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COAL MINING SECTOR CONTRIBUTION TO ENVIRONMENTAL CONDITIONS AND HUMAN DEVELOPMENT INDEX IN EAST KALIMANTAN PROVINCE

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Abstract

Coal mining has been one of the issues that led to pros and cons in Indonesia. Research shows that mining activities are one of the factors that affect people's incomes and local and national economic development. However, mining is a lucrative activity that leads to construction booms that attract population growth and lead to deforestation, thus affecting the environmental conditions of a region. The coal mining industry of Indonesian province of East Kalimantan, on the island of Borneo, provides most of the economic base needed to build the infrastructure and provide energy of the country. Kalimantan Province accounts for approximately 90 % of the entire country's coal production. East Kalimantan, with its mining operations mainly in the district of Kutai and its expanded territory, is a major coal-producing region of the country. This article will examine how coal mining sector contributes to environmental conditions and Human Development Index (HDI) in the province of East Kalimantan. This research was conducted using a combination of scientific methods, including literature, spatial analysis using geographic information system (GIS) technology, and quantitative data analysis. From the analysis of the spatial issuance of coal mining permit in East Kalimantan, the coal mining sector has a direct impact on regional revenue and contributes indirectly to the HDI in the province of East Kalimantan. However, it turns out that the planning and management of natural resources field exploitation business licenses are not performed systematically. As a result, many problems arise, such as disputes over control and ownership of land (agrarian conflicts), damage to the landscape, deforestation, environmental pollution, and public health problems. Thus, anticipatory measures are needed by the government so that the economy of East Kalimantan Province remained stable and sustainable.

Keywords: mining; environment; development; human; East Kalimantan

1. Introduction

Coal mining has its positive as well as adverse effects. It bears a positive relationship to income per capita (Betz, Partridge, Farren, & Lobao, 2015). The mining industry is providing most of the materials needed to build infrastructure and acquiring large amounts of energy. Mining practices up to now can be summarized in a few steps: obtaining a license, digging the ore, selling the metal, and, after the deposit is exhausted, abandoning the locations and starting another mine elsewhere. At the same time, mining is a human activity that disturbs the environment and is associated with considerable social impact, as well as inequality. That

said, our future depends on it. Not surprisingly, mining is one of the human activities with the greatest environmental and social impacts (Carvalho, 2017).

The need for natural resources further encourages their exploitation and land use. As a result, developing countries are saddled with unequal environmental burdens compared with developed countries that import raw materials. Many factors, such as poverty, weak institutions, and environmental regulations, may restrict developing countries in their management of natural resources extracted to meet market demand. For some, resource extraction has almost reached its limit (Swenson, Carter, Domec, & Delgado, 2011). Today, the mining and quarrying sector plays an essential role in the development of various countries in the world. The industry guarantees the supply of raw materials adequate and sustainable for the construction, building, and manufacturing sectors for these countries' economic development. Mining and quarrying activities produce crucial raw materials for further processing by the manufacturing industry and material and energy inputs for production. Economic recovery in the manufacturing industry has increased demand for inputs worldwide (Fugiel, Burchart-Korol, Czaplicka-Kolarz, & Smolinski, 2017).

Demand for minerals also carries significant risk, particularly where mineral resources and forest biodiversity coexist in developing countries seeking revenue from mining but do not have the control and capacity to enforce regulations. Mining causes environmental damage, one of them in the form of deforestation both within and outside the lease boundaries (Sonter, Herrera, Barrett, Galford, Moran, & Soares-Filho, 2017). Mining is very intensive and very damaging. The land area involved is quite small and is not seen as a significant cause of deforestation. However, mining is a lucrative activity that leads to construction booms that attract population growth and lead to deforestation (Chakravarty, Ghosh, Suresh, Dey, & Shukla, 2016). Data from the Central Bureau of Statistics, East Kalimantan Province, related to the environmental conditions there. Views of forest land show that the area of protected forest increased in 2016 compared to 2010, as did production forests. However, a decline in forest area was massive in area forest preserves. In 2010, the land area forest preserves, and travel amounted to 2,165,198 hectares, where in 2016 they covered only 438,490 hectares.

Coal exploration techniques, the growing understanding of the importance of safe exploration, and paying attention to the natural environment in the planning and execution of exploration activities have evolved over the years. Potential environmental impacts associated with mining are increasingly emphasized in the early stages of exploration. Attention to the social aspects of exploration also continues to grow and are usually given priority in the planning and implementation of such programs, including initial consultation with the communities. Most exploration programs include a focus on community training and employment of local labor (Friederich & Leeuwen, 2017). Mining activities are one of the factors that affect people's incomes and local and national economic development.

