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THE LAND REHABILITATION OF MINE OUT AREA OF SAND QUARRY IN CIKALAHANG VILLAGE, DUKUH PUNTANG DISTRICT, CIREBON REGENCY

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ABSTRACT

The sand quarry activities in Cikalahang Village, District of Dukuhpuntang, Cirebon Regency had been illegally mined by hundreds of people. The land properties are owned by the Cikalahang Village. Those mine areas are close to the Telaga Remis (Remis Lake) , which is administratively included in the Kuningan Regency. The existence of illegal mining has disturbed both of local government and people community. In the regional government point of view, the illegal mining will not significantly contribute to generate regional income, whilst for many people their mining activities will produce a destruction to the environment. These can be seen from the objection of the people that request the government to stop all of mine activities because of disturbance to environmental condition of the Telaga Remis (Remis Lake) as one of the water resources for the Cirebon Regency. Based on the intensity of the people requirements, the government of Cirebon Regency had decided to close all of activities of the illegal mining in those area in 2006.

According to the decision of Cirebon Regent and the Office of Environment, Forestry and Mining Cirebon Regency, it had prepared planning for rehabilitation and restoration to recover the natural and environmental capability in the mined out areas with respect to the regional spatial planning, land utilization and community demand. The intention of study is to analyse the currently condition of environment in those area including people perception and then making further evaluation to obtain the properly environmental pictures for determining the real and strategic action.

Data resources to support the study were collected through primary and secondary data. The primary data of physical-chemical component can be obtained by taking instantaneous samples of soil and surface water in the area of study. To identify the people perception, some questioners have been spreaded out to the various strata of people in order to obtain their perception and also direct interview will be applied in this study. The secondary data required for this study such as regional spatial planning, regional landuse and regional regulations will be taken from some institutions in Cirebon Regency.

Result analyses showed that the soil characteristics in mined out area were poor because of lack of nutrient and high porousity and the water of Telaga Remis and mine out area could be used as fishing cultivation and household water. The final study shows that the mined out area can potentially be developed as tourism resort in accordance with people request. The other consideration this area is adjacent to Telaga Remis with the background of the beautiful panorama of Mount Ciremai.

Keywords: land rehabilitation, illegal mining, people perception, tourism resort

INTRODUCTION

Cirebon Regency that is located in West Java Province (Figure 1) has a strategic potential of industrial mineral resources such as limestone, andesite, feldspar and sand. All of them have a function as an importance raw material for supporting the development of industry and physical infrastructures.

In the decentralization era, the regency government authorization has been demanded by the central government to be autonomy including the effort to obtain its own budget to run the regional

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government. Based on the need of self financing budget to its achievement, Cirebon Regency must create the potential income sources by changing the natural potential resources to be the economic potential resources. However, the exploitation of mineral resources must also obey the area of zonation as decided by the regional spatial planning (*Rencana Tata Ruang Wilayah*/RTWR). Ironically, in the reality many locations of industrial mineral mining activities are operated in the area which is not suitable for mine area such as sand mine activities in Cikalahang Village that according to hydrogeological map of Majalengka, this area has been categorized as the area with highly productive aquifer or water conservation area.

Since 2000s the quarry activities in Cikalahang had been done by hundreds of people, in which most of them come from outside area. There are no real companies that operate the quarry, because they run illegally (*Kantor Lingkungan Hidup Kabupaten Cirebon*, 2003). The existence of illegal mining has disturbed both of local government and people community. In the regional government point of view, the illegal mining will not significantly contribute to generate regional income, whilst for many people, their mining activities will produce destruction to the environment. These can be seen from the objection of the people that request the government to stop all of mine activities. The reason is due to environmental disturbance at the Telaga Remis (Remis Lake) as one of the water resources for the Cirebon Regency (*Pikiran Rakyat* newspaper, September 7, 2004).

Some environmental negative impacts are the destruction of landscape, the increases of dust concentration, the appearance of flooded area, increase in erosion intensity, the change of physical and fertility of soil, the changes of hydrology and the changes of bio- diversity. The government of Cirebon Regency has decided to close all of illegal mining activities in that area and to start rehabilitating and making reclamation to recover the natural and environmental capability (*Kantor Lingkungan Hidup Cirebon*, 2004).

The study is to analyze the current condition of the environment in those area and to make further evaluation to obtain the properly environmental pictures for determining the following action.

