

The Study of The Technical Plan of Post Mines Land Limestone Quarry in PT Semen Baturaja (Persero) Tbk

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Abstract

Limestone mining activities of PT Semen Baturaja Ogan Komering Ulu Regency Tbk South Sumatra Province is done in the open mining quarry mining with the system. Limestone is the primary raw material required in the manufacture of cement in PT semen baturaja Tbk. Mining activities in the quarry is open at the end of its activities, will leave the land mines. Land mines must be utilized in order to make the environment mining can function returns appropriate allocation. Utilization of land mines can be done for a variety of Evergreen plants such as designation, orchards, and others. Designation ex limestone mines of PT Semen Baturaja Tbk as contained in document his rope Post Plans, one of which is for Evergreen plants. Research conducted in the survey aims to assess, technically land use limestone mines of PT Semen Baturaja for Evergreen plants so that land mines can be used again, so that the negative effects of mining activities can be reduced. The results showed, the utilization of land of a former limestone to plant pine PT Semen baturaja has met the required technical aspect in planning post-war mine . Research results are expected to be of benefit to the stakeholders, academics, researchers, practitioners and the Association of mining, and the environment.

Keywords

land use Plan, a former Post-war mines, technical aspects, Plant Evergreen

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1. INTRODUCTION

PT Semen Baturaja (Persero) Tbk which operates in Baturaja Barat, Ogan Komering Ulu Regency, South Sumatra Province, has a strong commitment in running process of limestone quarries (limestone) which is environmentally. This is done to maintain the sustainability of the environment and the ecosystem functions, to the survival of present and future generations. Exploration activities conducted by PT Semen Baturaja (Persero) Tbk has successfully identified a number of reserves of limestone (chalk) which is an important backup. The results of an investigation into an exploration of limestone (lime) in the area of IUP production operation of PT Semen Baturaja (Persero) Tbk with total Reserves are 16,560,647 tonnes. Production plan with the target of 1,412,297 – 1,970,000 tons/year of its increase regularly every year.

Reclamation and post mine is part and parcel of mining activities, so that mining in this case not only the activities of the dig, load, loading, but must also return the land as an allotment. Act No. 4 of the year 2009 about Mineral and coal mining explained that reclamation is an activity that is conducted throughout the stages of the mining effort to organize, restore,

and improve the quality of the environment and the ecosystem to function return appropriate allocation (ESDM, 2009).

Limestone mining activities is not always can be done because the activity that takes place depends on the availability of a backup. Based on document mining feasibility study (business feasibility study) of PT Semen Baturaja. (Persero) Tbk year 2018, limestone mining activity plan will end in the year 2026. The mining activity has ended will certainly give impact on the community and also the environment around it. Therefore it takes a plan of activities to be performed after the mining activity ended so that the community remains prosperous and environment remain sustainable. PT Semen Baturaja (Persero) Tbk as the companies doing mining activities are obliged to carry out reclamation and post mine as already provided for in Regulation No. 78 Years 2010 and Ministerial Regulation No. 7 the year 2014. Post-war mine is an activity that is performed to restore the function of the natural environment and social functions according to local conditions throughout the region mining programmatically, systematic, and sustained some mining activities will end or the entire mining activity ended (ESDM, 2014).

Former mining environment will undergo changes in chemical, biological, and physical. Business handling the negative

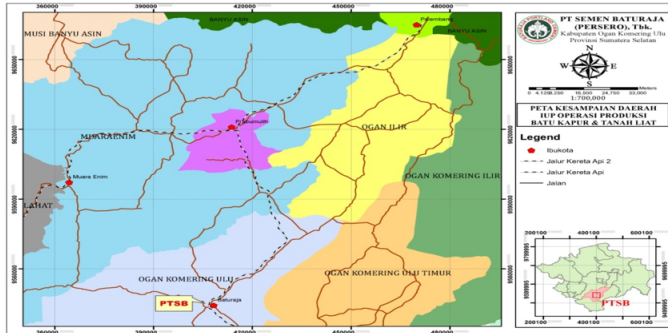


Figure 1. Map Of The Regional Recall. (Source: Document the feasibility study of PT Semen Baturaja Tbk, 2018)

impact of mining activities this is a planned reclamation activities (Andi et al., 2017). Reclamation aims to prevent erosion or to reduce the speed of the flow of water runoff, keeping land in order not to labile and more productive, and expected to be able to generate added value for the environment and creating conditions that are much more good compared with the State of the environment before the mining sustainable environment for the welfare of the current generation and future generations (Munir and Setyowati, 2017).