Gross Regional Domestic Product describes the ability of a province to create added value. Two approaches can be used to compile the Gross Domestic Product (GDP)—the expenditure approach and the business field. Both are presented as the added value of data broken down by source of economic activity or field of work and the components used. The GDP of the field of business is derived from the sum of all components of gross value added created by the sectors of a region's economy on a wide range of production activities. While

the approach of the expenditure side explains the use of the value added (Central Bureau of Statistics, 2018), research shows that coal mining is positively related to changes in per capita income and employment-population ratio (Betz et al., 2015). So, it can be said that coal mining is positively related to the GDP of a region.

Economic development is one of the indicators of success in the development of a region through a list called the Human Development Index (HDI). HDI is the brainchild of UNDP, introduced in 1990 and published in the annual *Human Development Report*. HDI measures human development achievements by several key quality-of-life components, per three primary dimensions: a long and healthy life, knowledge, and a decent life. The third dimension relates to many factors that, in a broad sense, measure the dimensions of health, using life expectancy at birth.

Furthermore, the dimensions of “knowledge” is a combined indicator of the average length of years in school and literacy rate. The dimensions of a “decent life” indicate the purchasing power for necessities. These indicators can be deduced from the average spending per capita as income is used to represent the development gains for a decent life (Central Bureau of Statistics, 2018).

Indonesia has tremendous geological wealth on Borneo island, especially from its deposits of coal. Kalimantan accounts for some 90% of Indonesia's coal production. East Kalimantan, along with mining operations in Kutai and Tarakan, is a major coal-producing region for the country.

Indonesia has a long history of coal mining, starting with the opening of its first mine in 1849. Production in Central Kalimantan (Cornot-Gandolphe, 2017), along with that in Barito and Asam Asam in South Kalimantan, dropped in early World War II. The 1960s brought liberalization of the country's investment and mining laws, which led to a significant rise in the opening of new mines in the late 1980s. This rapid growth made Indonesia the world's leading steam coal exporter by 2005. In 2013, Indonesia supplied 38% of global steam coal exports, and 50% of the Asian demand. The coal industry sector in Indonesia is a leading driver of Asian economic growth (Friederich & Leeuwen, 2017).

Indonesian coal mining industry also supplies the rapidly growing domestic market, mainly for electricity generation. However, the industry has now been through a challenging period of falling export demand and low prices, impacting miner income and contributing to a significant reduction in exploration. Elsewhere, low prices have forced the closure of several mines and the introduction of significant cost-cutting measures. Recently, local coal prices have rebounded, giving Indonesian coal miners some financial leeway. However, future Indonesian coal exports level remains uncertain, with Chinese and Indian demand, for example, unclear (Friederich & Leeuwen, 2017).

The Human Development Index in the province of East Kalimantan continues to increase each year. In 2014, HDI East Kalimantan was at 73.82 and continued to rise until 2017, when it reached 75.12. According to the East Kalimantan Provincial spending data, GDP at constant prices in 2010 experienced a significant increase in 2014 and declined in 2015 and 2016. GDP based on prevailing prices in the business field in East Kalimantan have been nearly the same, experiencing a significant increase in 2014, a decrease in 2015, and a slight increase in 2016. In the field of mining, the East Kalimantan Province GDP decreased in

2015 and 2016 but increased again in 2017 to reach 274,361,569 (Central Bureau of Statistics, 2018).

From some data that have been mentioned above, it can be said that coal mining is positively related to economic development through GDP and HDI as well as to the environmental condition of a region. This article will examine how coal mining sector contributes to the environmental conditions and the Human Development Index in the province of East Kalimantan, Indonesia.

2. Methods

Research was carried out by analyzing secondary regional data. Results of the analysis were then further processed to obtain the scientific correlation so that a conclusion could be drawn in answer to the purpose of the research. Some of the scientific methods used include literature review, spatial analysis using Geographic Information System (GIS), and quantitative analysis (Sharma, Kamble, & Gunasekaran, 2018). The spatial analysis methods were processed with GIS to allow researchers to see the condition of the earth's surface, thus providing a comprehensive overview with highly accurate information. At its most fundamental level, according to Malczewski & Rinner (2015), GIS tools and applications can perform analysis that is useful for its unique ability to visually represent detailed and clearly outlined data. Descriptive GIS analysis was used for problem-solving in existing processes and conducted periodically through such techniques as "spatial online analytical processing" or various "search approaches". The framework of geographic information systems (GIS) has been developed to explore the phenomenon of inter-explicit ecosystem services inherent in the placement of land cover in the landscape (Jackson et al., 2013).