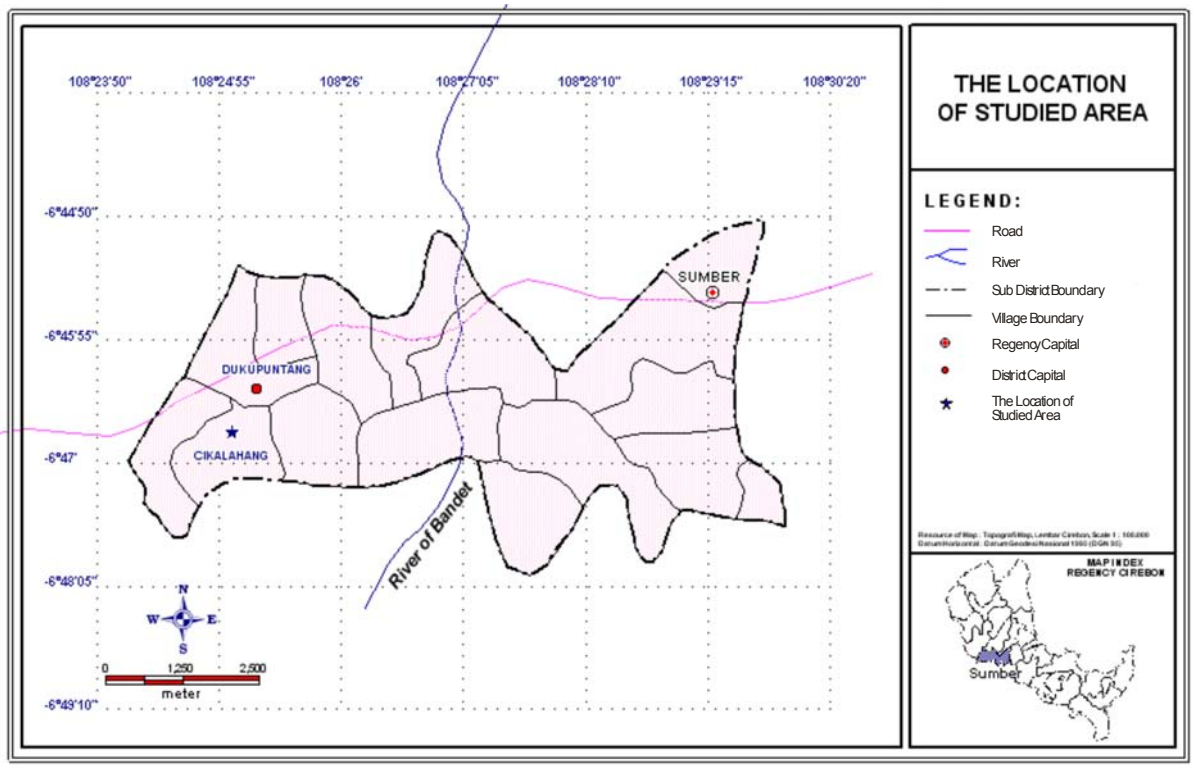

Figure 1. The Location of Sand Illegal Mine, Cikalahang Village, Dukuh Puntang

THE CONCEPT OF LAND REHABILITATION AND RECLAMATION FOR POST MINING OPERATION

The sand mined out area of Cikalahang is currently used as an area of plantation of the people in the village and this property is owned by the head of the village. Based on the Regional Spatial Planning of Cirebon Regency, this area is decided as a protective area which is near to the border of PT. Perhutani Unit III protection forest, Kuningan Regency. In the forestry area, there is a small lake called as Telaga Remis, which has a function as the water resources for the people surrounding this area and also for Cirebon Regency. Telaga Remis is administratively managed by the Kaduela Village, District of Pesawahan, Kuningan Regency.

In general, the concept of land rehabilitation is to restore the environment condition which is currently damaged to be a rehabilitated land with the highly land productivity so the land in the post mining still has an high value to be converted into different function of land utilization. This program will be matched to the West Java Province Regulation No. 17, 2001 about the management of mining activity.

In the mined out area has been found a lot of unused mine products such as gravel and boulder in the scattered area and also the irregular ponds with the overflows of water, which is possibly coming from the destruction of aquifer (Figure 2). In the outside of mine area most people use the land as a plantation area, agriculture, freshwater fishing cultivation in some ponds.

Figure 2. The Morphology in the Studied Area

Based on the above condition, the concept of land rehabilitation is to restore the damage area both landscape and soil structure to be a good rehabilitated area to support the protective function of Telaga Remis as a natural water reservoir from Mount Ciremai, which has a good scenic panorama, a big quantity of water and clear surface water.

