

Assessment of Unexpected Mine Closure Towards Sustainable Landscape: Case of a Coal Mining Lease at Central Bengkulu

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ABSTRACTS

Managing environmental risks of any mining activities is critical factor during mining operation, mine closure and post closure periods. Mine closure can be temporarily or permanently. Uncertainty associated with the post closure phase of mining lease, it is crucial to adopt sound management practices during this period to achieve sustainable landscape to give further benefit after mining operation has ended. One of mining company at Central Bengkulu experiences unexpected closure. The question is how the affected area by mining can be used for further usage. The goal of this research is to assess the closure criteria based on mine closure regulation. Data were collected from any stage of operation according to mine closure assessment, especially from rehabilitation sites, infrastructure, purifying and supporting facilities. The result indicate that rehabilitation sites shows partial re-vegetation of affected areas (dumping site and in-pit back filling site), some infrastructure were not dismantled and the areas of supporting facilities (e.g. Fuel Station) still need further soil remediation, and the hauling roads were needed the people for transportation usage. Overall score is still below acceptable range of “good closure” and need to be examined and supervised if the areas projected to have economic value after mining.

Keywords: mine closure, sustainable landscape, Bengkulu

1. INTRODUCTION

Mining operations have impacted on the ecosystem in mining areas, including environmental damage and ecological degradation such as air pollution, water and soil quality decline, loss of biodiversity and destruction of the landscape. Bengkulu province has enormous potency in coal reserves and already operate 28 Mining Leases or “Ijin Usaha Pertambangan/IUP” [1]. Even though mining played an important role in the regional economy, mining activities in Bengkulu caused serious environmental and ecological problems. To avoid such adverse impact on mining areas, some regulations have been established in Indonesia, namely Government regulation on reclamation and mine closure [2]. In a perfect world, mines only close when their mineral resources are exhausted and a mine closure plan is in place and progressive rehabilitation was implemented, however, in reality, many reasons why mines may close prematurely, including: economic, geological, technical, regulatory, policy changes, social or community pressure, closure downstream industry [3].

Mine closure planning is designed to manage and mitigate the social and environmental risks arising from this process. Combining reclamation of

mined land with mine closure goals is essential to achieve sustainable landscape according to closure goal [4]. Integrated mine closure is also important for mining companies in ensuring their business sustainability, their social license-to-operate as well as reducing the financial, environmental and legal risks. Simple abandonment of a mine without proper closure has historically led to a legacy of poor mining practices in both developed and developing nations [5]. Generic international guidance for the context of mine closure plans is available through organizations such as the International Finance Corporation [6], and the International Council on Mining and Metals [7]. Developed mining nations, like Australia, also have well developed mine closure planning guidelines for example from Australia [8][9]. In Indonesia, the regulation concerning reclamation of mine sites and mine closure has been regulated under Ministry of Energy and Mineral Resources no 7/2014 regarding implementation of reclamation and Mine Closure and Ministry of EMR Regulation no. 1878/2018 regarding Good Mining Practices [1]. In Bengkulu, most mine leases categorized as small lease, the implementation of the regulation need to be

examined. An interesting case of one mining Lease was unexpected become to closure, therefore some questions raised whether approaching good criteria of good mining practice in term of reclamation and Mine Closure. The goals of this paper is first, to examine the progress of reclamation within mine areas and, second, to assess its landscape towards sustainable ecosystems after mining.

2. MATERIALS AND METHOD

This research was conducted from March to September 2019 and located at one mine site (Figure 1). The study area of coal mine site (KW.BT.011-011) situated within three villages (Renah Kandis, Air Kotok and Batu Beriang) Central Bengkulu District.



Figure 1. Site location [10] (Huzaini et al, 2019)

Data collection was derived through, first, secondary data from mining report, and land cover from available Lands at imagery. Primary data on reclamation were collected from the field using vegetation sampling of several sites according to the rehabilitation stages. The progress and valuation of reclamation site,

supporting facilities was assessed in accordance to regulation of Ministry of Energy and Mineral Resources no 7/2014 in which include aspects of environment and social. Assessments were weighted according to Ministry Regulation no 7/2014 appendix XV (Table 1).