Quantitative analysis was done by scrutinizing thematic quantitative data, and correlations were illustrated in the form of wide range figures as triggers, with other phenomena's probabilities of occurrence related to the research (Yunus, 2010). Growth spatial methods for quantitative analysis was facilitated by developing the database, providing an efficient method for storing and indexing of data (Long & Nelson, 2013),

Geospatial information mapping was used, among other purposes, to distribute mining licenses in East Kalimantan, function of forest areas, and water resources to produce a map of Conformity of Mining Permits, and to tabulate spatial statistical data of Mining Licenses in East Kalimantan Province. Utilization of regional statistical data (East Kalimantan Province in Numbers - The Central Bureau of Statistics) in the form of HDI data, the GDP, as well as other supporting data. It aimed to reveal the relationship between territorial and social components. In summary, the flow of data analysis methods can be seen in Figure 1.

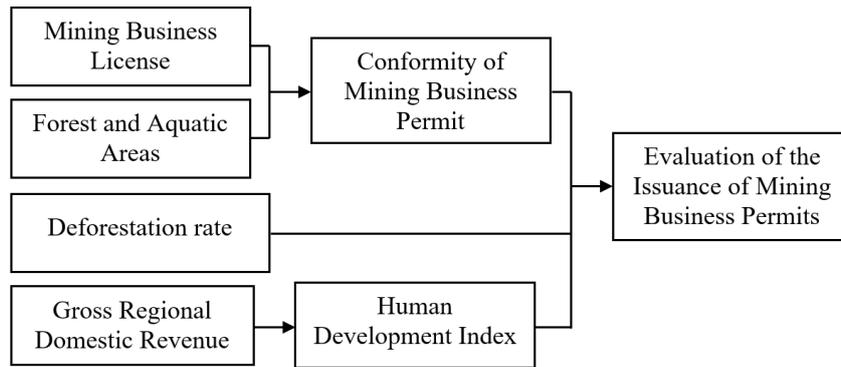


Figure 1. Flowchart of research

3. Results and Discussion

3.1 Spatial Analysis and Impact

The East Kalimantan Province reaches approximately ±12.734.692,04 hectares, administratively divided into 10 regional administrations—Balikpapan, Berau regency, Bontang, Kutai Barat, Kutai regency, East Kutai Regency Mahakam Hulu, Paser, Penajam Paser Utara, and Samarinda. Based on spatial analysis, it is the largest administrative region of East Kutai Regency (±3.281.009,71 ha) and Kutai Regency (±2.504.877,13 ha), while the smallest administrative areas are Bontang (±16.117,34 ha) and the city of Samarinda (±51.678,5 ha) (See Table 1 and Figure 2).

Table 1. Total Administrative Region District/City in the province of East Kalimantan

Regency/City	Area of Administration (ha)
Berau	2.200.702,41
Balikpapan	51.678,50
Samarinda	73.886,90
Kutai Barat	1.379.128,22
East Kutai	3.281.009,71
Kukar	2.504.877,13
Hulu Mahakam	1.846.922,22
Paser	1.062.147,21
Penajam Paser Utara	318.222,40
Bontang	16.117,34
East Kalimantan	12.734.692,04

(Source: [Spatial Data 2019](#))

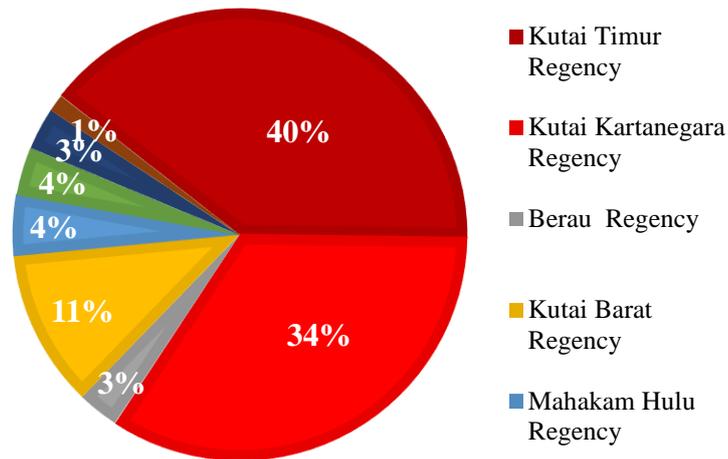


Figure 2. Area Administrative Region District/City in East Kalimantan Province (Source: [Spatial Data 2019](#))