The concept of rehabilitation to the mined out area will be based on the environment condition, the Regency regulation, the spatial planning and the people perception (Wiriosudarmo, 1999), which is arranged as follows :

1. The water resources both surface water and grounwater need to be conserved.

2. Panorama and scenic environment in Cikalahang is potentially to be developed as tourism resort.

3. Based on Spatial Planning of Cirebon Regency in 2004-2010, the Cikalahang area has been decided as catchment area and buffer area for Southern Cirebon.

4. The people and local government appeal that as soon as possible the quarry must be closed and need to be rehabilitated as a tourism resort and camping ground.

METHODS

Data required for the reclamation of mined out area will comprise primary and secondary data:

Primary data could be obtained by taking samples of soil, water, flora and fauna terrestrial in the study area. Soil sample was taken by hand auger (Jacob, 2001) and then analysed its chemical property in the soil laboratory. The result of analysis would be compared with Soil Chemical Property Valuation Criteria (Hardjowigeno, 1995) to know its fertility. Surface water samples were taken by grab sampling method from Telaga Remis and water pond in the activities area. The result of analyses is then compared to Water Standard Criteria based on West Java Government Regulation (*Kep. Gub. Jawa Barat*) 39/1991 and The Government Regulation of the Republic of Indonesia (*PP Republik Indonesia*) 82/2001.

The observation of terrestrial flora and fauna was conducted by directly observation. The people perception in Cikalahang village with the topic of land utilization after mining was taken by making an interview with the local people using standardized interview. Some questioners had been spreaded out to the various strata of people of two villages those are Cikalahang Village, Cirebon Regency and Kaduela Village, Kuningan Regency in order to obtain their perception to the final land use of mined out area.

The secondary data required for this study are regional spatial planning, regional landuse and regional regulations, which have linkages with the management of mined out area, management of protected area, management of waste, mine zonation and environmental standard. Flow diagram of management of mined out area can be seen on Figure 3.

RESULTS AND DISCUSSION

Soil Property and Fertility

Data of field observation that is compared to the results of laboratory analysis and soil fertilization criteria can be concluded that in general, the degree of soil fertility in the quarry area can be classified as poor, where the soil textures are dominated by sand fraction (87%) with the content of basis cation catagorized from extremely poor to poor. The result of soil analysis can be seen in the Table 1.

The analysis of soil chemistry shows the value of pH is 6.1 (slightly acid), the organic matter is too low 1.12%. So the soil tends to be sensitively eroded because of its organic matter contents is below of 2 %. The ratio of Carbon/Nitrogen (C/N) according to soil chemistry criteria can be classified lower, phosporous (P) and potassium (K) content are too low, the exchanged basis cation is between low and very low. The soil cation exchange capacity (KTK) is classified very low, 4.88 meq/100 g. The saturated basis is catagorized medium, 46%. This is very useful to determine soil fertility, because the increases of saturated basis will imply to the high avaibility of basis in the soil. Based on the analysis the soil characteristics in mined out area are poor because of lack of nutrient and porous.

