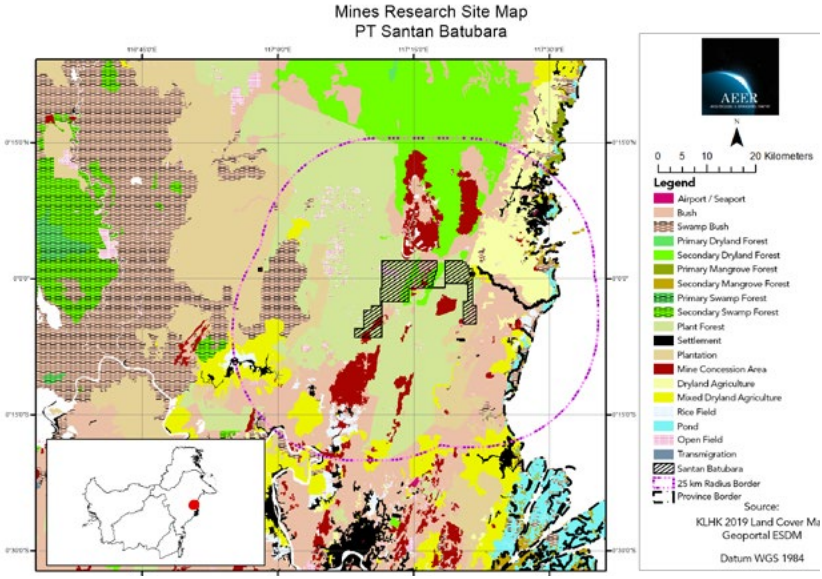


Figure 3. 43. Map of PT Santan Batubara

PT Santan Batubara is a coal mining company with a PKP2B type of permit with an area of 14,210 Ha in East Kalimantan. This company has a moderate biodiversity threat level with a score as high as 10. There are 7 species with *vulnerable* susceptibility levels at this surrounding mine site. These species

are *Acropora elegans*, *Acropora kirstyae*, *Acropora tenella*, *Anthracoceros malayanus*, *Argusianus argus*, *Lophura ignita*, and *Shorea guiso*. If referencing from the list of protected species by KLHK, 14 protected species are discovered at this surrounding mine site. Apart from those, 3 endemic species were also found around this mine site, namely *Mythus impluviatus*, *Rasbora laticlavia,* and *Rasbora rutteni*.

Based on land coverage identification that's conducted at this surrounding mine site, it is discovered land coverage in the forms of air/sea ports, shrubs, shrubs scrubs, secondary dryland forest, secondary mangrove forest, secondary peat swamp forest, plantation forest, settlement, agriculture, dry field agriculture, mixed dry field agriculture, field, clearing, and transmigration area. Around this mine site, there exists a conservation site in the form of Kutai National Park. Secondary dryland forests that are available play the role of species habitats surrounding this mine site. Although the potentials that are contained in secondary dryland forests are not as good as primary dryland forests as caused by disruptions that had occurred in these ecosystems, degradation of these secondary ecosystems will impact biodiversity around this mine site.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are two companies that hold PT Santan Batubara shares directly. First is PT Harum Energy, with a controlling stake of 99.9995%. The second Stakeholder is PT Sentral Batubara Jawa, with a controlling stake of 0.0005%. The stakeholder map of PT Santan Batubara can be seen in figure 3.44.

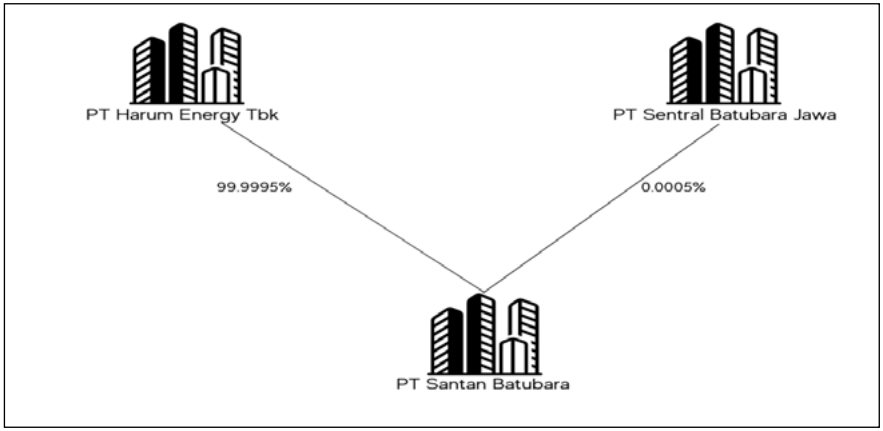


Figure 3. 44. Stakeholder Map of PT Santan Batubara

3.3.16. PT Firman Ketaun Perkasa (Category: High)

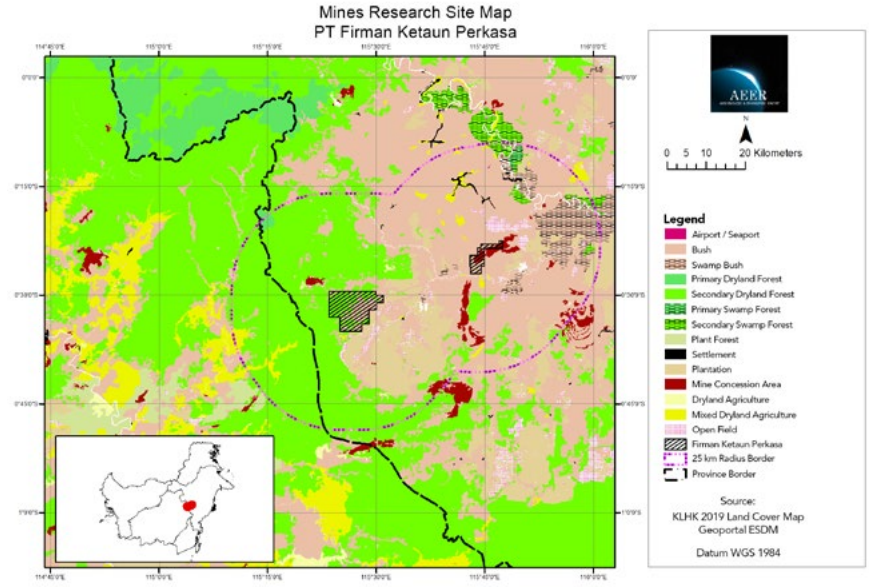


Figure 3. 45. Map of PT Firman Ketaun Perkasa

PT Firman Ketaun Perkasa is a coal mining company with PKP2B type of permit with an area of 10,220 Ha in West Kutai, East Kalimantan. This company has a high biodiversity threat level with a score as high as 12. According to GBIF and IUCN data, 1 species with a vulnerable susceptibility level and 4 species with an *endangered* susceptibility level are registered around this area. Species with *vulnerable* susceptibility levels at this surrounding mine site are *Anthracoceros malayanus*. Species with *endangered* susceptibility levels are *Callicarpa anomala*, *Dipterocarpus tempehes*, *Plagiostachys crocydocalyx,* and *Shorea bracteolata*. Based on the list of protected species by KLHK, 9 protected species are registered around this area. These KLHK-protected species are *Aethopyga siparaja*, *Anthracoceros malayanus*, *Haliastur indus, Loriculus galgulus*, *Microhierax fringillarius*, *Nisaetus cirrhatus*, P*latysmurus leucopterus*, *Psilopogon rafflesii*, and *Rhipidura javanica*. Apart from those, there are 2 endemic species around this mine site, namely *Macaranga winkleri* and *Rasbora trifasciata.*

Based on land coverage identification around this mine site, there is land coverage in the forms of air/sea ports, shrubs, shrub scrubs, primary dryland forest, secondary dryland forest, primary peat swamp forest, secondary peat swamp forest, settlement, agriculture, mixed dry field agriculture, and clearing. There exists a conservation site in the form of Alam Padang Lalay Preserve around this mine site. Primary ecosystems of dryland forest and peat swamp forest with the potential to hold high undisrupted biodiversity significantly were discovered. These ecosystems must be maintained from the degradation potentials of mining activities in their surrounding area.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are two companies that hold PT Firman Ketaun Perkasa shares directly. First is PT Bayan Resources, with a controlling stake of 75%. The second Stakeholder is PT Bayan Energy, with a controlling stake of 25%. The stakeholder map of PT Firman Ketaun Perkasa can be seen in Figure 3.46.

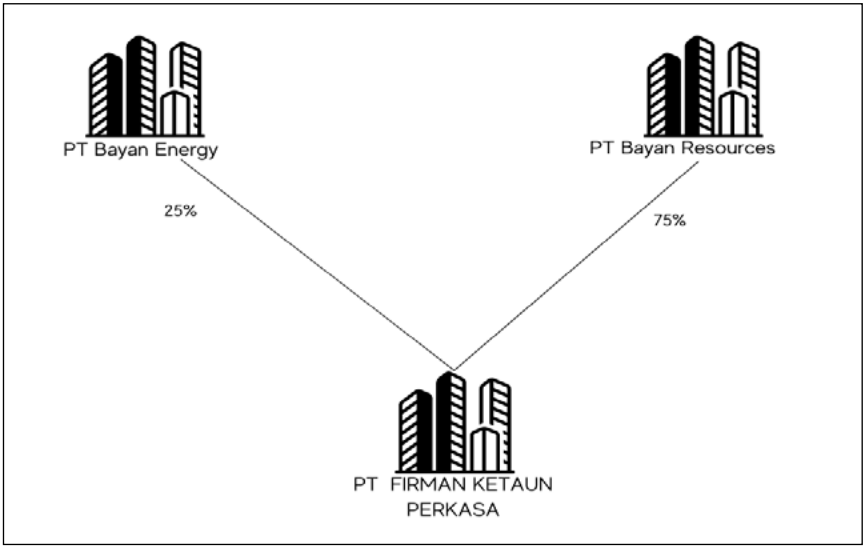


Figure 3. 46. Stakeholder Map of PT Firman Ketaun Perkasa

3.3.17. PT Insani Baraperkasa (Category: High)

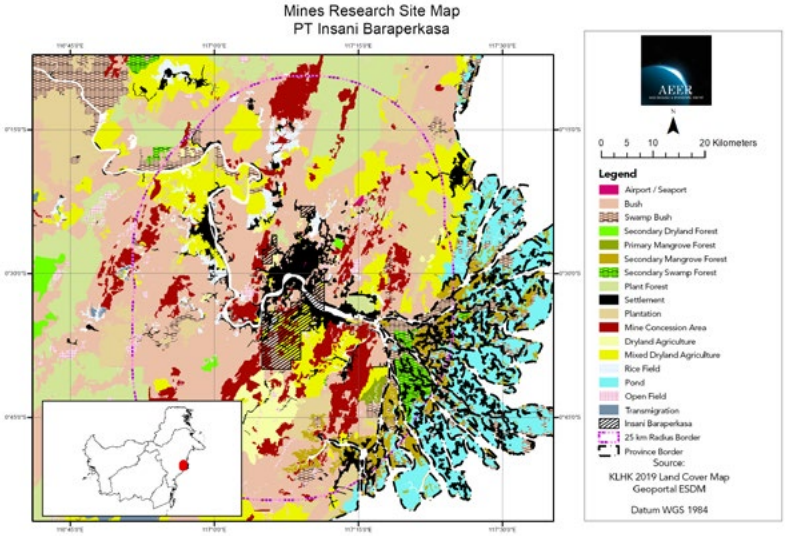


Figure 3. 47. Map of PT Insani Bara Perkasa

PT Insani Baraperkasa is a mining company with a PKP2B type of permit with an area of 24,477 Ha in East Kalimantan. This mining company has a high biodiversity threat level with a score of 14. According to GBIF and IUCN data, 17 species with *vulnerable* susceptibility levels, 4 with *endangered* susceptibility levels, and 1 with *critically endangered* susceptibility levels are registered around this mine site. Species with *vulnerable* susceptibility levels at this surrounding mine site are *Acridotheres javanicus*, *Argusianus argus*, *Centropus rectunguis*, *Cotylelobium lanceolatum*, *Cyornis caerulatus*, *Dipterocarpus gracilis*, *Durio dulcis*, *Hopea beccariana*, *Hopea sangal*, *Leptoptilos javanicus*, *Madhuca sericea*, *Maxomys whiteheadi*, *Nisaetus nanus, Shorea guiso*, *Shorea laevis*, *Spilornis kinabaluensis*, and *Tetramerista glabra.* Species with *endangered* susceptibility levels at this surrounding mine site are *Ciconia stormi*, *Cryptocarya lucida*, *Polyplectron schleiermacheri*, and *Shorea bracteolata*. The species with a *critically endangered* susceptibility level at this surrounding mine site is *Aquilaria malaccensis*. If referencing from the list of protected species by KLHK, 34 protected species are at this surrounding mine site. Apart from those, there are 8 endemic species at this surrounding mine site, namely *Acridotheres javanicus*, *Cryptocarya lucida*, *Macaranga winkleri, Pangasius kunyit* (pangasius kunyit), *Polyplectron schleiermacher*, *Rasbora laticlavia*, and *Zoothera everetti*.