The reclamation plan activities refer to sustainable development (sustainable development). The definition of sustainable development is development that is carried out to improve the well-being of the present generation without compromising the well-being of future generations and continued (Suparmoko, 2006). Sustainable development in the mining activity has a sense that taking or exploit natural resources (though it pollutes the environment) and reinvest in other forms such as in the bentun natural resources that can be updated (SDA), man-made capital or resources (produced asset) (SDK), or the human resources (HR).

2. EXPERIMENTAL SECTION

The location of the research carried out at the site of limestone mining of PT Semen Baturaja (Persero) Tbk in Baturaja Barat, Ogan Komering Ulu Regency, South Sumatra Province. Recall area can be reached by road from the city of Palembang, Ogan Komering Ulu Regency towards using four-wheeled vehicles through the cross-province with travel time approximately 6 hours. Then to the village of belly button through the streets of the village with journey time approximately 15 minutes. Research location as shown in Figure 1.

2.1 Literature Study

This research study library first seek to aid in resolving the issues that are in the field of literature are used relate to the title of the research such as the books with the publication of technical Studies regarding the post-war plans the mine, a journal of research, handbook and PT Semen Baturaja from archives, Tbk.

2.2 The observation Field

Field observations performed with observation directly onto the field against the general condition of the field, the activities of mining and activities connected with mine reclamation and post plans on the location of PT Semen Baturaja, Tbk.

2.3 Data retrieval

This research combines theory and data – field data, so both are obtained from the approach to problem resolution. The sequence of research work, namely:

1. The primary Data

Primary data is data that is obtained from the results of observation and orientation in the field, namely: data test results soil samples.

2. Secondary Data

Secondary data is data obtained from the supporting documents of PT Semen Baturaja: Map of regional Recall PT. Semen Baturaja (Persero) Tbk., Data is Data, Initial Hue land area RPT.

2.4 Data processing

Data processing activities carried out in order to process data that has been obtained through the primary measurement/test lab, and secondary data obtained through the study of literature and instasional. This needs to be done because the data obtained are still raw data so that needs to be processed further in order to get the data you need to plan for the post-war mine.

2.5 The deliberations of the

Problem solving in the research thesis is done by analyzing the results of the processing of data, where the data analysis is based against the literature-literature-related research issues.

2.6 Conclusions and Suggestions

After doing a correlation analysis of the data by examining the problems that were in the field could get an outline or conclusion. The taking of the conclusion is a core issue in field so that at subsequent research can serve as a basic reference point reference. After that, the conclusion will be accompanied by a suggestion so that in advising carefully in order to provide solutions and consider the company party.

3. RESULTS AND DISCUSSION

3.1 Initial Environmental Hue

Rona early in this research focuses on the study of the geophysical environment hue associated with soil and biology with the existing plant at the site of the project footprint. The changing nature of physical or chemical soil that occurs due to the mining of which in the form of an increase in bulk density and soil moisture as well as a decrease in permeability and the fertility of the soil (Cahyani and Hardjana, 2017). Technical aspects in the form of soil analysis must be done before the reclamation activities and revegetasi to determine the treatment that must be given in order for chemical and physical properties of soils are in good quality (Kemen-LHK, 2013).