There are 1189 fields of a coal mining concession in East Kalimantan Province with an area of ±2.855.226,94 ha, or approximately 22,42%, of the territory of East Kalimantan Province. In general, administrative areas at the district/city level in East Kalimantan license mining concessions with wide variation (See Table 2 and Figure 3). Bontang is the only region in the administrative district/city level without a licensed mining concession. If examined more closely, the factors that cause Bontang City does not own or issue mining business permit concessions are due to the small area and the leading sector of the City is oil and gas. Bontang is known as an industrial center, with services and trade with the three giant companies based in Kota Such, PT. Badak Natural Gas Liquefaction (PT. Badak NGL), PT. Pupuk Kalimantan Timur (Pupuk Kaltim) and Indominco Mandiri (subsidiaries PT. Bayan Resources Tbk).

Table 2. Area Mining Licenses in East Kalimantan Province

Regency/City	Area of Licensing (ha)
Berau	84.136,29
Balikpapan	3.181,8
Samarinda	32.289,65
Kutai Barat	322.651,65
East Kutai	1.132.321,75
Kukar	971.972,91
Hulu Mahakam	123.678,98
Paser	98.543,67
Penajam Paser Utara	86.450,24
Bontang	0
East Kalimantan	2.855.226,94

(Source: [Spatial Data 2019](#))

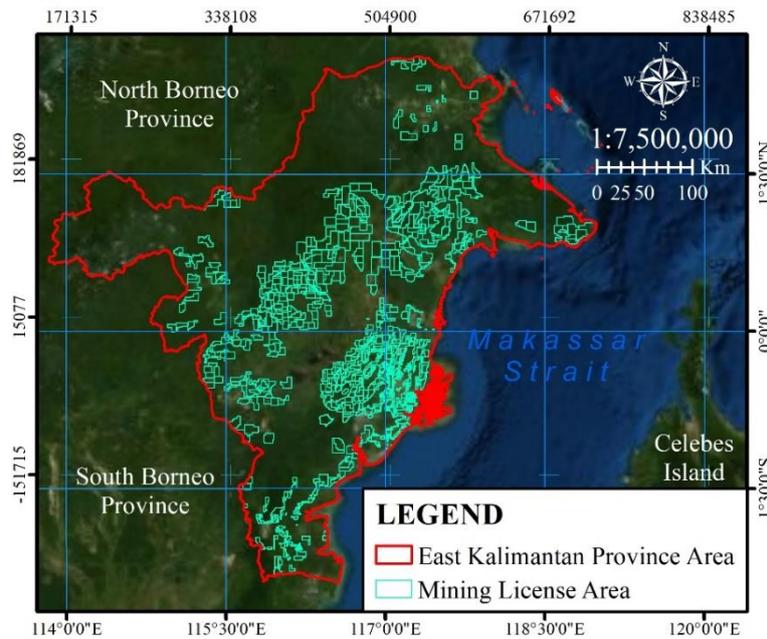


Figure 3. Distribution Map Mining Licenses in East Kalimantan Province (Source: Spatial Data 2019)

East Kalimantan Province is one of the largest coal reserves, mainly in the mining and quarrying sector. Mining is a strategic sector in East Kalimantan, but the mined land has problems with land use (Nasruddin, Su, & Suharyadi, 2016). Open pit coal mining in tropical forest ecosystems cause drastic degradation and land damage. It has become one of the drivers of deforestation on the island of Borneo in general and specifically in East Kalimantan Province. In addition to contributions from 209 publishing/licensing plantations, license concessions for plantations have reached ±1.162.694,3 ha, or 9,13% of the province of East Kalimantan. Based on spatial analysis conducted on the maps of Forest Areas and Water, the Mining Business License Distribution Map shows that most of the mining permit is at a location with functions Production Forest Area with an area of ±1.100.518,23 ha or by 38,54% of the total area of mining business licenses in East Kalimantan Province, see Table 3. It is noted that between 2000 - 2015, deforestation occurred in the area of 36.000 ha/year in East Kalimantan Province where 84% of them occurred in areas with forest area status. (Fadli, 2018), See Figure 4. It ranks East Kalimantan Province as the second-largest deforestation and air emission rates during the period between 1990 to 2015 (22%) (Wegscheider et al., 2019).