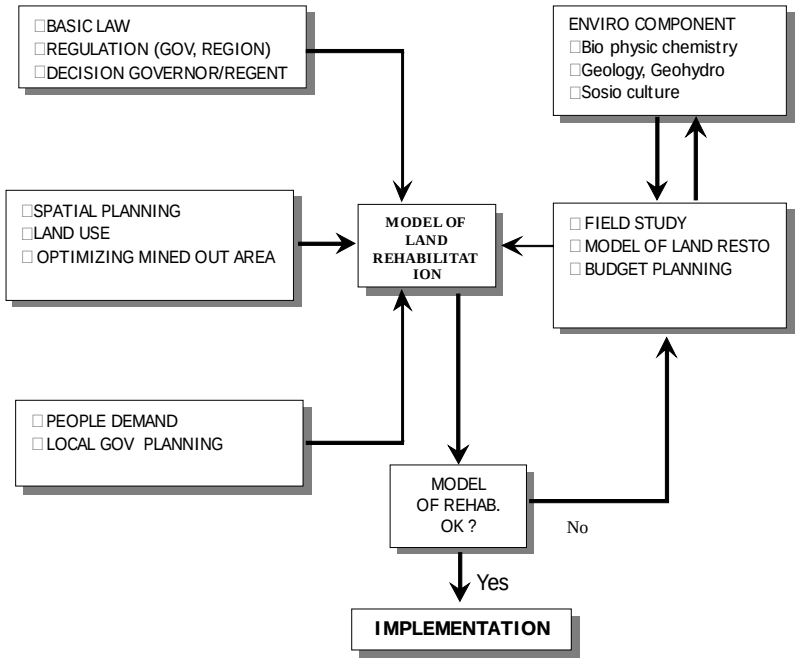

Figure 3. Methodology of Land Rehabilitation on Mined Out Area

Table 1. Soil Analysis in Quarry Area

No.	Parameter	Unit	Value	Criteria
A.	PHYSICAL PROPERTIES			
1.	Textures			
	- Sand	%	87	
	- Dust	%	8	Sand*
	- Clay	%	5	
B.	CHEMICAL PROPERTIES			
1.	PH			
	- H_2O	-	6.1	Slightly acid
	- KCl	-	5.1	
2.	- C	%	0.65	Very low
	- N	%	0.08	Very low
	- C/N		8	Low
3.	Organic Matters	%	1.12	Very low
4.	P---$_2O_5$ HCl 25 %	mg/100 g	130.78	Very high
5.	P---$_2O_5$ Bray 1	ppm	7.5	Very low
6.	K_2O HCl 25 %	mg/100 g	7.43	Very low
7.	K_2O Oks	ppm	49.2	
8.	Changeable Basis Cation			
	- Ca	Meq/100 g	1.67	Very low
	- Mg	Meq/100 g	0.3	Very low
	- K	Meq/100 g	0.07	Very low
	- Na	Meq/100 g	0.2	Low
	Total	Meq/100 g	2.24	
9.	KTK	Meq/100 g	4.88	Very low
10.	Saturated Basis	%	46	Medium
11.	Al	ppm	154.3**	Very high
12.	Electric conductivity	mS/m	1.6	Low

Sources : Primary Data (2004)
* = analysis based on soil texture triangle
** = valuation of Morgan Venema

THE WATER QUALITY

In mine rehabilitation design purposes the investigation to the water quality has also been done, because of its role in the supporting of human and organism life is very important. Most of 90% of human body is composed by water. The contamination to the water body will affect to the human and organism life who consume those water. Mining activities are predicted to give impact to the water, which will cause the degradation of water quality. The importance of water is also for pouring of plantation and other needs.

To see how far the degree of water pollution caused by mining activities, some water samples had been taken to be analyzed in the laboratory. The result of analyses was then compared to the water quality standard of B classification for household to comply to the West Java Government Regulation 39/1991 and Government Regulation 82/2001. In the general the water quality still meets to the requirement of water quality standard (Table 2).

Result showed that the water quality of Telaga Remis and water flooding in the mine area is quite good. It can be seen from its turbidity value that is still lower than 2 FTU. It means the water still meet the requirements for the life of aquatic biota (< 100 FTU). Visually the water is clear with the values of TDS are between 64 mg/l to 67 mg/l that are below the standard of 1000 mg/l. All of the water parameters (pH, COD, hardness, nitrogen, nitrate, nitrite and amonium, sulphate, chloride) are still in the ranges of the concentration standard values. Generally the water of Telaga Remis and the mine area can be used as fishing cultivation and household water.

Table 2. Water Quality Analysis

No	Parameter	Unit	Location		Standard Quality	
			1	2	*G.WJ	**PP
I.	Physical Properties					
1	Color	Visual	Clear	Clear	-	-
2	Turbidity	FTU	2.0	2.0	-	-
3	TDS	mg/L	64	67	1000	1000
II.	Chemical Properies					
1	PH	-	6.83	7.24	5 – 9	06-Sep
2	COD	mg/L	12.0	8.0	-	25
3	Hardness	(mg/L CaCO3	17.9	22.2	-	-
4	Iron(Fe)	mg/L	0.07	0.13	5	0.3
5	Mangan (Mn)	mg/L	0.02	0.02	0.5	0.1
6	Copper (Cu)	mg/L	tt	Tt	1	0.02
7	Zinc (Zn)	mg/L	0.01	0.02	5	0.05
8	Cr^{6+}	mg/L	Tt	Tt	0.05	0.05
10	Nitrit (NO_2)	mg/L	tt	Tt	1	1
11	Nitrat (NO_3)	mg/L	0.28	0.70	10	10
12	Ammonium (NH_3)	mg/L	0.5	0.5	0.5	0.5
13	Sulphate (SO_4)	mg/L	9	18	400	200
14	Chloride	mg/L	4.90	3.54	600	250