Based on land coverage identification that's conducted at this surrounding mine site, there is land coverage in the forms of air/sea ports, shrubs, shrub scrubs, secondary dryland forest, primary mangrove forest, secondary mangrove forest, secondary peat swamp forest, plantation forest, settlement, agriculture, dry field agriculture, mixed dry field agriculture, field, dam, and clearing. A conservation site exists in the form of Raya Bukit Soeharto Forest park around this mine site. An essential ecosystem with a high potential to become a wildlife habitat is found, namely the primary mangrove forest. This ecosystem must be maintained from threats of degradation that are caused by the occurrence of mining activities around it.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are two companies that hold PT Insani Baraperkasa shares directly. First is PT Resources Alam Tbk, with a controlling stake of 99.9%. The second Stakeholder is Pintarso adjianto, with a controlling stake of 0.01%. The stakeholder map of PT Insani Baraperkasa can be seen in Figure 3.48.

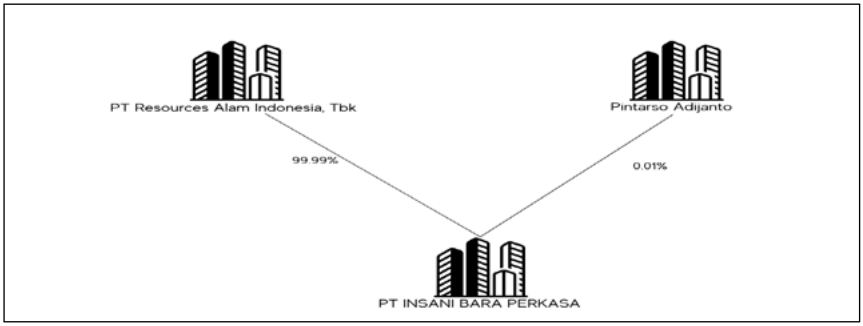


Figure 3. 48. Stakeholder Map of PT Insani Bara Perkasa

3.3.18. PT Lanna Harita Indonesia (Category: High)

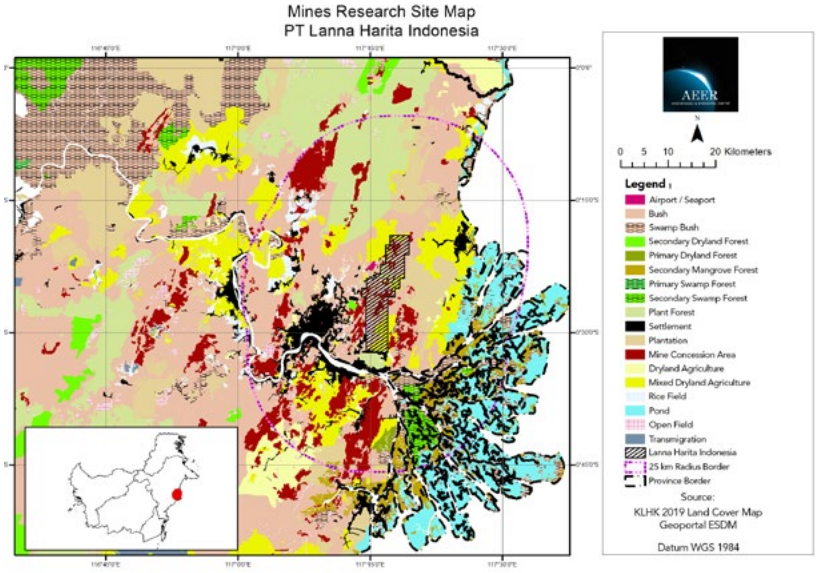


Figure 3. 49. Map of PT Lanna Harita Indonesia

PT Lanna Harita Indonesia is a coal mining company with PKP2B type of permit with an area of 12,343 Ha in Kutai Kartanegara Regency and Samarinda, East Kalimantan. This mining company has a high biodiversity threat level with a score of 14. According to GBIF data in the surrounding mine site, there are 9 species with *vulnerable* susceptibility levels, 3 with *endangered* susceptibility levels, and 1 with *critically endangered* susceptibility levels. Species with *vulnerable* susceptibility levels at this surrounding mine site are *Acridotheres javanicus*, *Anthracoceros malayanus*, *Argusianus argus*, *Centropus rectunguis, Dipterocarpus gracilis*, *Durio dulcis*, *Hopea sangal*, *Madhuca sericea*, and *Rhyticeros undulatus.* Species with endangered susceptibility levels at this surrounding mine site are *Ciconia stormi*, *Cryptocarya lucida*, and *Shorea bracteolata*. The species with a *critically endangered* susceptibility level at this surrounding mine site is *Aquilaria malaccensis*. If referencing from the list of protected species by KLHK, there are 28 protected species around this mine site. Apart from those, there are 3 endemic species around this mine site, namely *Acridotheres javanicus*, *Cryptocarya lucida*, *Rasbora laticlavia*.

Based on land coverage identification around this mine site, there is land coverage in the forms of air/sea ports, shrubs, shrub scrubs, secondary dryland forest, primary dryland forest, secondary dryland forest, plantation forest, settlement, agriculture, dry field agriculture, mixed dry field agriculture, field, dam, and clearing. A conservation site in the form of Raya Bukit Soeharto Forest Park also exists. A mangrove ecosystem was discovered that has a role in the available wildlife habitat surrounding this mine site. This mangrove ecosystem must be kept from the danger of degradation due to mining activities.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are three companies that hold PT Lanna Harita Indonesia shares directly. First is Lanna Resources Public Co. Ltd., with the most significant controlling stake of 55%. The second Stakeholder is PT Harita Mahakam Mining, with a controlling stake of 35%. The third Stakeholder is Pan-United Investment Pte. Ltd., with a controlling stake of 10%. The stakeholder map of PT Lanna Harita Indonesia can be seen in Figure 3.50.

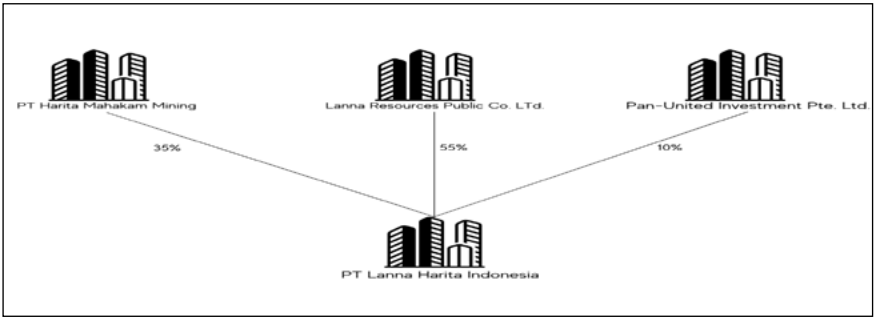


Figure 3. 50. Stakeholder Map of PT Lanna Harita Indonesia

3.3.19. PT Ratah Coal (Category: Moderate)

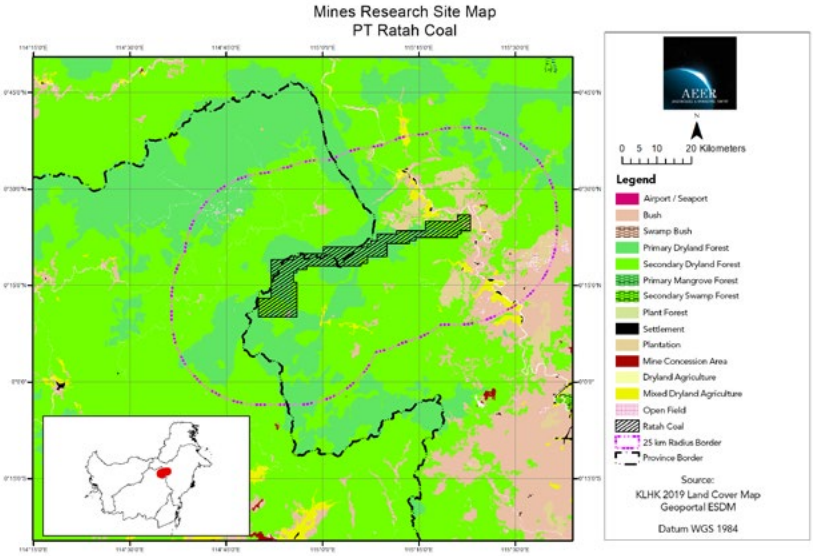


Figure 3. 51. Map of PT Ratah Coal

PT Ratah Coal is a coal mining company that is still at the exploration stage with a PKP2B type of permit with an area of 36,490 Ha. This mining company has a moderate biodiversity threat level with a score of 10. According to GBIF data at this surrounding mine site, there are 1 species with a *vulnerable* susceptibility level, namely *Argusianus argus*. If referencing from the list of

protected species by KLHL, there are 7 protected species at this surrounding mine site. Apart from that, 1 endemic species was found at this surrounding mine site, namely *Macaranga winkleri.*

Based on land coverage identification around this mine site, it is discovered that land coverage in the forms of shrubs, shrub scrubs, primary dryland forest, secondary dryland forest, plantation forest, settlement, agriculture, mines, dry field agricultures, mixed dry field agriculture, and clearing. Moreover, a conservation site exists in the form of Alam Bukit Sapat Hawung Preserve around this mine site. There is land coverage of dryland forest that has good potential as a wildlife habitat around the mine site. This ecosystem must be kept from the dangers of degradation caused by the occurrence of mining activities surrounding it.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are two companies that hold PT Ratah Coal shares directly. First is PT Alam Tri Abadi, with a controlling stake of 99%. The second Stakeholder is Coaltrade Services International Pte Ltd, with a controlling stake of 1%. The stakeholder map of PT Ratah Coal can be seen in Figure 3.52.

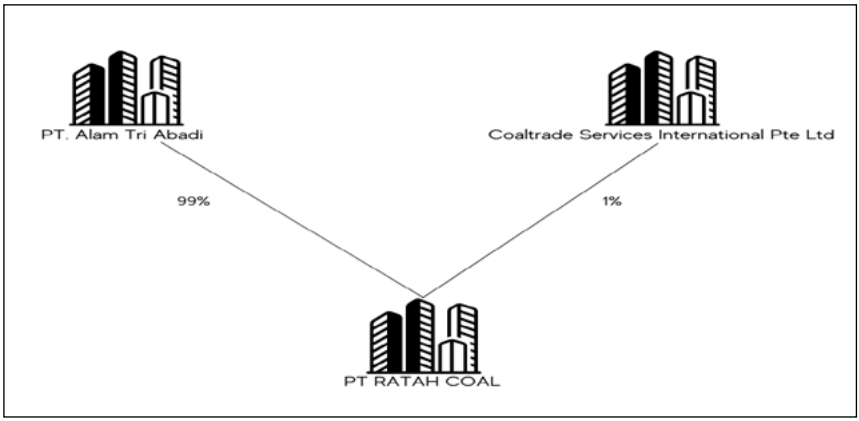


Figure 3. 52. Stakeholder Map of PT Ratah Coal

3.4. Research Mines in South Kalimantan

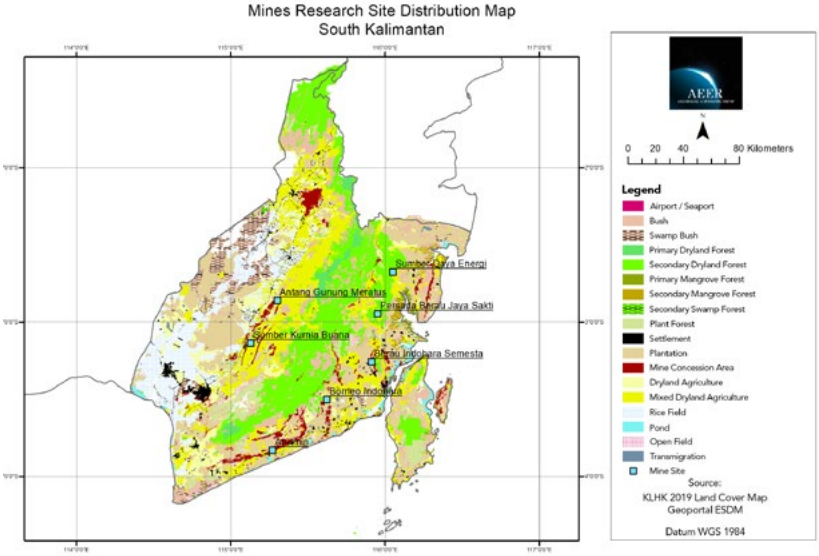


Figure 3. 53. Distribution Map of Research Mines in South Kalimantan

3.4.1. PT Borneo Indobara (Category: High)

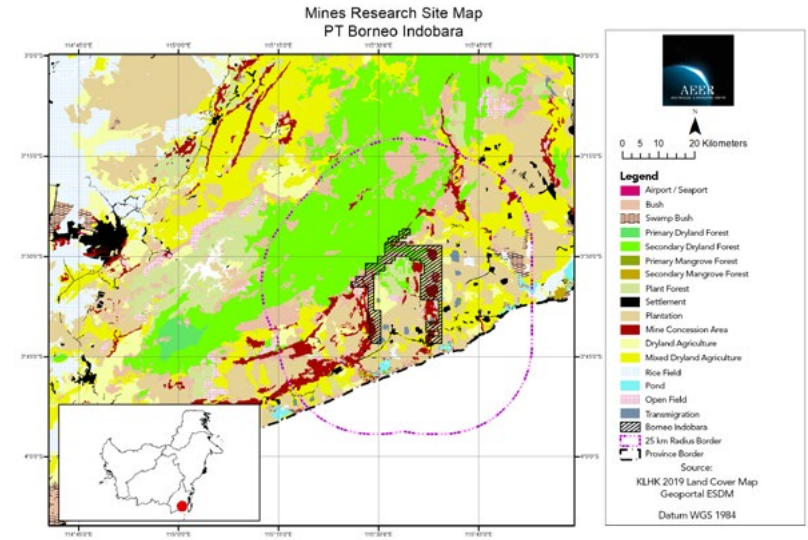


Figure 3. 54. Map of PT Borneo Indobara

PT Borneo Indobara is a mining company with PKP2B type of permit with an area of 24,100 Ha in Tanah Bumbu, South Kalimantan. This company has a high biodiversity threat level of 13. According to GBIF and IUCN data, 4 species with *vulnerable* susceptibility levels and 3 species with endangered susceptibility levels are registered. Species with *vulnerable* susceptibility levels at this surrounding mine site are *Dipterocarpus gracilis*, *Nothaphoebe foetida, Ophiophagus hannah* (king cobra), and *Tetramerista glabra*. Species with *endangered* susceptibility levels at this surrounding mine site are *Aquilaria microcarpa*, *Heritiera globosa*, and *Siebenrockiella crassicollis* (black marsh turtle). If referencing from the list of protected species by KLHK, 5 protected species at this mine site are registered, namely *Anthracoceros albirostris*, *Crocodylus porosus*, *Harpactes diardii*, *Heritera globosa*, and *Koompassia malaccensis*. Apart from those, 4 endemic species are registered at this surrounding mine site. These species are *Gastromyzon borneensis* (Borneo ray-finned fish), *Glyptothorax pictus*, *Occidozyga sumatrana* (Sumatran puddle frog), and *Rasbora trifasciata*.