Table 3. Size of Mining Permitted to Function in Forest Areas, East Kalimantan

Function	Area (ha)	Area (%)
Production Forest (HP)	1.100.518,23	38,54
Use Areas (APL)	1.052.539,85	36,86
Production Forest (HPT)	544.686,38	19,08
Etc	157.482,48	5,52
Total	2.855.226,94	100,00

(Source: Analysis Spatial Data 2019)

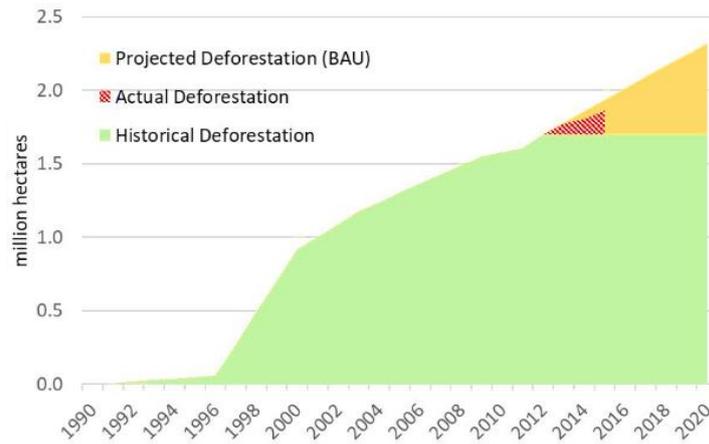


Figure 4. The rate of deforestation in East Kalimantan in 1990-2015
(Source: [Wegscheider et al., 2019](#))

In addition, the issuance of mining permits draws less attention to spatial patterns, particularly in the context of ownership and control of land by the local society, leading to various social conflicts. With an area the size of the Republic of Indonesia on the island of Borneo, reaching $\pm 53,98$ million ha, $\pm 10.435.919$ ha, or 19,3% of the territory, has become the object of a conflict stemming from overlapping land use ([Secretariat of the Acceleration Policy Team of One Map, 2019](#)) where coal mining in East Kalimantan Province contributed therein. By looking at the exploitation of natural resources, which is quite massive in East Kalimantan Province, related parties should anticipate the potential for the emergence of various environmental problems, especially the impact of the mining and quarrying sector through air pollution and waste disposal. Mining and quarrying operations give rise to two types of environmental problems: depletion of non-renewable resources and environmental damage. The latter includes pollution of/by air, soil, water, and noise, on natural habitats, plus visual impact on the landscape and the effects on groundwater levels ([Fugiel et al., 2017](#)).

Recently, the matter of the socio-environmental health impact of soil processing, with contamination both radioactive and non-radioactive, has been appointed as the main concern. The question remains whether sites that have been contaminated by mineral processing can be rehabilitated sufficiently to allow the use of other post-mining efforts. These are essential questions from the perspective of social sustainability associated with the perception of health risks and the technical capability to rehabilitate contaminated sites ([Ali, 2014](#)). To assess the cumulative impact of coal mining on physical, mental, and social communities, we need to overcome gaps between disciplines. Only then can the full cost of the coal industry on the community be described and made available, to inform the public about what policies should be prioritized: human health and the environment, or economic benefits ([Morrice & Colagiuri, 2013](#)).

Most of the environmental problems associated with coal mining have been neglected for years, with inadequate consideration for the implementation of policies to adequately repair the damage. Most people who live around this area are familiar with the situation and consider coal mining as an important economic activity for the region, even as the risk to the environment and human health continues to increase. In fact, consideration of the potential

risks to human health and the environment is substantial in the area degraded by coal mining. Restoration needs to be a high priority at all levels of governance, and a way to incorporate it into the procedure to prioritize restoration activities needs to be found. When restoration of the former coal mining area begins (Rocha-Nicoleite, Overbeck, & Müller, 2017), rehabilitation of areas severely degraded by reforestation with fast-growing species are expected to quickly recover their organic carbon stock dynamics (Agus, Son, Faridah, Wulandari, & Napitupulu, 2016).