The type of soil in the area of research is the kind of podsolik yellowish red. It also found the Association hidromorf and the alluvial soil types (PT.SemenBaturajaTbk, 2017). Pay attention to these things, then it's basically on site studies and its surroundings found at least three types of ground covers, podsolik, alluvial and hidromorfik. According to the results of field observations, ground on site activities belongs to the ground fertile for farming. Research on the location of land needs to be fixed sand fraction and domination of the ashes were where it shows the composition of the sand and dust of the ground. The lands dominated by sand fraction have a high composition so that the lands were very low in the water. All types of soil found at the site of the study in fact has a low natural fertility level.

3.2 Climatic

Location of limestone quarry development activities of PT Semen Baturaja (Persero) Tbk in OKU administratively in the Regency of South Sumatra Province OKU. Based on the type of climate in the South Sumatra District in particular, and generally this area belong to the tropical regions. The tropical climate described statements by some experts with a wide range of terms are as follows:

1. Including Afa Climate (tropical rain climate), according to Koppen.
2. Include A Climate (very wet), according to Schmidt – Ferguson 1950.
3. Include Climate B1 (area with 7 to 9 months of wet and dry two months), according to a 1979 Oldeman.

The data in the form of climatology data for rainfall and meteorological data which represent the areas of study are obtained from a previous Report about the environment i.e. AMDAL (environmental impact analysis on Th 2017) and retrieved from the station Climatology Kenten Palembang. The data collected for the span of the last 10 years (2006-2015) and climate factors include precipitation and rainy day, air temperature, wind direction and speed, as well as elements of climate studies. With the presence of climate data is expected to provide a reflection of climatic conditions in the area of activity.

3.3 Conditions of space and Geology

3.3.1 Space Conditions

The village of Navel and beyond is largely a forest production that is not too dense, most other coffee plantations, rubber, pepper and the fields of the people. Area of inquiry is within the river basin area of Saka, Sangur, and Lungkuk. Average temperatures range between 21, 73 °C to 32, 39 °C, with a relatively high rainfall.

3.3.2 Fisiografi and geology

Based on Geological Sheet Map of Palembang from Centre for research and improvement of Geology, including part of Palembang sheet subbasin the North of Palembang, partly included in subbasin Jambi. The second sub basin is part of the South Sumatra basin that formed during the tertiary period.

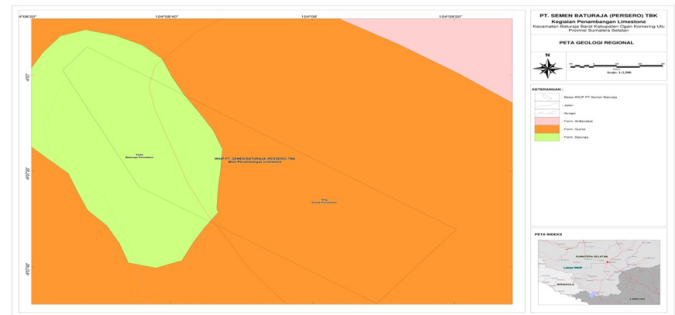


Figure 2. Geologic Map Of The Location Of The Mining PT Semen Baturaja (Persero) Tbk

The geological formation of Baturaja in General according to Van Bemmelen was included in the Group of Palembang who has the formation of Air Benakat (Tma), Kasai (Qtk), and Muara Enim (Tmpm). Formation of Batukapur is a collection of very bottom of fasies of 1,000 thick Telisa-1,200 m grown as the deposits of sand and was region oil (Talang Akar, Verandah, Benakat). Area of IUP limestone in the area of PT Semen Baturaja Navel (Persero) Tbk ± 103.5 Ha, located in the subdistrict of Baturaja Barat Regency of Ogan Komering Ulu South Sumatra Province. The topography of the region of Batukapur in mining area power Navel is characterized by Karst topography which has an average altitude of 45 meters above sea level. Navel land restricted by the mining population in the Southwest is located approximately 210 metres from the highway with Azimuth 2150 49', while from railway station of approximately 620 metres Northwest. Batukapur mining area is surrounded by the river Ogan, a distance of approximately 320 meters against the mining location. Ogan river water is 30 m from the sea. Map of the geology of the study area is shown in Figure 2. The location of areas of study including class 0-8% slope was Meosin old, at the area found more than 300 metres maximum.