Table 1. Scoring of Mine closure evaluation

Item	Weight	Evaluation weight (%)	Evaluation score (%)
Mining Site after operation:	(30)		
a. Dismantling	5	100	5
b. Reclamation	15	100	15
c. Site safety	10	100	10
Processing facilities:	(40)		
a. Dismantling	10	100	10
b. Reclamation	15	100	15
c. Contaminated soil remediation	15	100	15
Supporting facilities:	(30)		
a. Dismantling	5	100	5
b. Reclamation	15	100	15
c. Contaminated soil remediation	10	100	10
TOTAL	100		100 %

3. RESULTS AND DISCUSSION

3.1. Mine Closure Assessment.

Total mining lease area of KW.BT.011-011 is about 1955 ha (Figure 2). The exploitation of reserves

started at 2010 and extended to 2014 with 18 pits. By 2018 the status of the pits as follow: 5 pits still active, 11 mined out, and 2 pits has been rehabilitated (Table 2)

IUP border

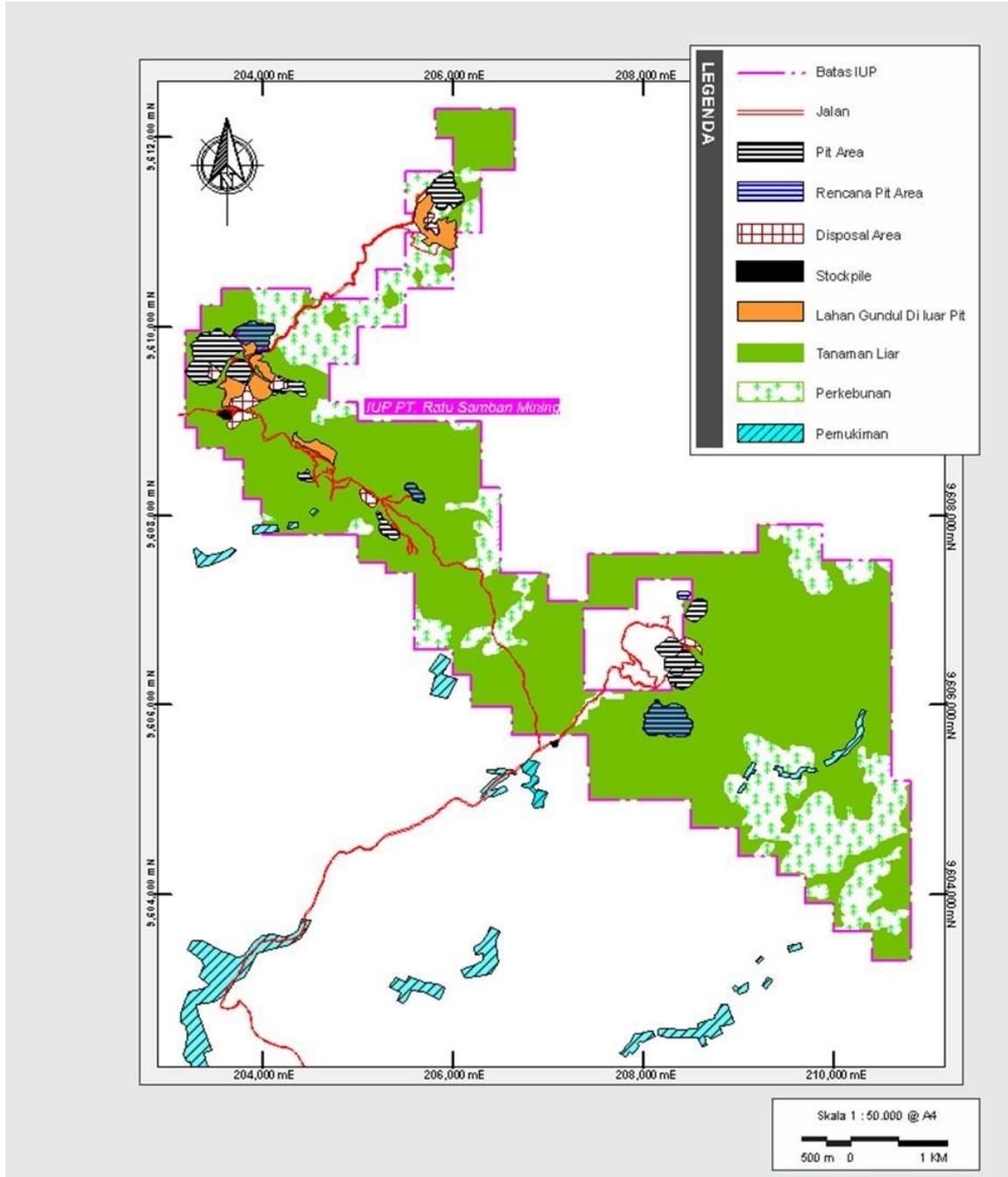


Figure 2. Pits distribution along the Mining Lease.

Table 2. Progression of mining pits.