3.2 Mining Relationship Analysis of Socio-Economic Conditions

One tangible result of regional development by local governments is economic growth. Thus, an indicator of economic development in the region is the economic growth in the region. Economic growth is a positive, year-to-year change in the level of economic activity. The economic growth in an area can give an idea of the extent to which public economic activity will generate revenue in a given period. The increase in national income through increased GDP is a picture of economic growth at the macro level. This variable also gives impetus to the improvement of people's purchasing power (Masiku, Wijaya & Rochaida, 2017),

Table 3. Percentage Distribution of Gross Regional Domestic Product at Current Market Prices by Industrial in East Kalimantan Province (%), 2014–2017

No.	Business field	2014	2015	2016	2017
1.	Agriculture, Forestry, and Fisheries	7.00	7.72	8.22	7.96
2.	Mining and excavation	50.21	45.03	43.17	46.31
3.	Processing industry	19.32	20.59	20.62	19.07
4.	Procurement of Electricity and Gas	0.02	0.04	0.05	0.05
5.	Water Supply, Waste Management, Waste and Recycling	0.04	0.04	0.05	0.05
6.	Construction	7.50	8.29	8,31	8,07
7.	Wholesale and Retail Trade; Repair Cars and Motorcycles	4.58	5.12	5.53	5.30
8.	Transportation and Warehousing	2.99	3.46	3.71	3.62
9.	Provision of Accommodation and Eat Drink	0.73	0.86	0.95	0.93
10.	Information and Communication	1.07	1.20	1.30	1.26
11.	Financial Services and Insurance	1.50	1.66	1.72	1.53
12.	Real estate	0.84	0.95	0.96	0.88
13.	Company services	0.21	0.21	0.22	0.21
14.	Administration, Defense, and Compulsory Social Security	1.94	2.30	2,32	2.03
15.	Education services	1.18	1.44	1.62	1.55
16.	Health Services and Social Activities	0.44	0.55	0.63	0.59
17.	Other services	0.43	0.54	0.63	0.62

No.	Business field	2014	2015	2016	2017
	Gross Regional Domestic Product	100.00	100.00	100.00	100.00

(Source: [Central Bureau of Statistics, 2018](#))

Based on Table 3, during the period of 2014–2017, the structure of the economy in East Kalimantan Province was dominated by five categories, the undertaking of: Mining and Quarrying; Field Construction Business; Business Field Agriculture, Forestry, and Fisheries; Business Field and Retail Trade; and Car and Motorcycle Repair. Among these economic activities, the largest role in the formation of 2017 East Kalimantan GDP was produced by the undertaking of mining and quarrying, which reached 46.31%. The mining sector contribution amounted to 286.63 trillion rupiahs, or about 50.21% in 2014 and dropped to 274.36 trillion rupiahs or about 46.31% in 2017. The decline was caused by low demand for domestic coal, or Domestic Market Obligation. East Kalimantan, which led the field performance of the mining trade, is highly dependent on global economic conditions. On the expenditure side, the deceleration of overseas export growth after the decline in output of main business fields is estimated to be the main cause of the economic slowdown in East Kalimantan in 2018 ([Bank Indonesia, 2018](#)).

In the previous period, 2009–2013, growth in coal exports rose sharply, driven by increased demand from China and India. Indonesia was able to increase coal production by 68% during the period. China and India absorbed almost 90% of the additional supply of coal during the period, while only about 4% of the growth went for domestic consumption. The reason for this impressive rise can be found in the availability of low-cost mines, close to the port, and located in Indonesia's favorable geographic location. Thus, in a relatively short time, Indonesia's coal industry has become one of the biggest influences on sea traffic of the steam coal market in Asia, which constitutes half of all Asian steam coal imports. As a result, Indonesia's coal mining sector has become very dependent on export markets. In 2014 until early 2017, the Indonesian central government exerted tighter controls on the production and export of coal. More stringent regulations were installed to eliminate illegal mining and exports, which had grown in the previous period, contributing to the international coal market oversupply. Therefore, the government set short and medium-term targets for production, making Indonesia's coal mining sector very dependent on export markets ([Cornot-Gandolphe, 2017](#)).

In January 2019, the Coal Reference Price (HBA), as determined by the Minister of Energy and Mineral Resources Minister Decree No. 01/K/30/MEM/2019, amounted to USD 92.41 per ton, down USD 0.10 per ton from December 2018. HBA in January 2019 continued the downward trend of the prior five months, from the month of August (USD 107.83 per ton), September (104.81 per ton), October (100.89 per ton), November (97.90 per ton) and December (92.51 per ton). HBA figures remained relatively stable when compared to the same month in 2018, which was USD 95.54 per ton.