Based on land coverage identification around this mine site, there is land coverage in the forms of air/sea ports, shrubs, shrub scrubs, secondary dryland forest, primary mangrove forest, secondary mangrove forest, plantation forest, settlement, agriculture, dry field agriculture, mixed dry field agriculture, field, dam, clearing, and transmigration area. Moreover, a conservation site exists in the form of Raya Sultan Adam Forest Park. An ecosystem that has the potential to become a wildlife habitat is discovered around the mine site, namely dryland forest and mangrove forest. This ecosystem must be maintained from threats of degradation that could arise from mining activities around the ecosystem. By protecting the said ecosystem from existing disruptions, species that inhabit the mentioned area could be protected from population size reduction and extinction threats.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are three companies that hold PT Borneo Indobara shares directly. First is PT Roundhill Capital Indonesia, with a controlling stake of 99.07%. The second Stakeholder is PT Gerak Bangun Jaya, with a controlling

stake of 0.6%. The third Stakeholder is GE Haryanto, with a controlling stake of 0.33%. The stakeholder map of PT Borneo Indobara can be seen in Figure 3.55.

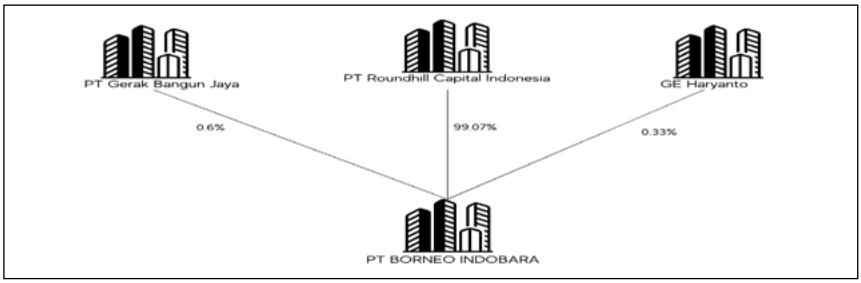


Figure 3. 55. Stakeholder Map of PT Borneo Indobara

3.4.2. PT Antang Gunung Meratus (Category: Moderate)

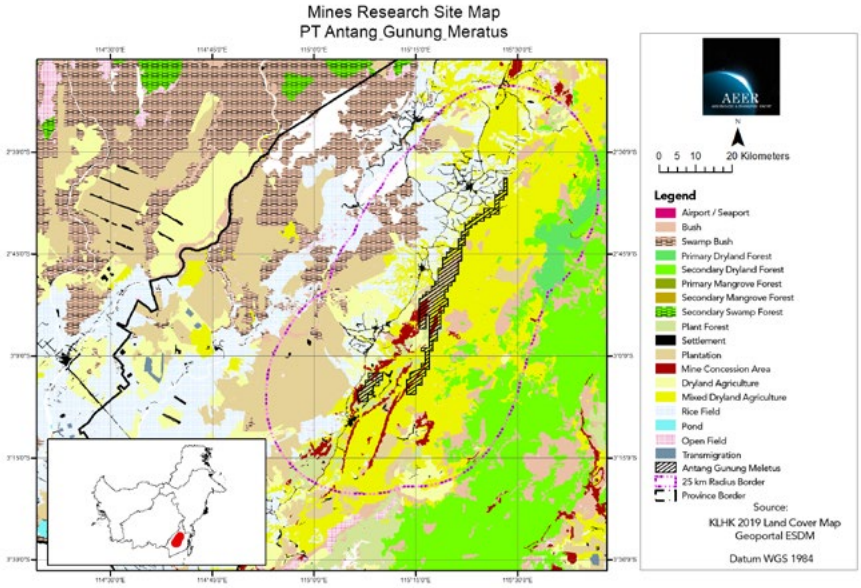


Figure 3. 56. Map of PT Antang Gunung Meratus

PT Antang Gunung Meratus is a mining company with PKP2B type of permit

with an area of 20,666 Ha in South Kalimantan. This mining company has a moderate biodiversity threat level of 10. There are 5 species with *vulnerable* susceptibility levels around this mine site, namely *Argusianus argus*, *Buceros rhinoceros*, *Meristogenys jerboa*, *Nisaetus nanus*, and *Rhyticeros undulatus*. If referencing from the list of protected species by KLHK, there are 23 protected species by KLHK that are at this surrounding mine site. Apart from those, 1 endemic species is also found around the mine site, namely *Rasbora laticlavia.*

Based on land coverage identification of this mine site, there is land coverage in the forms of shrubs, shrub scrubs, primary dryland forest, secondary dryland forest, plantation forest, settlement, agriculture, dry field agriculture, mixed dry field agriculture, field, and clearing. Around this mine site, there exist conservation sites in the form of Alam Gunung Kantawan Preserve and Raya Sultan Adam Forest Park. An ecosystem is discovered that has the potential to become a wildlife habitat in the form of dryland forest around this mine site. This ecosystem must be kept from threats of mining activities. Degrading this ecosystem could implicate the wildlife population size reduction that inhabits said ecosystem.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are two companies that hold PT Antang Gunung Meratus shares directly. First is PT Baramulti Suksesarana, with a controlling stake of 97.8%. The second Stakeholder is Antang Latieff, with a controlling stake of 2.2%. The stakeholder map of PT Ratah Coal can be seen in Figure 3.57.

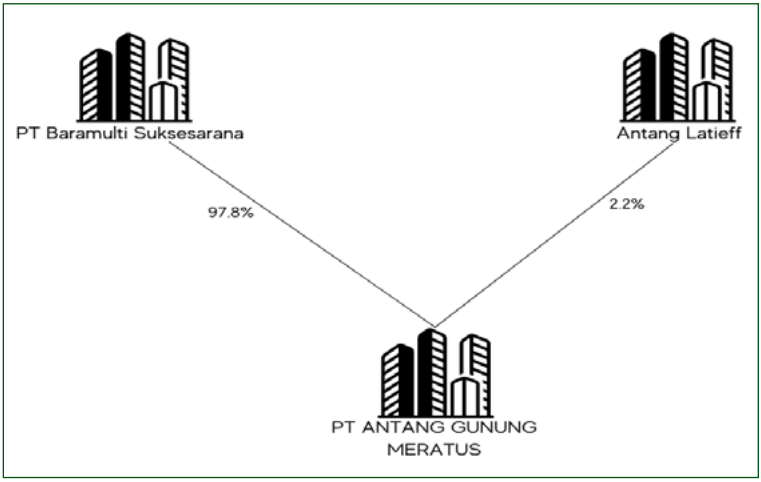


Figure 3. 57. Stakeholder Map of PT Antang Gunung Meratus

3.4.3. PT Sumber Daya Energi (Category: High)

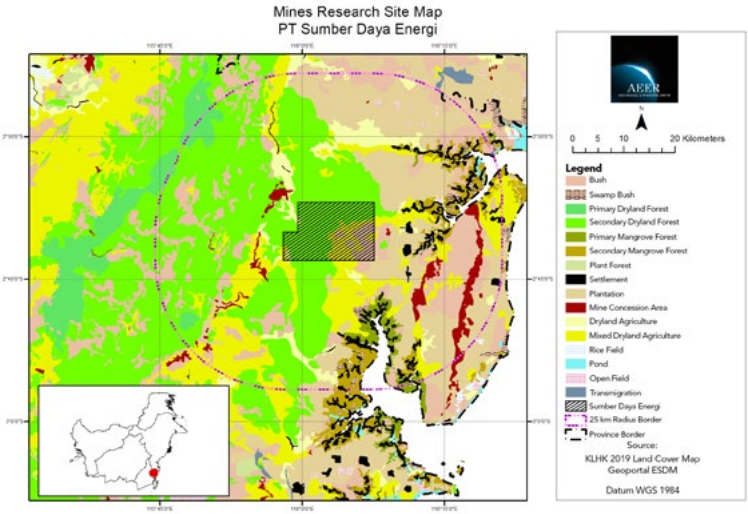


Figure 3. 58. Map of PT Sumber Daya Energi

PT Sumber Daya Energi is a coal mining company with IUP type of permit with

an area of 18,500 Ha in Kotabaru, South Kalimantan. This company has a high biodiversity threat level of 12. There are 4 species with *vulnerable* susceptibility levels and 1 species with 1 endangered susceptibility level around this mine site. Species with *vulnerable* susceptibility levels at this surrounding mine site are *Acridotheres javanicus*, *Anthracoceros malayanus, Nisaetus nanus,* and *Sus barbatus*. The species with *an endangered* susceptibility level at this surrounding mine site is *Nasalis larvatus*. If referencing from the list of protected species by KLHK, there are as many as 8 protected species by KLHK at this surrounding mine site. Apart from those, there are also 2 endemic species around this mine site. These species are *Acridotheres javanicus* and *Nasalis larvatus*.

Based on land coverage identification that's conducted at this surrounding mine site, it was discovered land coverage in the forms of shrubs, shrub scrubs, primary dryland forest, secondary dryland forest, primary mangrove forest, secondary mangrove forest, settlement, agriculture, dry field agriculture, mixed dry field agriculture, field, dam, and clearing. Moreover, there exist conservation sites in the forms of Alam Teluk Kelumpang Preserve, Sea Strait, and Sebuku Strait, as well as Alam Teluk Pamukan Preserve at this surrounding mine site. Around this area, essential primary dryland and mangrove forest ecosystems have the role of wildlife habitats of the surrounding mine site. These ecosystems must be kept from threats of mining activities that could potentially degrade the habitats quality of these ecosystems.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are three companies that hold PT Sumber Daya Energi shares directly. First is PT Qinfa Mining Industri, with a controlling stake of 70%. The second Stakeholder is PT Widyanusa Mandiri, with a controlling stake of 25%. The third Stakeholder is PT Lintas Timur Investama, with a controlling stake of 5%. The stakeholder map of PT Sumber Daya Energi can be seen in Figure 3.59.