3.3.3 The vegetation

The type of vegetation found in the location of the activity plan an increase in cement production capacity of PT Semen Baturaja (Persero) Tbk in OKU are shrubs (Figure 3). Based on field survey to see that vast vegetation of shrubs is very small, in the form of open land due to the opening of land for access roads by PT Semen Baturaja (Persero) Tbk. from the quarry to the factory. It is also surrounded by small to medium diameter trees (Figure 4).

3.4 Land use Post mine to Plant Evergreen

Stages of reclamation include the conservation of top soil, planting a cover crop, crop planting countermeasure of heavy metal pioneers (Juniah, 2017). Structuring and allotment of land to plant spruce mine post has an area of 3.58 ha. Reclamation on the post mining plan of PT Semen Baturaja (Persero) Tbk is intended for the stocksoil location of former topsoil landfills in the form of reforestation or land rehabilitation activities after the closure of ex-mining areas and the return of surface land



Figure 3. Condition of vegetation in the area of research



Figure 4. The vegetation mix of shrubs and trees had the small-medium



Figure 5. Land Allocation Plan (Rona End Mine) Mining of PT Semen Baturaja limestone (Persero) Tbk (Source: Processed Data FROM PT Semen Baturaja RPT TEAM (Persero) Tbk, 2018)



Figure 6. Evergreen Plants in zone revegetasi

to restore and restore land quality, especially those related to prevention of land erosion quality of waters and rivers, pollution of heavy metals. Reclamation activities carried out by means of revegetation by planting a cover crop in the area that has been rehabilitated are interspersed with greening of grasses of elephant grass.

3.4.1 types of plants

The choice of plant species based on considerations such as suitability of land use, suitability of possible growth and benefit principles. For that type of plant cover is selected i.e. Legumes Cover Croop (LCC) as well as with the staple crops that is Evergreen plants (Figure 6). Procurement of seeds is done by purchasing the seedlings ready for planting. Prior to sowing staple crops it is necessary in the planting of plant cover. Pine seedling needs as much as 625 stems per hectare

3.4.2 Planting

The cropping pattern is set based on norms with attention to the aspects of soil and water conservation, as well as in accordance with the results of the study set a distance of planting 4 m x 4 m, so the number of plants is 625 Tree/Ha. Planting is carried out with a grid system on relatively flat land (0-15%), namely the placement of perpendicular lines and planting points spread evenly without taking into account contours. The direction of

the planting path is as far as possible north-south. Planting paths are continued when cutting the road. Planting on undulating land (slopes of 15-25%) is carried out with a planting path in the direction of contour lines (according to the technical preparation of land / open lines on sloping land), so that it is not straight. Planting in one compartment is done in monoculture which means that in one compartment there is only one type of staple plant. The planting process begins with the installation of a stake (45 cm long) which is inserted into the point and planting path as a sign of the position of the plant hole to be made. Stake is plugged into all planting points with the help of a rope (so that it is straight). If right at the planting point there is a disturbing rock or stem base, the position of the driver is shifted, but for the next point it still follows the initial path. Planting holes are made at each planting point that has been marked as a marker. Planting holes are made with a size of about 30x30x30 cm.

3.4.3 Maintenance and Plant Care

1. Maintenance of the Crop year to-1

Plant maintenance year 1 started at the plant's age one month. Principal plant maintenance activities be weeding and trimming, stitching is as well as the eradication of pests and diseases of plants.

2. Plant Maintenance-2nd Year

Maintenance activities year 2 begins after the plants age over 1 year or second year of planting activities include weeding, fertilization, as well as pest and disease safely.

3. Maintenance of the Crop year to-3

Maintenance activities 3rd year begins after the plants age over 2 year or third year planting activities include weeding, fertilization, as well as pest and disease safely.

3.4.4 Success Criterion

Reclamation implementation success rates note by doing an assessment of all the activities of the reclamation with a success rate of reclaiming as follows.