The decline in January 2019 HBA occurred due to Chinese government import restrictions on coal. That coincided with a global coal market oversupply. It also led to lower coal prices in the following months. Indonesian reference coal prices continued to decline to 81.86 per ton in May 2019, due to shrinking market demand. A spokesman for the Ministry

of Energy and Mineral Resources, Agung Pribadi, said that the countries of Eastern and Western Asia, especially China and India, were currently limiting imports of Indonesian coal. Those countries launched a policy to increase domestic coal production to meet local demand (Sulaiman, 2019). The Indonesian Coal Mining Association estimated last year that the country's annual coal exports to China would range around 110 to 120 million tons, with a 25% market share, making China the largest coal importer. The Ministry of Energy has observed a downward trend in the Indonesian coal price since October 2018. The negative trend continued into this year (2019), down to USD 92.41 per ton in January, USD 91.8 per ton in February, 90.57 per ton in March and then to 88.85 per ton in April. The government is targeting national coal production of 485 million tons, which would supply 25% of the domestic market (Sulaiman, 2019).

Based on 2014–2016 information obtained from the Department of Energy and Mineral Resources of East Kalimantan Province, most entrepreneurs mining during that period chose not to perform operational activities. Some even closed their businesses. This condition was a major cause of low performance and high growth in the credit risk of mining in East Kalimantan (Bank Indonesia, 2018) (Figure 5).

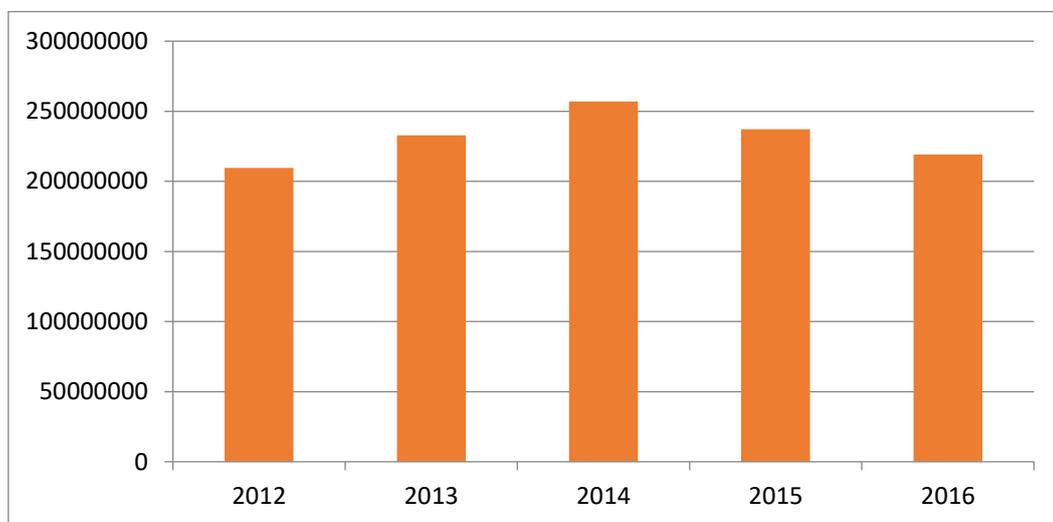


Figure 5. Production of Coal in East Kalimantan Province Years 2012–2016
(Source: Central Bureau of Statistics, 2018)

The mining and quarrying category broke down into four sub-categories, namely coal and lignite, oil, gas and geothermal mining, sub-field mining ores, and other mining and quarrying. Contributions to the mining and quarrying sector category to the GDP formation in East Kalimantan remained high during the last five years. Although production began to decline with unstable commodity prices, the highest sub-categories affecting local revenue in the mining and quarrying sector were still dominated by coal and lignite with a total of 75.54 percent in 2017 (Regional Balance Sheet and Statistical Analysis, 2018).

Coal's dominant position in the GDP affects economic growth conditions in the area. Economic growth, in turn, affects the high levels of income as one of the conditions for fulfillment of basic needs and improving the quality of human capital. Stable economic growth rate areas causing long-term repetition effects are essential for improving human

development. The increase in these revenues magnifies government capacity in the provision of social services, education, and health and periods of human development (Ezkirianto & Findi, 2013).

The basic value of the Human Development Index (HDI) is determined by three components, such as people's purchasing power, indicators of longevity and healthy life and indicators of community knowledge. Value is a variable percentage of GDP subcomponents. It is an indicator of people's purchasing power, as shown by the the HDI. In contrast to other components, that can be observed in the long term, changes in people's component purchasing power can be tracked in a relatively short time. The impact of economic growth and income distribution is in line with the success of social welfare in East Kalimantan Province.