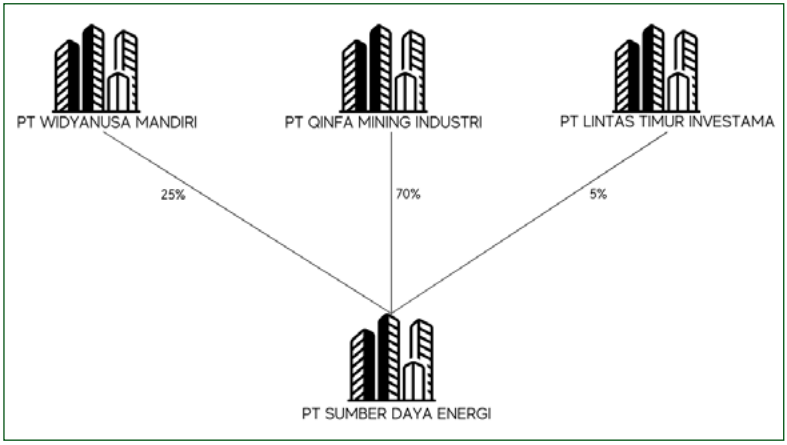


Figure 3. 59. Stakeholder Map of PT Sumber Daya Energi

3.4.4. PT Persada Berau Jaya Sakti (Category: High)

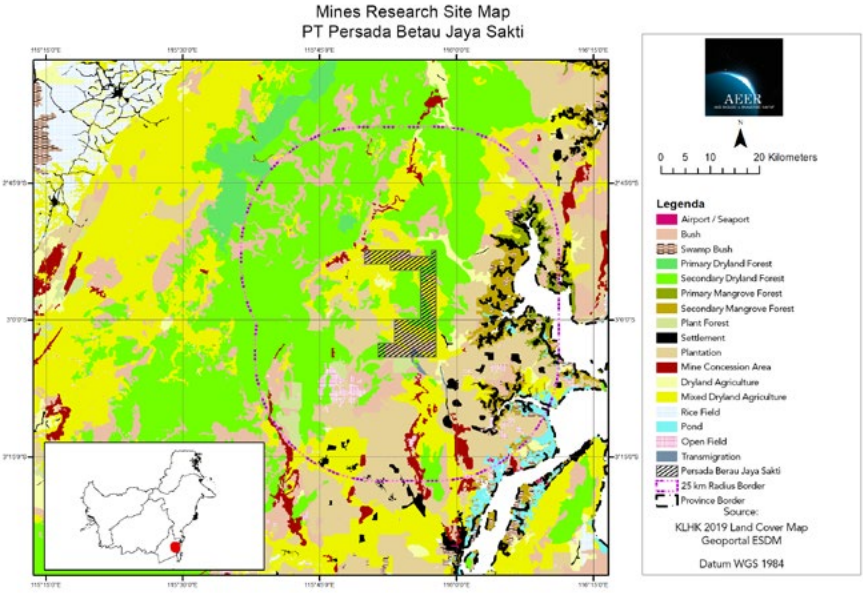


Figure 3. 60. Map of PT Persada Berau Jaya Sakti

PT Persada Berau Jaya Sakti is a coal mining company with IUP type of permit with an area of 17,094 Ha in Kotabaru, South Kalimantan. This company has a high biodiversity threat level with a score of 13. According to GBIF and IUCN data, 5 species with *vulnerable* susceptibility threat level, 1 species with *endangered* threat level, as well as 1 species with *critically endangered* level, are registered to be at the surrounding mine sites. Species with *vulnerable* susceptibility threat levels at this surrounding mine sites area are *Buceros rhinoceros, Durio dulcis*, *Hopea sangal*, *Nisaetus nanus*, and *Sus barbatus.* Species with *an endangered* susceptibility threat level at this surrounding mine site are *Nasalis larvatus*. The species with *a critically endangered* susceptibility threat level at this surrounding mine site is *Pongo pygmaeus*. If referencing from the list of protected species by KLHK, there are 14 protected species around this mine site. Apart from those, there are two endemic species at this surrounding mine site, namely *Pongo pygmaeus* and *Nasalis larvatus*.

Based on land coverage identification around the mine site, there is land coverage in the forms of air/sea ports, shrubs, shrub scrubs, primary dryland forest, secondary dryland forest, primary mangrove forest, secondary mangrove forest, plantation forest, settlement, agriculture, dry field agriculture, mixed dry field agriculture, field, dam, clearing, and transmigration area. Around this mine site, there are conservation sites in the forms of Alam Teluk Kelumpang Preserve, Sea Strait, and Sebuku Strait. Important ecosystems that could play a role as wildlife habitats are discovered, namely dry field and mangrove forest ecosystems. These ecosystems must be kept from threats of habitat degradation that could arise from their surrounding mining activities

3.4.5. PT Berau Indobara Semesta (Category: High)

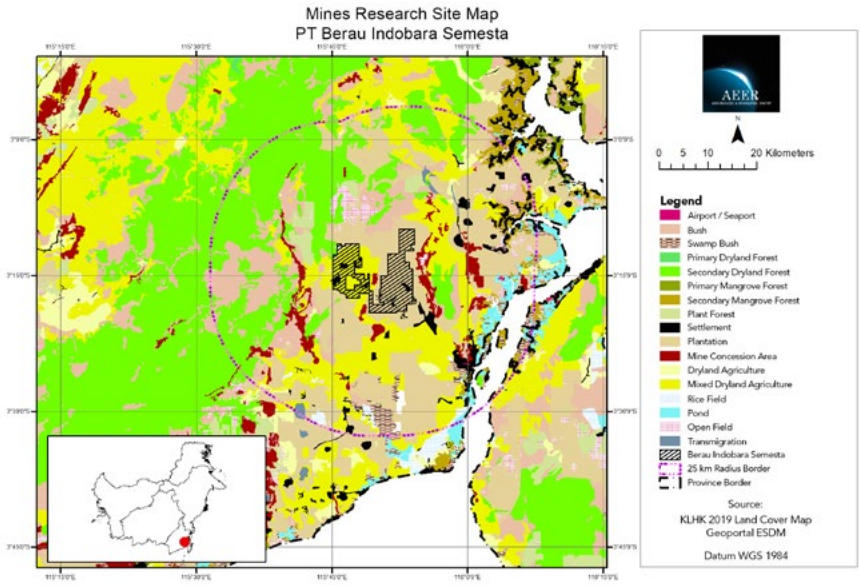


Figure 3. 61. Map of PT Berau Indobara Semesta

PT Berau Indobara Semesta is a mining company with IUP type of permit with an area of 14,050 Ha in Tanah Bumbu, South Kalimantan. Ths company has a high biodiversity threat level of 12. According to GBIF and IUCN data, 9 species with *vulnerable* susceptibility levels, 1 species with endangered susceptibility level, and 1 species with critically endangered level are registered. Species with vulnerable susceptibility levels at this surrounding mine site are *Cryptocarya tawaensi, Durio dulcis, Hopea sangal*, *Leptoptilos javanicus, Macaca fascicularis*, *Ophiophagus hannah*, *Rhyticeros undulatus*, *Shorea polyandra*, and *Sus barbatus*. The species with *an endangered* susceptibility level at this surrounding mine site is *Nasalis larvatus.* The species with *a critically endangered* susceptibility level at this surrounding mine site is *Hopea rudiformis*. If referencing from the list of protected species by KLHK, 13 protected species are at this surrounding mine site. Apart from those, 1 endemic species is discovered around this mine site, namely *Nasalis larvatus.*

The presence of protected and endemic species indicates the existence of suitable habitats for said species to inhabit. Mining activities around these species' habitats could cause habitat degradation that will reduce the population size of endemic and protected species around the mine site.

Based on land coverage identification around the mine site, there is land coverage in the forms of air/sea ports, shrubs, shrub scrubs, secondary dryland forest, primary mangrove forest, secondary mangrove forest, plantation forest, settlement, agriculture, dry field agriculture, mixed dry field agriculture, field, dam, clearing, and transmigration area. Moreover, there are conservation sites in the forms of Alam Teluk Kelumpang Preserve, Sea Strait, and Sebuku Strait around this mine site. The primary mangrove ecosystem has good potential to become a wildlife habitat that lives inside it. This ecosystem must be kept, along with other ecosystems such as secondary dryland forests and secondary mangrove forests, from threats of degradation due to mining activities around them.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are two companies that hold PT Antang Gunung Meratus shares directly. First is PT Batulicin Enam Sembilan, with a controlling stake of 99%. The second Stakeholder is Muhammad Bahruddin, with a controlling stake of 1%. The Stakeholder map of PT Antang Gunung Meratus can be seen in Figure 3.62.

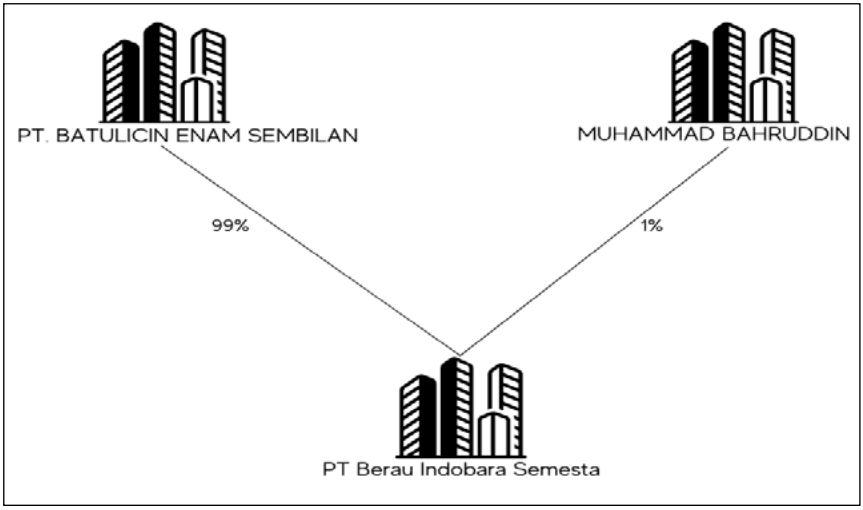


Figure 3. 62. Stakeholder Map of PT Berau Indobara Semesta

3.4.6. PT Arutmin Indonesia (Category: High)

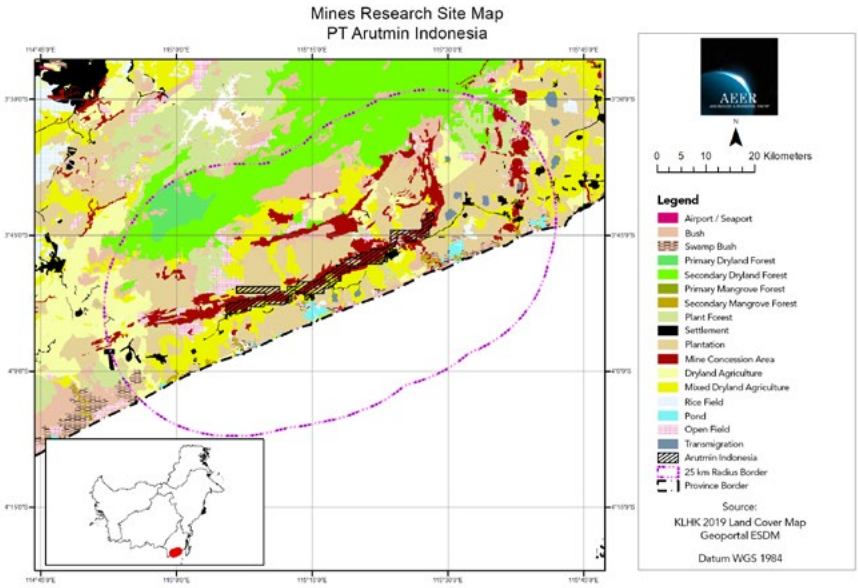


Figure 3. 63. Map of PT Arutmin Indonesia

PT Arutmin Indonesia is a mining company with an IUPK type of permit. Two concession mine sites of PT Arutmin Indonesia are included in the mines research list located in Tanah Laut Regency with an area of 11,403 and Kotabaru Regency with an area of 12,030 Ha. This company has a high biodiversity threat level of 12. According to GBIF and IUCN data, 16 species with *vulnerable* susceptibility levels and 5 species with *endangered* susceptibility levels are registered at this surrounding mine site. Species with *vulnerable* susceptibility levels at this surrounding mine site are *Acridotheres javanicus*, *Aetomylaeus nichofii* (banded eagle ray), *Anthracoceros malayanus, Ctenolophon parvifolius*, *Dipterocarpus gracilis*, *Durio dulcis*, *Egretta eulophotes*, *Leptoptilos javanicus, Macaca fascicularis*, *Nisaetus nanus*, *Nothaphoebe foetida*, *Presbytis frontata, Presbytis rubicunda*, *Sus barbatus*, *Telatrygon biasa* (indonesian sharpnose ray), and *Tetramerista glabra*. Species with *endangered* susceptibility levels at this surrounding mine site are *Aquilaria microcarpa*, *Dipterocarpus hasseltii, Heritiera globosa*, *Hylobates muelleri*, and *Nasalis larvatus*. If referencing from the list of protected species by KLHK, there are 21 protected species at this surrounding mine site. Apart from those, 4 endemic species are also found around this mine site, namely *Acridotheres javanicus*, *Hylobates muelleri, Nasalis larvatus,* and *Pectenocypris korthausae*. The presence of rare and endemic species that are around this mine site must be kept by minimizing threats and disruptions that could affect said species and their habitats.

Based on land coverage identification that's conducted at this surrounding mine site, there is land coverage in the forms of air/sea ports, shrubs, shrub scrubs, primary dryland forest, secondary dryland forest, primary mangrove forest, secondary mangrove forest, plantation forest, settlement, agriculture, dry field agriculture, mixed dry field agriculture, field, dam, clearing, and transmigration area. Around this mine site, there are conservation sites in the forms of Alam Teluk Kelumpang Preserve, Sea Strait, and Sebuku Strait, Alam Teluk Pamukan Preserve, Pleihari Tanah Laut Wildlife Reserve, and Raya Sultan Adam Forest Park. Important ecosystems with the potential to play a role in suitable wildlife habitats are discovered, namely dryland and mangrove forests. Primary mangrove forest has the potential to become

suitable habitats for protected fish species that are at this surrounding mine site. These ecosystems must be kept from degradation threats that could arise from the occurrence of mining activities around them.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are two companies that hold PT Arutmin Indonesia shares directly. First is Bhira Investment Pte. Ltd., with a controlling stake of 75%. The second Stakeholder is PT Bumi Resources, with a controlling stake of 25%. The stakeholder map of PT Arutmin Indonesia can be seen in Figure 3.64.