1. the arrangement of land

- (a) Wide area (ha) furnished >90% of the acreage that is supposed to be styled.
- (b) the scattering/placement of ground shoots with the criteria:
 - i. Extensive acreage set (ha) >80% of the area that should be filled.
 - ii. The amount of land sprinkled >80% Tops of the total land shoots dug and stored.

2. Revegetasi

(a) percentage of growing plants

Percentage grow plants every swath of calculated by way of comparing the number of plants that existed with the plan the number of plants that are supposed to exist within a swath of measure are assessed.

$$T = \left(\sum \frac{h_i}{N_i} \right) \times 100\% \\ = \frac{h_1 + h_2 + \dots + h_n}{N_1 + N_2 + \dots + N_n} \times 100\% \quad (1)$$

Where: T = percent (%) of growing plants
 H_i = Amount of plant life found on the swath of measure to i
 N_i = number of plants that are supposed to be there on a swath of measure to the i

To determine the success rate of the plant used the criteria, as follows:

- i. Successfully: percentage of growing plants <90%
 - ii. Were: percentage of 80% plant-growing 90%
 - iii. less successful: percentage of growing plants >80%
- (b) percentage of Healthy Plants
 Observation of growth of plants classified in three (3) criteria that is healthy, less healthy, and languished with the following restriction:
- i. healthy Plants are plants that grow fresh and relatively straight shaft and high minimum in accordance with the theme of the standard.
 - ii. less healthy Plants are plants that have abnormal growth or stricken with pests and diseases.
 - iii. Plants languish are plants that have abnormal growth or stricken with pests diseases so if kept small is likely to grow well.
- (c) the number of plants Per Hectare
 The number of plants per hectare minimum of 625 trees/ha or tailored to his planting distance, and maximum distance of planting 4 m x 4 m.
- (d) Komposisi types of plants
 The diversity of types of plants adapted to the objectives and provisions of the reclamation of the already designed in the original planning.

3. Final Completion

This final settlement includes plant maintenance activities carried out, including covering planting, fertilizing, eradicating pests and diseases or weeding / irrigation and enrichment.

3.4.5 Soil Quality Test

The initial environmental tone for quantitative soil quality was determined by measuring and sampling directly in the field followed by laboratory analysis. The results of the measurement of soil quality analysis are then compared with the Land Quality Standards set out in the draft Decree of the State Minister of Environment in 1994. This Ministerial Decree states that land quality standards are set by each Governor by referring to National Quality Standards. Determination of quality standards is based on research and still accommodates the aspirations of the community, employers and interested parties.

The taking of soil samples at the study site includes soil on the pile soil can be seen in Figure 7 and also the initial hue soil can be seen in Figure 8 with the results of testing in the lab, can be seen in Table 1. The results of organic C-test on pile soil samples are 0.72, in the criteria of soil chemistry including very low different from the results of organic testing in soil samples the initial hue is 9.29, in the criteria of soil chemistry including very high. The pH content in the pile soil and initial hue soil



Figure 7. Sampling soil pile on zone revegetasi



Figure 8. Sampling the soil initial hue

samples is almost close together, in the soil sample the Ph content is 6.2 whereas in the soil sample the initial pH content is 5.2. In the texture of 3 fractions including sand, dust, clay on soil samples of texture deposits 3 sand fractions: 41, dust: 18, clay: 42 whereas in soil samples the initial hue of texture 3 fractions cannot be analyzed because the initial ronol soil sample content >5% .

4. CONCLUSIONS

Based on the research that has been done, get the following conclusions:

1. The condition of the initial environmental tones at the study sites in Puser Village, West Baturaja District, Ogan komering Ulu Regency, South Sumatra has a tropical climate.
2. The limestone mine post mining plan is intended for pine plant activities including:
 - (a) Plans for land allotment for revegetation zones with an area of 3.58 ha.
 - (b) The geology of baturaja formation is included in the Palembang group which has Air Benakat (Tma), Kasai (Qtk), and Muara Enim (Tmpm) formations.
 - (c) The IUP area of limestone in the Puser area of PT.