RSM PIT	Blok	Area (Ha)	Status	Village
Pit B1,2	III	5	Revegetated	Air Kotok
Out Pit B1,2	III	4	Revegetated	Air Kotok
Pit B5	III	3.3	<i>Mined Out</i>	Air Kotok
Pit C	III	1.1	<i>Mined Out</i>	Air Kotok
Pit A1	III	4.7	<i>Mined Out</i>	Air Kotok
Pit Ex B3	III	0.7	<i>Mined Out</i>	Air Kotok
Pit B1,2	III	5.4	<i>Mined Out</i>	Air Kotok
Pit 5	II	4	<i>Mined Out</i>	Sekayun
Pit 7	II	4.3	<i>Mined Out</i>	Sekayun
Pit 5	II	1	<i>Mined Out</i>	Sekayun
Out Pit B1,2	III	3.5	<i>Mined Out</i>	Air Kotok
Pit B1,2	III	5.4	<i>Mined Out</i>	Air Kotok
Pit 1,2	II	3.5	<i>Mined Out</i>	Sekayun
Pit E	III	3.09	<i>Active</i>	Air Kotok
Pit 5	II	5.3	<i>Active</i>	Sekayun
Pit B1,2	III	15	<i>Active</i>	Air Kotok
Pit F	III	9.5	<i>Active</i>	Air Kotok
Out Pit F	III	11.75	<i>Active</i>	Air Kotok
Total		78.79		

Source : Mine closure Plan PT. RSM., 2018

The reclamation stage of area affected by mining operation as shown in Table 2, indicate that only two pits (pits B1,2 and Out pit B1,2) have completed its revegetation of affected area. Affected open areas due to mining operation was 155 ha, including 52 ha for mine operation activities and 62 ha for dumping site and 41ha for roads and open areas. Completed reclamation site was only 13.2 ha. The purifying facilities were only in form of settling pond and has been dismantle so, there were no ponds anymore. In term of supporting facilities, out of three bridges, only one bridge was dismantle due to the need of local people use for transportation. The workshop and Fuel storage facilities will be handed over to the community for further usage, however the treatment or remediation of contaminated soil and hydrocarbon contamination will be on company responsibilities. The score against closure criteria was depicted in Table 3. The score towards mine closure is recorded low in term of government regulation (28.6%).

Table 3. Evaluation score against closure criteria

Item	Weight	Evaluation weight (%)	Evaluation score (%)
Mining Site after operation:	(30)		
a. Dismantling	5	31	1.59
b. Reclamation	15	22	3.31
c. Site safety	10	0	0
Processing facilities:	(40)		
a. Dismantling	10	0.56	0.06
b. Reclamation	15	0.56	0.08
c. Contaminated soil remediation	15	100	15
Supporting facilities:	(30)		
a. Dismantling	5	0.07	0.03
b. Reclamation	15	0.07	0.01
c. Contaminated soil remediation	10	85	8.5
TOTAL	100		28.6 %

Source : [10] (Huzaini et al, 2019)

3.2. Implication on Sustainable Landscape after Mining

Case of unexpected closure is always dilemmatic, on one hand, the plan on closure cannot be implemented and the other hand, the source of financing closure was interrupted. The mine closure legislation should ensure the following [11] : stable and safe conditions are achieved to protect public safety and health, the area is left environmentally benign with no unacceptable or toxic discharges, any remaining infrastructure is sustainable, social sustainability is assured and future liabilities are minimized for all stakeholders. With the score only 28%, the mining lease cannot be handed over to the government (relinquishment) as the company cannot reach a point where met agreed completion criteria to satisfaction of the responsible authority. As indicated the objective and principles of mine closure [8], Industry Mine closure Steering Committee (IMCSC) [11] and [3], the key aspects of proper closure plan should involve stakeholder consultation, better planning, financial provision, ensure implementation according to standards criteria and responsible authority.

The end land use after mining is still need to be examined, what is the appropriate and sustainable use of landscape after mining. Refer to 30 years' experience on forest ecosystem development in post mining landscape in eastern Germany [12] indicated that many "missing link" need to be further examination to establish general findings on the ecological development of disturbed landscape. Consequently, from Indonesian cases need to be more explored in term of mine closure legislation [11] as an ecosystem development [4][13] and as sustainability of post mining landscape management [14].

4. CONCLUSION

As several mining Leases approaching either the end of their mine life or exhausted, establishing proper legislation and criteria for mine closure is necessary. It can be concluded from unexpected closure at one mining lease in central Bengkulu that meeting criteria of proper mine closure is still far from "good" closure. The action needed for further development and management of the post mining area and also need further strong legislation to regulate mine closure plan and its implementation.

ACKNOWLEDGMENT

Many thanks to field work team from C-SMILE (Center of Sustainable Mine Land Rehabilitation) University of Bengkulu, team from ESDM Bengkulu and Zen for providing

maps and GIS calculation. Thanks also for financial support from UNIB research institution (LPPM) under grant of Fundamental Research.

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