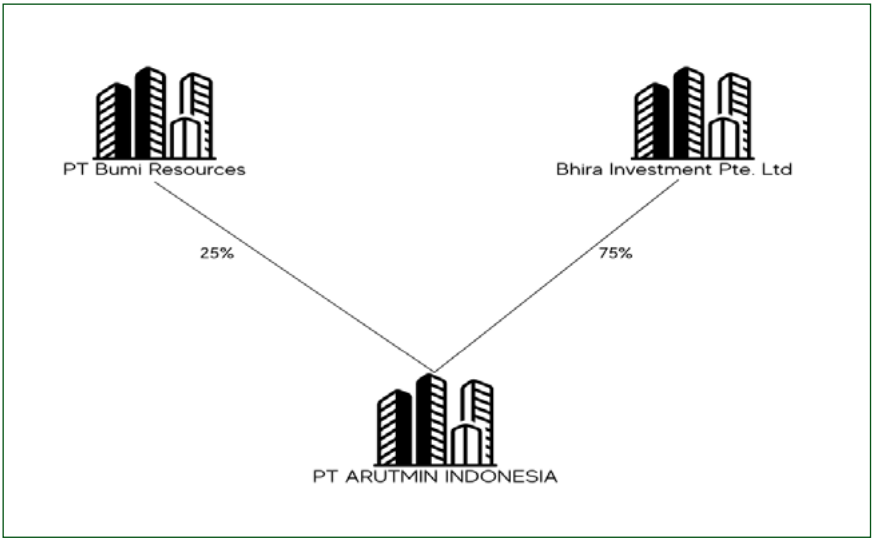


Figure 3. 64. Stakeholder Map of PT Arutmin Indonesia

3.4.7. PT Sumber Kurnia Buana (Category: Moderate)

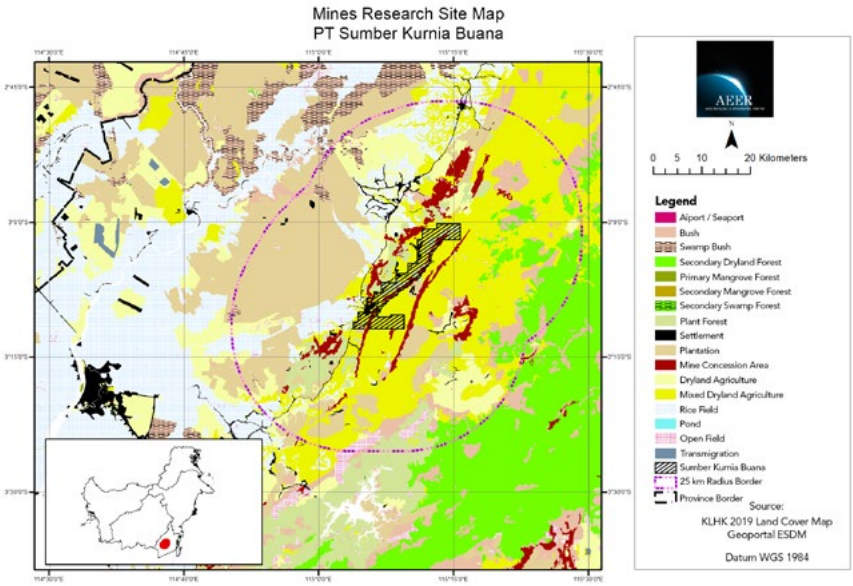


Figure 3. 65. Map of PT Sumber Kurnia Buana

PT Sumber Kurnia Buana is a mining company with PKP2B type of permit with an area of 10,920 Ha in South Kalimantan. This company has a moderate biodiversity threat level with a score of 7. It is not found any species with endangered susceptibility levels in accordance with the IUCN. If referencing from the list of protected species by KLHK, there are 1 protected species around this mine site: *Rhipidura javanica.* Apart from that, there are 3 endemic species around this mine site. These species are *Betta ideii* (betta fish), *Pectenocypris korthausae*, and *Rasbora laticlavia*. The presence of endemic species around this mine site must be kept from threats of degradation.

Based on land coverage identification that's conducted at the surrounding mine site, there is land coverage in the forms of shrubs, shrub scrubs, secondary dryland forest, plantation forest, settlement, agriculture, dry field agriculture, mixed dry field agriculture, field, and clearing. Around this mine site, there are conservation sites in the forms of Alam Gunung Kantawan

Preserve and Raya Sultan Adam Forest Park. The presence of endemic fish species indicates the existence of a water body that has the potential as a habitat for those endemic fish species. Mining activities could degrade the water quality in the surrounding area, negatively implicating those endemic fish species.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are three companies that hold PT Sumber Kurnia Buana shares directly. First is Yayan Suryana, with a controlling stake of 40%. The second Stakeholder is Ir. Lunardi Satyaputra, with a controlling stake of 40%. The third Stakeholder is PT Ir Lim Sujamin, with a controlling stake of 20%. The stakeholder map of PT Sumber Kurnia Buana can be seen in Figure 3.66.

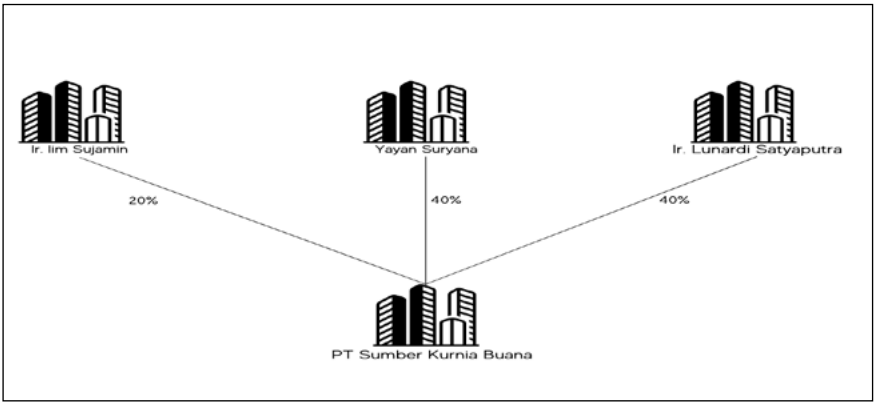


Figure 3. 66. Stakeholder Map of PT Sumber Kurnia Buana

3.4.8. PT Amanah Putra Borneo (Category: High)

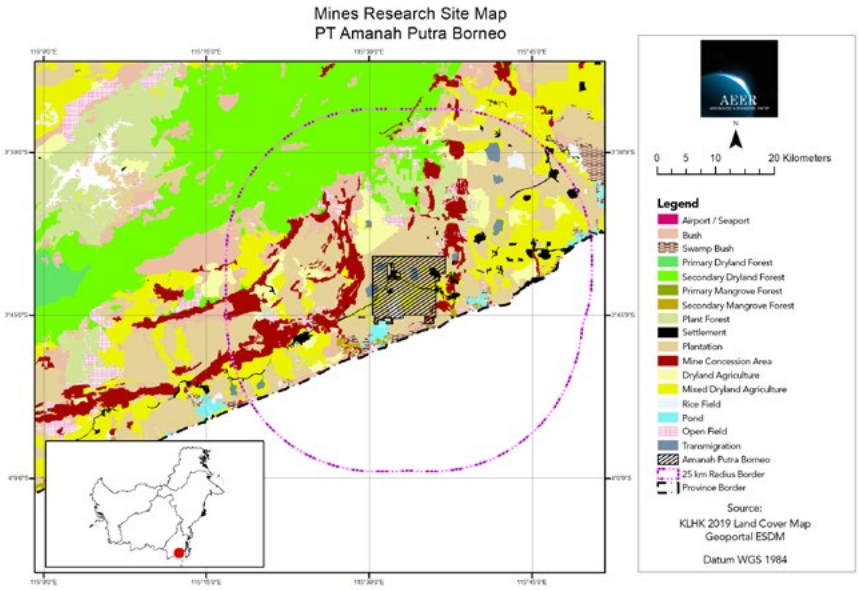


Figure 3. 67. Map of PT Amanah Putra Borneo

PT Amanah Putra Borneo is a coal mining company with IUP type of permit with an area of 11,440 Ha in Tanah Bumbu Regency, South Kalimantan. This mining company has a high biodiversity threat level with a score of 11. According to GBIF data at this surrounding mine site, there are 3 species with *vulnerable susceptibility* levels and 2 species with *endangered* susceptibility threat levels. Species with vulnerable susceptibility levels at this surrounding mine site are *Dipterocarpus gracilis*, *Nothaphoebe foetida*, and *Tetramerista glabra*. Species with *endangered* susceptibility levels at the surrounding mine site are *Aquilaria microcarpa* and *Heritiera globosa*. If referencing from the list of protected species by KLHK, there are 2 protected species at this surrounding mine site. These species are *Heritiera globosa* and *Koompasia malaccensis*. No endemic species are found at this surrounding mine site.

Based on land coverage identification at this surrounding mine site, there is land coverage in the forms of air/sea ports, shrubs, shrub scrubs, secondary

dryland forest, primary mangrove forest, secondary mangrove forest, plantation forest, settlement, agriculture, dry field agriculture, mixed dry field agriculture, field, dam, clearing, and transmigration area. Moreover, there is a conservation site in the form of Raya Sultan Adam Preserve around this mine site. The mangrove forest ecosystem that is found at this surrounding mine site has good potential for habitats of existing wildlife around this mine site. Furthermore, secondary dryland forest that has the potential to become a wildlife habitat is also found, although it is not as good as primary dryland forest due to disruptions that have occurred in this area. These ecosystems must be kept from threats of degradation caused by the occurrence of mining activities.

There is no data for the owner/Stakeholder of PT Amanah Putra Borneo at KESDM, Minerba Online Data Indonesia (MODI) official website.

3.5. Mines in North Kalimantan

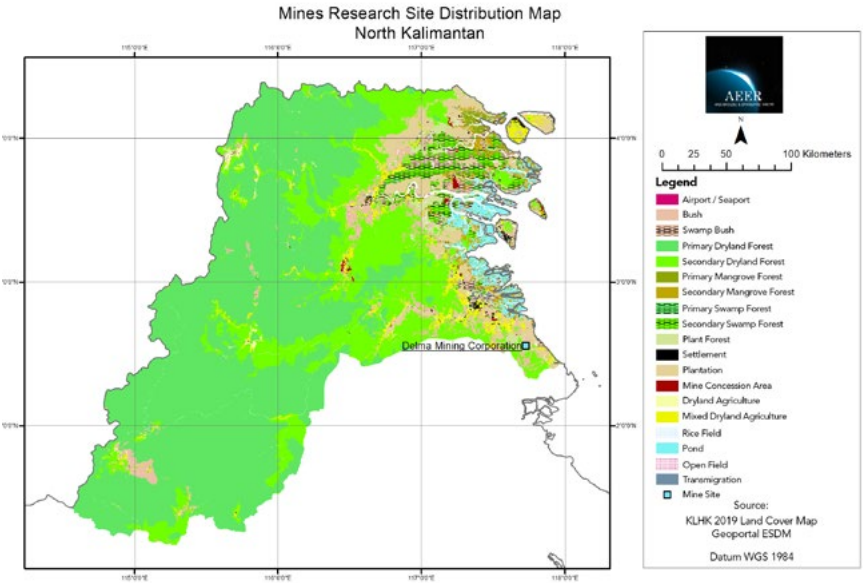


Figure 3. 68. Distribution Map of Research Mines in North Kalimantan

3.5.1. PT Delma Mining Corporation (Category: Low)

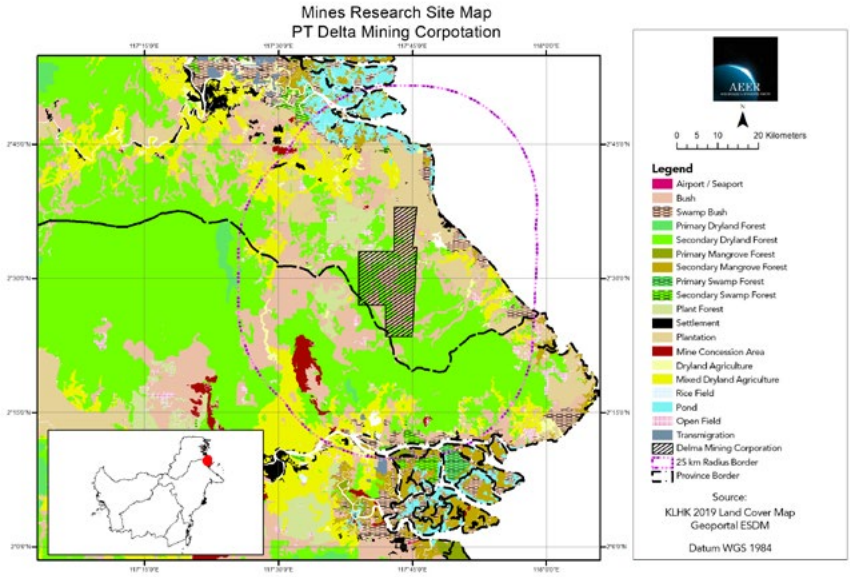


Figure 3. 69. Map of PT Delma Mining Corporation

PT Delma Mining Corporation is a mining company with a PKP2B type of permit with an area of 20,160 Ha in Bulungan, North Kalimantan. This company has a low biodiversity threat level with a score of 4. In accordance with data from IUCN, no species with endangered susceptibility levels are found. If referencing from the list of protected species by KLHK, there are 1 protected species around this mine site, namely *Anthracoceros albirostris*. No endemic species are found at this surrounding mine site.