The increase in the HDI is based on people's purchasing power. It is heavily influenced by household activities such as fulfillment of the needs for food, clean water, schools and health care. Household spending depends on the level and distribution of income, education, and people's lifestyles. Relatively high-income levels tend to increase the quality of household spending to improve human development (Lumbantoruan & Hidayat, 2013), The higher the income, the greater people's purchasing power, their access to education and better health. Income affects the value of the HDI in the region.

Table 5. Human Development Index by Regency/City in East Kalimantan Province, 2012–2017

No.	District / City	2012	2013	2014	2015	2016	2017
1.	Paser	68.18	69.61	69.87	70.3	71	71.16
2.	Kutai Barat	67.14	68.13	68.91	69.34	69.99	70.18
3.	Kukar	69.12	70,71	71.2	71.78	72.19	72.75
4.	East Kutai	68.71	69.79	70.39	70.76	71.1	71.91
5.	Berau	70.77	72.02	72.26	72.72	73.05	73.56
6.	North Sand Penajam	67.17	68.07	68.6	69.26	69.96	70.59
7.	Mahakam Ulu		63.81	64,32	64.89	65.51	66.09
8.	Balikpapan	76.56	77.53	77.93	78.18	78.57	79.01
9.	Samarinda	77.34	77.84	78.39	78.69	78.91	79.46
10.	Bontang	77.55	78.34	78.58	78.78	78.92	79.47
	East Kalimantan	72.62 *	73.21	73.82	74.17	74.59	75.12

(Source: Central Bureau of Statistics, 2018)

Based on the extensive distribution of mining permits per district/city in the total area of mining concessions in East Kalimantan Province (Figure 1), the district with the highest rate of mining permits is East Kutai Regency, with 40% of total mining permits, or 1,132,321.75 ha, in East Kalimantan region. It affects the high-income areas, people's purchasing power, and district HDI value, rated at 71.91. When compared to the HDI by regency/city in East Kalimantan Province in 2012–2017, East Kutai Province HDI ranks second highest after Berau.

Central city in East Kalimantan Province has a higher HDI value than that of the HDI districts. The city administration with the highest index value is Bontang 79.47, followed by Kota Samarinda and Balikpapan, with values of 79.46 and 79.01, respectively. Those figures are influenced by access to education and better health compared with other regions. The education and health sectors are other indicators for calculation of HDI in the region.

4. Conclusion

The results of spatial analysis data and study of the impact of administration/publishing permit coal mines in East Kalimantan, Indonesia, show that the use of the natural resources sector is still the central pillar of the country's economic propulsion and development. Nevertheless, behind that significant contribution, and the planning and management of business permits, the exploitation of natural resources is hardly systematic. As a result, many problems arise from the various activities involved with the exploitation of natural resources. Some of the problems arise from disputes over land ownership (agrarian conflict), damage to the landscape, deforestation, environmental pollution, and public health problems. In the context of resource management and a sustainable living environment, application of systemic and model planning and management of business permits for the exploitation of natural resources run a significant risk for the preservation of the environment. The problem is exacerbated by the lack of supervision and control system implementation.

The coal mining sector has a direct contribution to the regional income of the people of East Kalimantan. This is evident from the level of GDP, to which the mining and quarrying sector makes the highest contribution. Of several sub-categories of mining and quarrying, coal mining dominates the value of the sector. So, the coal mining sector indirectly contributes to the HDI in the province of East Kalimantan. Such conditions are at high risk of instability as future demand for coal from the export market disappears as a primary strategic sector for improving the local economy. Therefore, local authorities must evaluate and taking precautions so that the economy of East Kalimantan Province remains stable. One alternative effort to boost the local economy in East Kalimantan Province is building the tourism sector to improve the supporting infrastructure.

One of the principles of environmental science is sustainability. Sustainability in environmental science is described as the ability to meet the resources and services needs of current and future generations without compromising the health of the ecosystems that provides them (Offerman, 2019). In coal mining industry, sustainability should be understood the same way so that it has to reduce the environmental impact of mining and minimize the footprint its activities throughout the mining cycle.

Author Contributions

Kunny Izza Indah Afkarina contributed ideas for choosing background, methods, data analysis, discussion of results. Poerborini Damayanti carried out method and presentation of results, Sindhung Wardana contributed for background, mapping, and bibliography.

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