Semen Baturaja (Persero) Tbk covering an area of \pm 103.5 Ha.

- (d) The type of vegetation contained in the planned location of activities to increase cement production capacity of PT. Semen Baturaja (Persero) Tbk in OKU Regency is a bush.
- (e) The types of plants to be planted are the basic types of plants such as evergreen plants. Besides that, it is also planted with a cover crop of Legum Cover Crop (LCC).
- (f) The distance of plants to be planned is 4m x 4m so that the number of evergreen plants needed for an area of 3.58 hectares is 2,238 stems.
- (g) The success criteria are assessed based on the set parameters, namely the percentage of land success calculated based on the total area of the arrangement compared to the area that should be structured, revegetated and the final settlement which includes the activities of planting, fertilizing, eradicating pests and diseases or weeding / enriching.

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REFERENCES

- Andi, A., N. Isma, Y. Wirdaningsi, S. Widodo, and A. Nurwaskito (2017). Analisis Reklamasi Tambang Batukapur Di Kecamatan Bungoro Kabupaten Pangkep Provinsi Sulawesi Selatan. *Jurnal Geomine*, 5(2); 68-75
- Cahyani, R. W. and A. K. Hardjana (2017). Trial Of Plant Species With The Treatment Of Planting Media On Post C Quarry Land In KHDTK Labanan, Berau District, East Kalimantan. In *PROS SEM NAS MASY BIODIV INDON*, volume 3. pages 361-367
- ESDM (2009). Undang-Undang nomor 4 tahun 2009 tentang pertambangan mineral dan batubara
- ESDM (2014). Peraturan Menteri No. 7 tahun 2014 Tentang Rencana Reklamasi dan Rencana Pasca Tambang
- Juniah, R. (2017). Sustainable Mining Environment: Technical Review of Post-mining Plans. *Indonesian Journal of Environmental Management and Sustainability*, 1(1); 6-10
- Kemen-LHK (2013). Reklamasi Lahan Pasca Tambang: Aspek Kebijakan, Konservasi dan Teknologi. In *Proseding hasil seminar penelitian*
- Munir, M. and R. D. N. Setyowati (2017). Kajian Reklamasi Lahan Pasca Tambang Di Jambi, Bangka, Dan Kalimantan Selatan. *KLOROFIL*, 1(1); 11-16
- PT.SemenBaturajaTbk (2017). Dokumen AMDAL PT. Semen Baturaja Tbk
- Suparmoko, M. (2006). *Panduan & analisis valuasi ekonomi sumberdaya alam dan lingkungan: konsep, metode penghitungan dan aplikasi. Edisi Pertama*. BPFE

Table 1. Soil Quality Test Result

No.	Parameter	Method	Unit	Identification Number	
				Pile Soil 1810.03981	Initial Hue Soil 1810.03982
1	C-Organik	Walkley & Black / Gravimetric	%	0.72	9.29
2	N-Total	Kjeldahl	%	0.14	0.45
3	C/N Ratio	Calculation	-	5	21
4	P ₂ O ₅ Available	Bray / Olsen	ppm	7	16
5	P ₂ O ₅ Potential	HCl 25%	mg/100g	40	116
6	K ₂ O Potential	HCl 25%	mg/100g	30	51
7	Cations Can Be Exchanged	N NH ₄ OAc	K ⁺	0.56	0.62
			Na ⁺	0.15	0.18
			Ca ²⁺	17.1	33.94
			Mg ²⁺	0.82	1.86
8	Acidity Can Exchange	N KCl	Al-dd	21.57	0.21
			H-dd	2.14	0.22
9	Cation Exchange Capacity	N NH ₄ OAc	cmol(+)/kg	49.84	52.61
10	Base Saturation	Calculation	%	37.37	69.58
11	Water Content	Gravimetric	%	10.7	8.9
12	pH	Potensiometri	H ₂ O	6.2	5.2
			N KCl	4.5	3.6
13	Texture Of 3 Fractions	Pipette	Sand	41	-*
			Dust	18	-*
			Clay	42	-*