Based on land coverage analysis that's conducted at this surrounding mine site, there is land coverage in the forms of shrubs, shrub scrubs, primary dryland forest, secondary dryland forest, primary mangrove forest, secondary mangrove forest, primary peat swamp forest, secondary peat swamp forest, plantation forest, settlement, agriculture, dry field agriculture, mixed dry field agriculture, field, dam, clearing, and transmigration area. At this surrounding mine site, there is a conservation site in the form of KKPD (Derawan Small

Islands and Surrounding Marine Conservation Areas). Ecosystems of dryland, mangrove, as well as peat swamp forest contain the excellent potential to become wildlife habitats around this mine site. These ecosystems must be kept from threats of degradation that might arise from mining activities around these ecosystems.

According to the official website of KESDM Minerba Online Data Indonesia (MODI), there are three companies that hold PT Delma Mining Corporation shares directly. First is PT Cendana Kayu Abadi, with a controlling stake of 99.56%. The second Stakeholder is Amirsyah Risjad, with a controlling stake of 0.22%. The third Stakeholder is Rizal Risjad, with a controlling stake of 0.22%. The stakeholder map of PT Delma Mining Corporation can be seen in figure 3.70.

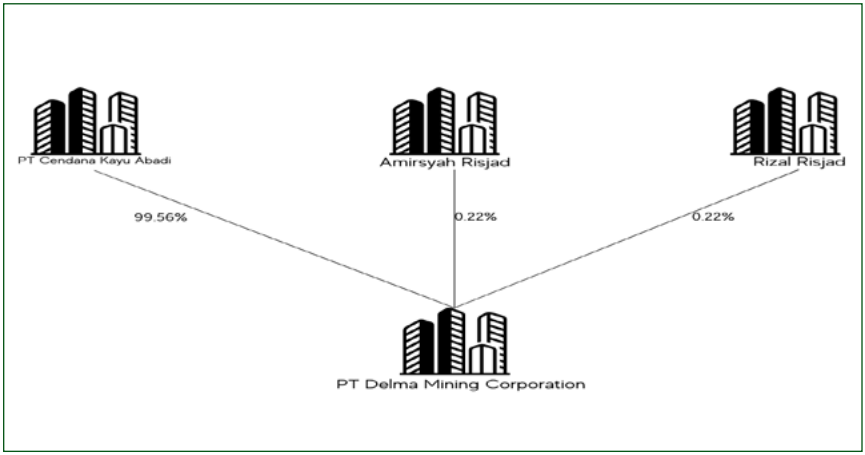


Figure 3. 70. Stakeholder Map of PT Delma Mining Corporation

CHAPTER 4
DISCUSSION

Chapter 4
Discussion

4.1. The Existence of Rare Animals Around Mine Sites

It was discovered as many as 5 species c*ritically endangered*, 33 species *endangered*, and 69 species with *vulnerable* levels at the surrounding research mine sites area. *Critically endangered* species that are found are *Aquilaria malaccensis* (gaharu tree), *Eretmochelys imbricata* (hawksbill sea turtle), *Hopea rudiformis*, *Pongo pygmaeus* (bornean orangutan), and *Sphyrna lewini* (scalloped hammerhead). Gaharu are found around the area of PT Insani Baraperkasa and PT Multi Harapan Utama. Hawksbill sea turtles are found around the area of PT Batubara Selaras Sapta. *Hopea rudiformis* are found in the area of PT Berau Indobara Semesta and PT Singlurus Pratama Coal. Bornean orangutans are found in two different mines, namely PT Kaltim Prima Coal and PT Persada Berau Jaya Sakti. In the area around PT Singlurus Pratama Coal, Scalloped hammerheads are found. Apart from the 2 species with *critically endangered* susceptibility levels, 11 species with *endangered* susceptibility levels are also found. Among them are *Nasalis larvatus* (proboscis monkey) and *Chelonia mydas* (green sea turtle).

Orangutans need forest habitats to support their livelihood. Bornean orangutans are frugivore animals, which means they consume fruits as their primary food source. Around 60% of the food that orangutans consume is fruits. Bornean orangutans also consume leaves and shoots, insects, bird eggs, mushrooms, flowers, as well as barks. Registered around 500 species of plants become the source of food for Bornean orangutans (Caldecott and Miles, 2005). Therefore, healthy forest ecosystems are needed to support the sustainability of Bornean orangutans.

Orangutans hold an essential role in terrestrial ecosystems, especially in forest areas. Orangutan feeds that are dominated by fruits support orangutans' role as forest plant seeds' dispersion agent, especially fruits that are relatively

bigger to not be consumed by smaller animals such as birds. This affects the regeneration and biodiversity patterns of forests. By consuming fruits, orangutans could bring plant seeds from parent trees to other far-range locations. With its relatively big bodies and fruit-dominant consumption, orangutans hold an essential role as seed distributors that they consume to other areas that have the potential to become germination areas of seeds that were brought. Bornean orangutans, the biggest frugivore in Kalimantan, have a potential role as seed dispersers better than other frugivore animals. Their bigger size causes Bornean orangutans to be capable of bringing bigger-sized plant seeds that cannot be consumed by smaller animals (Caldecott and Miles, 2005).

Forum Orangutan Indonesia (FORINA) conducted *analisis kelangsungan hidup populasi dan habitat* (Population and Habitat Viability Analysis / PHVA) on Sumatran orangutans and Bornean orangutans in the year 2016 that is listed in a document report titled "*Final Report Orangutan Population and Habitat Viability Assessment*" (FORINA, 2016). Based on this report document, mining activities are one of the propellant factors of the reduced size of orangutan's population through its land clearing activities that eliminate Bornean orangutans' habitats. Based on FORINA's report, the mining activities of PT Kaltim Prima Coal, PT Indominco Mandiri, as well as PT Jembayan Muarabara threaten the existence of orangutans in Kutai-Bontang National Park's landscape. Based on FORINA's report, the estimated population size of orangutans at these three concession mine sites is 29 individuals, with a carrying capacity of only as prominent as 11 individuals. Primary threats for orangutans around these mine sites are high-intensity land clearing activities, eliminating Bornean orangutans' habitats with a rate of 5 km2 per year since 1980.

The proboscis monkey is a rare and endemic animal of Kalimantan. Proboscis monkeys usually live in areas of peat swamp forest, mangrove forest, and riparian zone. Proboscis monkeys' population is very dependent on their water quality. This causes proboscis monkeys' intolerance of ecosystem disruptions. Land function change well as river function change as transportation

infrastructure reduces the area of proboscis monkeys' habitat and causes the population size reduction of proboscis monkeys (Bismark, 2010). Several activities that propel the decrease of proboscis monkeys' habitats, namely, river water pollution, mining activities, and river transportation. Proboscis monkeys need healthy forest ecosystems to fulfill their needs. Around 98% of proboscis monkeys' food sources are plants that encompass leaves, shoots, fruits, and flowers (Bismark, 2010).

Coal mining activities that are able to alter landscapes on a massive scale will threaten the existence of orangutans and proboscis monkeys around it. Land clearing activities for mines will eliminate the habitats of orangutans caused by the disappearance of trees' coverage as their habitation and source of food. Orangutans and proboscis monkeys' disappearance as seed disperser agents will hinder natural forest regeneration that is disrupted. This potentially reduces species biodiversity caused by disruptions in natural forest regeneration. With the disappearance of orangutans from forest ecosystems, accordingly, more efforts are needed to fix ecosystems damaged by human activities.

Sharks are a component of the sea ecosystem and are commonly the highest-tiered carnivore in one ecosystem's food chain. Data regarding their eating habits, reproduction, migration, and others are primarily distributed and based on a few specimens. The scalloped hammerhead, *Sphyrna lewini*, is considered a common predator, indicating individual specialization and different trophic levels. These species inhabit ocean islands and coastal areas in the east tropic Pacific Ocean (ETP). The scalloped hammerhead, *Sphyrna lewini*, has global circum distribution in tropical waters and warm climates (Chodrijah and Fauziah, 2021). This species is a member of the Sphyrnidae famili, and this type of shark can be found in Indonesian waters. S. lewini has conservation status according to the International Union for Conservation of Nature and Natural Resources (*Red List* IUCN) and is threatened with crisis (*Critically Endangered*). According to GBIF data, as well as mine sites in Kalimantan data, this species is located in the area of PT Singlurus Pratama Coal. *S. lewini*, which is already threatened with extinction, will be significantly

disrupted by human activities, one of them from PT Singlurus Pratama Coal's mining.

The prey of scalloped hammerheads is every fish or crustacean. Scaridae and most other species are registered as reef fish. Sharks are essential in the ecosystem as high-tiered carnivores (Montano et al., 2021). The harmony of an ecosystem is heavily affected by environmental conditions and the food chain. If coral reef ecosystems in an area perished as a consequence of waste and warmed up the temperature of water surfaces, consequently its characteristic becomes considerably turbid; subsequently, a few coral fish species will die or migrate, also causing negative impacts on sharks as their sustenance vanishes from the habitat. Waters that contain heavy metal substances will get accumulated in the food chain, commonly called bioaccumulation. The higher a biome's tier in a food chain, the higher the bioaccumulation of heavy metal in the said biome. The scalloped hammerhead is a high-tier carnivore; consequently, it can be concluded that heavy metal bioaccumulation that is eaten by sharks will increase and impact the death of sharks (Tiznado et al., 2021).

In Figure 4.1, it's explained that heavy metal and carbon dioxide emission that occurs can endanger water biomes. A polluter that gets into waters either directly or from the atmosphere entering the sea then gets absorbed by biomes. Acceleration of bioaccumulation at each trophic level is caused by the different amount that gets eaten at each trophic level. Bioaccumulation occurs when an organism absorbs a substance at a faster level than where a substance disappears or is removed from catabolism and excretion. Therefore, the longer the biological half-life time of toxic substances is, the higher it gets for chronic toxication, even if the environmental toxicity level is not too high. Toxicity induced by metal is linked with bioaccumulation and biomagnification. Conservation or metal absorption is faster than the rate of organisms' metabolism, and excretion causes the accumulation of metal accumulation (Rubalingeswari et al., 2021).

Chemical substance absorption by an organism can occur by breathing,

absorption through the skin, or ingestion. When chemical substance concentration is higher in an organism compared with its environment (air or water), this is called bioconcentration. Biomagnification is an alternative process linked with bioaccumulation because chemical or metal substance concentration increases when moving up from one trophic level to another. Naturally, bioaccumulation processes are needed for organisms to grow and thrive; however, the accumulation of dangerous substances can also occur (Bonsignore et al., 2018). For example, although mercury has only a tiny amount in the oceans' water, mercury can be absorbed by algae (commonly as methyl mercury). This is efficiently absorbed but excreted very slowly by organisms. Bioaccumulation and bioconcentration produce accumulation in adipose/fat tissue at trophic levels sequentially: zooplankton, little nekton, bigger fish, et al. Whatever eats these fishes will consume higher levels of mercury that fish have accumulated. This process explains why predator fish such as swordfish and sharks or birds like osprey and eagles have higher mercury concentration in their tissue than species with direct exposure. For example, herring contains around 0.01 portion per million (ppm) of mercury, and sharks contain more than 1 ppm mercury.

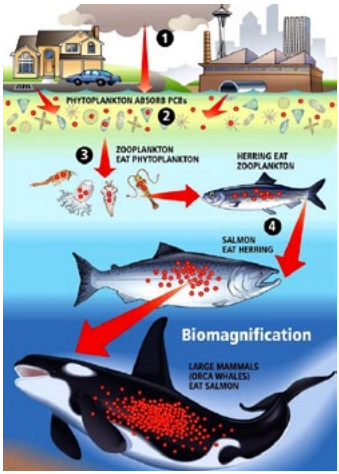


Figure 4. 1. Bioaccumulation
(Source: bluegrowth.org)

Apart from scalloped hammerheads, according to GBIF and mine's locations in Kalimantan data, there are also discovered green sea turtles that hold IUCN's critically endangered status around the area of PT Berau Coal. Primasatya (2013) explained that dangerous metal substances that exceed the quality standard threshold at sea turtles' egg nests caused by mining activities affect green sea turtles' egg incubation. The green sea turtle is one of the species that's impacted and threatened by mine sites built by PT Berau Coal. Sea turtles have essential roles in the ocean ecosystem, such as preserving and tending coral reefs by eating sponges that hinder the growth of coral reefs, consuming seagrass to maintain oceans' cleanliness so the seagrass doesn't grow dense and hinder sunlight onto the seabed, preventing decomposition that will create mushroom habitat from occurring (KKP, 2021).

The green sea turtle is one of the few creatures that consume seagrass. Seagrass must be consistently cut short to help them grow on the seabed. Sea turtle grazing helps maintain the health of seagrass. Seagrass provides breeding sites for many ocean animals. Without them, many ocean species harvested by humans and lower-tier food chains will disappear. This reaction could cause more ocean species to be threatened with extinction.

Sea turtles use beaches and dunes to lay eggs. Coastal environments such as this are impoverished with nutrition and are dependent on vegetation to protect them from erosion. Eggs hatched or not, and hatchlings that fail to get into the ocean are a source of nutrition for dunes vegetation and therefore protect sea turtles' nest habitats, creating positive feedback.

Wastes generated from mine wastes are hazardous to the livelihood of the ocean and coastal ecosystems. Mine waste is one of the aspects that impacts the rising temperature of water surfaces. As a consequence of this rising water temperature hence ocean ecosystems will perish.

Presently, waters in Indonesia are starting to be threatened with waste, especially in areas near mine sites. The impact of mine sites will affect ocean water quality and undoubtedly influence scalloped hammerheads' livelihood

and the constant reduction of green sea turtles' population in nature.

The government has the role of overseeing ocean pollution that occurs, as already explained in Regulation No. 32 the Year 2014 regarding Marine. Pollution that occurs could damage biodiversity and cause climate change. These pollutants must be prevented, handled, and repaired by all parties, whether from the government or mining companies.

Around the research mines area, there are 16 conservation sites that encompass Natural Preserve, Derawan Small Islands and Surrounding Marine Conservation Areas (KKPD), Wildlife Reserve, Forest Park, and National Park. Natural Preserves that are located around these research mines are Alam Bukit Sapat Hawung Preserve (around PT Kalteng Coal and PT Sumber Barito Coal), Alam Gunung Kentawan Preserve (around PT Antang Gunung Meratus and PT Sumber Kurnia Buana), Alam Muara Kaman Sedulang Preserve (around PT Gunungbayan Pratamacoal, PT Kartika Selabumi Mining, PT Nusantara Santan Coal, and PT Nusantara Wahau Coal), Alam Padang Lalay Preserve (around PT Firman Ketaun Perkasa, PT Gunungbayan Pratama Coal, and PT Trubaindo Coal Mining), Alam Pararawen Preserve (around PT Asmin Bara Bronang and PT Suprabari Mapanindo Mineral), Alam Teluk Adang Preserve (around PT Batubara Selaras Sapta and PT Kideco Jaya Agung), Alam Teluk Apar Preserve (around PT Batubara Selaras Sapta), Alam Teluk Kelumpang Sanctuary, Sea Strait, and Sebuku Strait (around PT Berau Indobara Semesta, PT Persada Berau Jaya Sakti, and PT Sumber Daya Energi), as well as Alam Teluk Pamukan Preserve (around PT Sumber Daya Energi).

KKPD that are at these surrounding research mine areas is KKPD Derawan Small Islands and Surrounding Marine Conservation Areas (around PT Berau Coal and PT Delma Mining Corporation).

Wildlife reserve that is in the surrounding research mine area is Pleihari Tanah Laut Wildlife Reserve (around PT Arutmin Indonesia). Raya Forest Park that are at these surrounding research mine areas are Raya Bukit Soeharto Forest Park (around PT Gunungbayan Pratamacoal, PT Insani Baraperkasa, PT Multi

Harapan Utama, and PT Singlurus Pratama Coal), Raya Lapak Jaru Forest Park (around PT Asmin Bara Bronang and PT Tadjahan Antang Mineral), Raya Lati Petangis Forest Park (around PT Batubara Selaras Sapta and PT Kideco Jaya Agung), as well as Raya Sultan Adam Forest Park (around PT Antang Gunung Meratus, PT Arutmin Indonesia, PT Borneo Indobara, and PT Sumber Kurnia Buana).

National park that is at these surrounding research mine areas is Kutai National Park (around PT Indominco Mandiri, PT Kaltim Prima Coal, PT Nusantara Santan Coal, PT Nusantara Wahau Coal, PT Perkasa Inakakerta, PT Santan Batubara, and PT Tambang Damai).

Based on an ANDAL document published by PT Kaltim Prima Coal regarding the Increased Coal Production Capacity Up To 70 Million Ton Per Year, which was released in 2010, land clearing activities in mining areas will eliminate flora and fauna habitats in impacted areas. However, with fauna's ability to move from one place to another, it is expected that faunas impacted by mining activities might migrate to safer habitats, one of them towards Kutai National Park on the south side mining area of PT Kaltim Prima Coal.

In an interview that AEER conducted in 2021 at Santa Ulu Village, Central Santan, as well as Kadere Bay around PT Indominco Mandiri mine site, locals still encountered the existence of rare and protected faunas surrounding the mine site. These animals are python, monkey, crocodile, bear, hornbill, gibbon, clouded leopard, wild boar, pangolin, proboscis monkey, orangutan, and deer. Locals' encounterance with these animals indicates the existence of said animals' habitats around the surrounding mine site of PT Indominco Mandiri. Mining activities at PT Indominco Mandiri will reduce the area of habitats as well as cause degradation of the remaining wildlife habitats. This implicates the habitats' capability to support wildlife that inhabits said habitats. The ecosystem's capability derivation to provide space and resources for wildlife will impact the reduction of wildlife population size that are at these habitats. Furthermore, reducing resource quantities that these habitats can provide will propel wild animals to seek other resources to fulfill their needs. This propels

conflict between existing wild animals with locals that inhabit settlements around the mine sites. Based on the same interview, locals encountered several wild animals damaging and consuming locals' agricultural land. Few incidents of wild animals conflict occurred around PT Indominco Mandiri's mine sites; among others, for instance, are monkeys that clear away coconut and sugar palm agriculture, langur eating locals fruits and vegetables, a python that eats at locals livestock, as well as crocodiles eating dogs owned by locals. One propelling factor for conflict between wild animals and locals is the declining resources and space availability in impacted wildlife habitats. Therefore, wildlife habitat reparation around mine sites is needed in nearby area of PT Indominco Mandiri, as well as reduction of degradation and habitat derivation threat sources, one of them from coal mining activities.

Wildlife's characteristics of migration capability from one area to another doesn't mean wildlife habitat reduction through mining activities is allowed. Wildlife migration towards more suitable areas caused by the occurrence of mining activities will increase the aggregation of this wildlife in areas that are far from the impact of mining activities. This will implicate the increased competition between recent species that have just come to these areas and species that have already been in these areas. This increase in competition will lead to the decline of impacted wildlifes' health levels, moreover potentially prompt population size reduction caused by the increase in competition. Attention, as well as better company policies regarding the handling of lost wildlife habitats as a consequence of mining activities, are required.

Apart from that, animal migration that is expected to happen needs to be more strictly overseen. Around mine sites, there are still forms of other land uses such as areas of settlement, agriculture, and fields that locals use as sources of income. Animal migration from mine sites can't be fully confirmed going towards conservation sites as there are no efforts to control from companies to ensure impacted animals migrate towards more protected conservation sites. Impacted animals will migrate outside of mine sites to the available areas around the mine sites and other available areas around the mine sites that not only consist of conservation sites. If animals move towards

settlements and fields used by locals, wildlife conflicts can occur due to the increased contact and also conflict between humans and impacted animals.

4.2. Mangrove Ecosystems Around Mine Sites

Mangrove is wooden halophytes that create an intertidal forest and provide many critical ecosystem services, including protecting beaches, coastal fish and crustacean nurseries, forest products, recreation, nutrition filter, and carbon absorption. As they grow at the intersection of land and ocean, they have semi-terrestrial components and ocean, including a unique adaptation of exceedingly effective aerial roots, viviparous embryo, and nutrition retention mechanism. Mangrove is shrubs or trees that grow in salt or brackish water. Mangrove trees also contain complex salt filtration and root systems to resolve salt water immersion and waves (Vo et al., 2012).

Mangrove forest is one of the most efficient terrestrial and coastal ecosystems in binding atmosphere carbon dioxide and reserve carbon inside biomass and sediments (Donato et al., 2011). Mangrove and seagrass ecosystems are commonly recognized as blue carbon ecosystems globally; this ecosystem is essential to absorb organic carbon in more significant amounts compared to other ecosystems (Lovelock & Duarte, 2019). Blue carbon is carbon absorption or elimination from the earth's atmosphere by several oceans, and coastal ecosystems can be seen in Figure 4.2. This happens through plant growth, accumulation, and organic substance fixation inside the soil. As the ocean covers 70% of this planet, ocean ecosystem restoration has the most considerable blue carbon development potential.

Mangrove swamp protects coasts from erosion, storm surge (especially during tropical cyclones), and tsunami. They limit high energy wave erosion, particularly during the occurrence of storm surges and tsunamis. Mangrove's extensive root system is efficient in squandering wave energy. Likewise, they stall the tide until the sediment is deposited when it comes in, leaving all except smooth particles when the tide is low. Through this, mangrove builds

the environment. Because of the uniqueness of the mangrove ecosystem and erosion protection given from them, they often biome conservation programs' objectives, including national biodiversity action schemes.

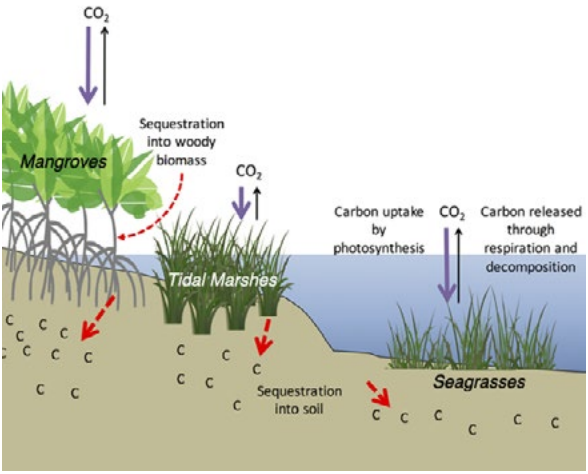


Figure 4. 2. Carbon cycle in mangrove ecosystem
(Source: us-ocb.org)

Global mangrove cover was estimated at around 83,495 km2 and 167,387 km2 in 2012, with Indonesia possessing 30% of all the global mangrove forest area. Mangrove forest is responsible for around 10% of global carbon deposit, with an estimated carbon burial rate. Mangrove has a high degree of carbon absorption potential. They contribute 3% of the global carbon absorption by tropical forests and 14% of global coastal carbon burial. Mangrove is naturally disrupted by floods, tsunamis, beach storm such as typhoons and hurricanes, lighting, diseases, and pests (WWF, 2016).

Based on land coverage information as well as mine sites data, PT Amanah Putra Borneo, PT Arutmin Indonesia, PT Batubara Selaras Sapta, PT Berau Coal, PT Berau Indobara Semesta, PT Borneo Indobara, PT Delma Mining Corporation, PT Indominco Mandiri, PT Insani Baraperkasa, PT Kaltim Prima Coal, PT Kideco Jaya Agung, PT Lanna Harita Indonesia, PT Multi Harapan Utama, PT Perkasa Inakakerta, PT Persada Berau Jaya Sakti, PT Santan

Batubara, PT Singlurus Pratama, PT Sumber Daya Energi, and PT Tambang Damai are mining areas that posses primary and secondary mangrove forests in 25 kilometres radius from mine site. The total area of impacted mangroves around these mine sites is 136,430.05 ha. According to research by Alongi (2020), the average carbon absorption on mangrove ecosystems globally is around 179.6 grams C/m2/year, or equal to 1,796 ton C/ha/year. If damage and degradation occur on mangrove ecosystems around the mine sites, subsequently, loss of carbon absorption potential around these mine sites might reach up to 245,028.37 ton C/year. Loss of mangrove absorption power will impact global CO2 carbon emission. This loss of mangrove absorption power capability can be analogized with power plants' capabilities to use renewable energy in reducing carbon emission of PLTB Tolo in Jeneponto, South Sulawesi, with 72 MW power that took up to US$160,7 million only reducing up to 160,600 tons of carbon (CNN Indonesia, 2018). PLTB Tolo reduction quantity still doesn't compare with the absorption power of the mangrove ecosystem around the research mine sites.

As habitats that absorb carbon are modified and reduced, the amount of stored carbon will be released into the atmosphere and impact a much more accelerated climate change. Impacts on these habitats globally will, directly and indirectly, release previously-stored carbon that has been stored in the habitats' sediment. A decrease in coastal vegetation habitats can be seen around the world; an example that can be seen in a mangrove is as caused by mines opening as happened in Indonesia. Measuring the drop rate is challenging to calculate however measurements have been estimated by researchers that show if the blue *carbon* ecosystem keeps declining, for many reasons, 30-40% of tidal swamp and around 100% of mangrove forest could disappear in the next century (Pendleton et al., 2012).

The decline of mangroves is caused by numerous factors, including issues of water quality, agricultural practices, invasive species, pathogens, fish catching, and climate change. More than 35% of global mangrove habitats still exist however they are drastically declining. Decreases in habitats are caused by river dams, land opening for mines, construction et al., overfishing,

and climate change; according to Dana Margasatwa Dunia, almost 16% of mangroves that IUCN rates are included in IUCN's Red List; because of construction and other causes, 1 out of 6 mangroves in the world are threatened with extinction. Dams threaten habitats by stalling the amount of fresh water from reaching mangroves. Damage to coral reefs also plays a role in the health of mangrove habitats because coral reefs stall tidal energy to a more appropriate degree that can be tolerated by mangroves. Salt marsh may not be as vast as forests on this earth, however, they have a C burial level 50 times faster than a tropical rainforest. The burial level is estimated to reach 87,2 ± 9,6 Tg C year-1, more significant than in tropical rainforests, 53 ± 9,6 Tg C year-1n (Macreadie et al., 2013).

Reasons for the decline of mangrove, seagrass, and swamp are land-use change,drought, dam construction around the river flow area, cultivation and agriculture convergence, land development, and the increase of ocean's water surface as an impact of climate change. Loss of underground biomass (roots and rhizome) will turn this habitat into a source rather than a carbon absorbent. The reduction of water quality activities subsequently causes phytoplankton, the biggest producer of oxygen, to experience a decrease in abundance (Hader et al., 2015).

One of the benefits of the mangrove ecosystem is it stalls the sedimentation rate. *Sediment trapping* functions to catch sediment from freshwater from muddying the sea. *Sediment trapping* plays an important ecological role; it brings nutrition, supports coastal habitats adapting to sea-level rise. However, an overflow of sediment could cause problems. Meanwhile, massive and sudden sediment disposal could kill mangrove ecosystems (Muxham et al., 2018). Sedimentation caused by PT. MHU's mining activities, according to ANDAL PT. MHU year 2013, that occurs in forest areas due to mining activities increased to 56.73 ton/ha/year. Sedimentation initial condition is 23.94 ton/ha/year rise to 80.67 ton/ha/year. This accelerated shift is suspected will affect mangroves. If mangroves located around the mine sites get degraded, subsequently sedimentation will directly enter into the water column.

Even though they are resilient to many natural disruptions, they are very vulnerable to human impacts, including urban development, cultivation, mines, and overexploitation of coral, crustacea, fish, and wood. Mining is one of the most threatening activities for the existence of mangroves. Waste, anthropogenic activities, and mine construction can disrupt mangrove habitats. Mangrove provides ecosystemic service, critical habitat to be preserved and, if possible, repaired.

4.3. Land Degradation Caused by Mining Activities

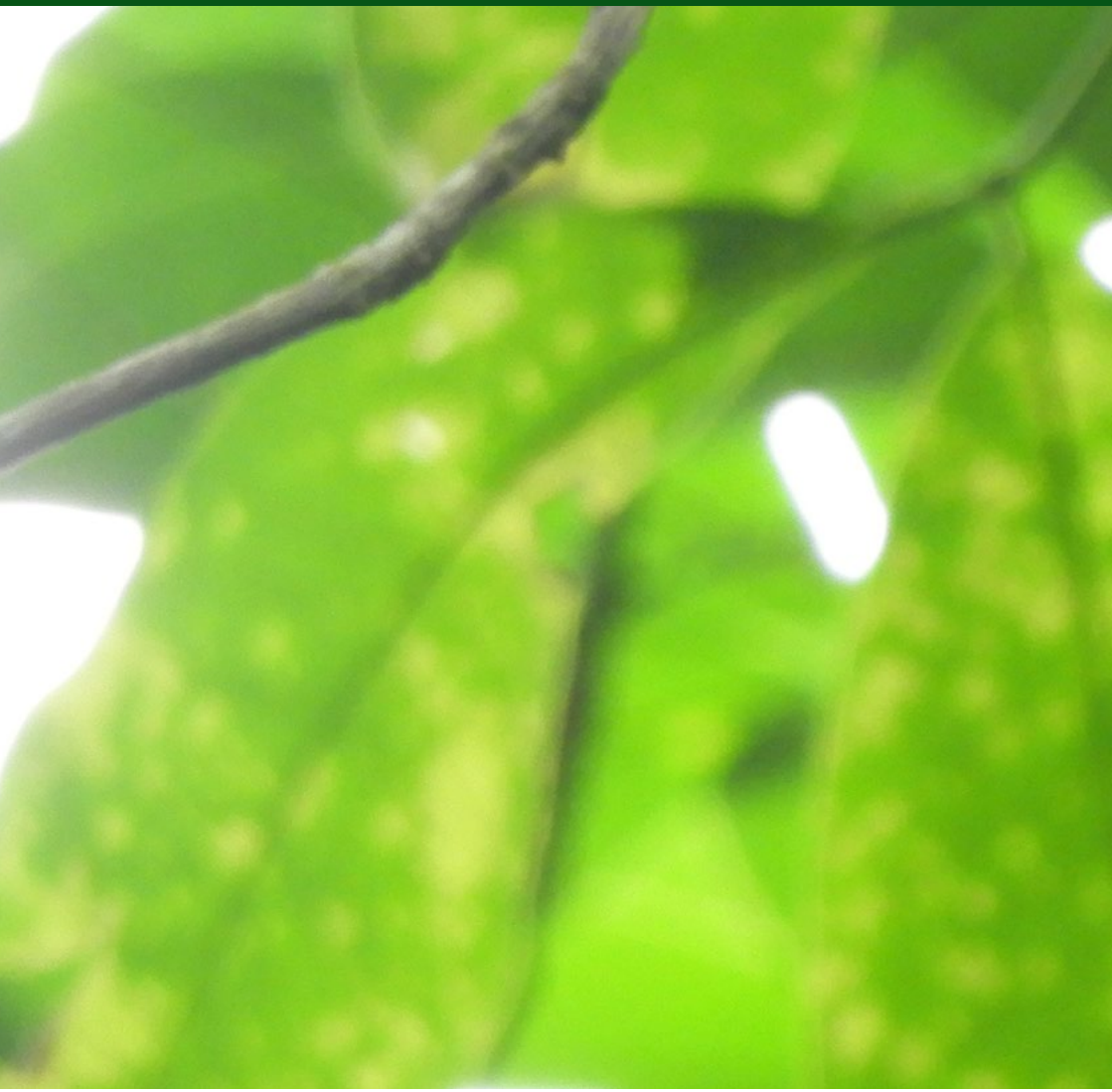
Besides mangrove ecosystems, dryland forest ecosystems are also threatened with mining activities. Mining companies located at the area of dryland forest ecosystems on this research are PT Amanah Putra Borneo, PT Antang Gunung Meratus, PT Arutmin Indonesia, PT Asmin Bara Bronang, PT Batubara Selaras Sapta, PT Berau Coal, PT Berau Indobara Semesta, PT Borneo Indobara, PT Borneo Prima, PT Delma Mining Corporation, PT Firman Ketaun Perkasa, PT Gunung Bayan Pratama Coal, PT Indominco Mandiri, PT Insani Baraperkasa, PT Kalteng Coal, PT Kaltim Prima Coal, PT Kartika Selabumi Mining, PT Kideco Jaya Agung, PT Lanna Harita Indonesia, PT Multi Harapan Utama, PT Nusantara Santan Coal, PT Nusantara Wahau Coal, PT Perkasa Inakakerta, PT Persada Berau Jaya Sakti, PT Ratah Coal, PT Santan Batubara, PT Singlurus Pratama Coal, PT Sumber Barito Coal, PT Sumber Daya Energi, PT Sumber Kurnia Buana, PT Suprabari Mapanindo Mineral, PT Tadjahan Antang Mineral, PT Tambang Damai, PT Trubaindo Coal Mining, and PT Tuhup Coal Mining. Mining activities will degrade areas on a massive scale, not only mining areas. Place of laying overburden area has the potential to increase soil erosion if revegetation doesn't be conducted immediately. Considerable risk of soil erosion will thin out the already running low topsoil in mining areas. This will impact local water availability and increase sedimentation in river areas, increasing the risk of flood occurrence. Moreover, massive-scale land clearing activities are also a real threat to the existence of primary forest in the area (Novianti et al., 2018).

Mining activities alter the landscape through massive excavation activities and release pollutants that will damage the ecosystems around the mine sites (El-Hamid et al., 2019). Mining activities will alter climate factors such as temperature and rainfall. According to research conducted by El-Hamid et al. (2019), the average temperature rise of around 0.029°C occurred. This temperature increase impacts the significant rise of evapotranspiration around the mine sites. This damages the hydrologic and material cycle around the mine sites (El-Hamid et al., 2019). Disruptions to the material cycle and energy flow around the mine sites potentially reduce the productivity of the lands around it and cause degradation of habitats.

Land function changes, as well as ecological process disruption, will become the damaging factors to wildlife habitats. Mining activities devastate ecosystems on a massive scale through landscape change. Moreover, mining activities also degrade numerous ecosystem elements, such as damaging soil fertility and water quality through an increase in soil acidity. A decrease in soil fertility will devastate the growth of numerous plant species and hinder the ecosystem's regeneration process. This could cause a chain effect (*cascade effect*) towards higher tier trophic. Other species that are dependent on the presence of forests and plants as their source of nourishment will be disrupted. This will implicate the population size reduction of various levels of life. Therefore, mining activities, especially coal mining in Kalimantan, must be reduced and stopped expansion to protect environmental health and biodiversity. A healthy ecosystem will provide substantial benefits to many forms of life inside it. Water regulation, forest resource provision, as well as economic and cultural values for locals are part of of the ecosystemic service contained.

Locals experience various negative impacts of ecosystem devastation as an impact of mining activities. According to an interview result conducted by AEER in 2021 at Santan Ulu Village, Central Santan Village, Santan Ilir Village, and Kadere Bay around the mining area of PT Indominco Mandiri, numerous negative impacts can be felt by the locals as a consequence of the occurrence of mining activities. One of the negative impacts that are felt is the

increase in flood intensity, and floods are harder to predict. More frequent floods are caused by vegetable plants becoming more difficult to plant and grow because of their characteristics being not resilient to too much water. Furthermore, a decrease in river water quality also occurs, where once can be drunk and used for sanitation purposes, now can no longer as a consequence of the enormous amount of waste in the river. This also implicates locals' water catch, such as mussels that no longer exist around the community area. Moreover, soil fertility also experiences a decrease. This is seen with the less and less discovery of earthworms in farmlands. Besides that, this can also be seen in the rise in the need for fertilizers which is getting higher. In contrast, previously, fertilizers are not needed in plentiful amounts for locals to farm.



CHAPTER 5
CONCLUSION AND SUGGESTION

Chapter 5
Conclusion and Suggestion

5.1. Conclusion

Overall, there needs to be a reduction and ceasement of coal mining activities in Kalimantan as it has the potential to worsen biodiversity around the mine sites. However, mine sites whose activities need to be immediately reduced and ceased are mine sites with high threat levels towards biodiversity, considering the existence of rare and protected species as well as the presence of essential ecosystems around these mine sites. If mining activities are not reduced and ceased, then population size reduction of rare and protected species as a consequence of mining activities might ensue. This will worsen the extinction threats that are faced by these species. The existence of critical ecosystems such as the existence of dryland first as well as mangrove areas around mine sites is also needed to be maintained for their roles and ecosystemic service potentials that can be generated from these ecosystems to support various species and humans in its surrounding areas' livelihoods.

5.2. Suggestions

5.2.1. Suggestions for government

1. Conduct ceasement of land expansion for coal mines in areas that are rich with biodiversity. Discontinue PKP2B (coal contract of work) license renewal, especially for regions that threaten biodiversity.
2. Strengthen supervision for environmental rehabilitation programs in post-mined areas to restore their environmental condition as healthy ecosystems.
3. Encourage periodical research around extractive industrial areas to conduct *monitoring* of biodiversity conditions around extractive industrial areas and publicize the data transparently.
4. Encourage the development of renewable energies to replace the need

for coal-based energy so that coal mining activities can be pushed to discontinue.

5. Create steps and strategies for just transition from coal mining activities, including environmental aspects, communities and workers that are impacted by the coal mining sector; thereby, energy transition of leaving behind coal resources can be conducted more efficiently.
6. The Indonesian government, as G20 President of 2022, includes the agenda of protection of biodiversity as one of its priorities in the forms of reduction and ceasement of coal mining activities, ecosystem restoration on mine sites, as well as striving for funding to reach these goals.

5.2.2. Suggestions for financial institutions

1. Reveal information to the public regarding the funding of coal mining activities and expose the impacts of mining projects that are being funded towards biodiversity information to the public.
2. Divert investment funds that are initially for mining activities towards other more environmentally friendly sectors to prevent loss of biodiversity in impacted areas.

5.2.3. Suggestions for importer countries

As the biggest portion of Indonesia coal for export, importer countries should pursue energy transition to renewable energy and build cooperations with the Government of Indonesia to implement transition programs in energy sector and biodiversity protection, taking account of the welfare of community and coal sector workers that are impacted.

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The diversity of life forms on earth includes the variety of species, genetics, and ecosystems. Biodiversity plays an essential role in human survival. Healthy ecosystems and biodiversity will provide various environmental services to improve the quality of human life. One area with high biodiversity is Kalimantan.

Kalimantan is a habitat for many important species. The stability of the ecosystem in Kalimantan is essential to support human life and the biodiversity in it through the provision of ecosystem services. However, Kalimantan is one of the largest coal-producing areas in Indonesia. Land clearing activities are the main driver of deforestation in coal mining activities. It is recorded that an area of 143,592 Ha of natural forest and 8,765 Ha of plantation forest in Kalimantan has been deforested into mining land. This is a real threat to biodiversity in Kalimantan.

Along with losing biodiversity, climate change is a real threat to all living things. One of its causes is the use of fossil fuels in the form of coal. Indonesia is the third largest coal-producing country globally, so it is vulnerable to environmental crises. On the other hand, Indonesia has ratified the Paris Agreement on climate change.

Indonesia's ambitious target of reducing greenhouse gas emissions must require the support of various parties. One effort to reduce greenhouse gas emissions is to stop the expansion and even stop the operation of coal mining areas to prevent negative impacts on the surrounding environment's ecological, economic, and social aspects.

This study aims to assess the threat of mining areas in Kalimantan to biodiversity. Mining areas are grouped by threat category using a scoring technique. The results of this study can be considered in reducing coal production drastically and putting a halt to the expansion of the mined area to achieve climate and biodiversity targets.

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