Explanation:
Primary Data, September 2004
* Water Quality Standard according to West Java Government Regulation No. 39/1991
** Water Quality Standard according to PP 82/2001
1 = Telaga Remis;
2 = Water pond in quarry

BIOLOGICAL COMPONENT

A. Terrestrial Flora

The vegetation dominated in the protective forest in the area of Perhutani Unit III is pine (*Pinus merkusii*), but there is also other vegetation like *kuciat* (*Ficus* sp), and other decoration trees, which are cultivated close to the Telaga Remis. In the location of quarry there are many types of vegetations such as *Gnetum gnemon*, *Mangifera indica*, *Nephelium lappaceum*, *Artocarpus integra*, *Pangium edule, Artocarpus communis* and *Coccos nucifera*. The local people also cultivate second crop such as *Manihot esculenta,* corn (*Zea mays*) dan vegetables. Gulma type found in this area is nearly the same as the other ones in West Java, those are kinds of grasses and *Mimosa pudica.*

So far, there is no indication that the illegal mining in Cikalahang tends to decrease the vegetation diversity, because the condition of vegetation is almost the same as the other location in Cirebon. Prior to the illegal mining acitivitis, this area is one of dry cultivation areas in Cikalahang village.

B. Terrestrial Fauna

In general the faunas found in the location surrounding the mine area is wild animals such as aves, namely: *Streptochelia chinensis*, *Lonchura sp*; reptilia *Mabuya multifasciata* (lizard) and *Natrix sp* (snake). The animals hardly exist because many areas have been opened extensively.

THE ECONOMIC CONDITION OF THE COMMUNITY

Most of people in Cikalahang Village, Cirebon Regency and Kaduela, Kuningan Regency depend on their life not only from the agriculture sector, but also sometimes they work in the non-agricultural sector. This indicates that the entrepreneurship characters among the people will arise to keep the job opportunities on the different sectors. The other factors are the limitation of agricultural job, land ownership, social status and unproductively of land for the people. So, it can push them to find any prospect jobs in the outside of agricultural sectors. The strongly indicator of limitation of job opportunity in their village is the highly percentage of people mobilization outside of Cikalahang village. Table 3 shows the dependency of people Cikalahang and Kaduela to the non-agricultural economic sector.

Table 3. Source of Income in Cikalahang

No.	Source of Income	*Cikalahang (%)	**Kaduela (%)	Amount (%)
I.	Agricultural sector :			
a.	Rice field	14.25	19.25	33,5
b.	Crop plantation	3.09	5.21	8.30
c.	Fish cultivation	8.13	7.37	15.50
d.	Farm labour	2,67	4.43	7.1
	Subtotal of agricultural sector	**28.14**	**36.26**	**64.40**
II.	Non -Agricultural sector :			
e.	Mine workers	2.90	0.60	3.50
f.	Construction labour outside village	2.00	5.30	7.30
g.	Tourism	10.20	4.00	14.20
h.	Transportation (motorcycle rider ,etc)	3.03	1.63	4.66
i	Informal sector	3.90	1.83	5.73
j.	Etcetera	0.18	0.04	0.21
	Sub-total of non- agricultural workers	**22.21**	**13.40**	**35.60**
	Total amount	50.35	49.66	100

Source : Primary Data , 2004

Remarks:

*Cikalahang Village, Cirebon Regency

** Kaduela Village, Kuningan Regency

PEOPLE PERCEPTION TO THE MINED OUT AREA

A. Perception to Land Reclamation Plan

There is a signifcant indication that the majority of people agree to the land reclamation plan. Sampling to the respondent in Cikalahang showed that 57 people (81.20 %) agree, 6 people (8.57 %) disagree and 7 people (10 %) do not give any answer. The people perception in Cikalahang can be seen in Table 4.

B. Perception to the Reclamation Type

About 30 % of people say that the mined out area need to be recreation resort and camping ground, so it can be integrated to the recently Telaga Remis recreation area. The people perception to the reclamation type can be seen on the Table 5.

The Rehabilitation of Mined out Area in Cikalahang The mined out area should be rahabilitated is 5.5 hectares that has function as a water infiltration or water reservoir where the depth of sand mining

Table 4. People Perception to the Reclamation Plan

No.	Perception of people to the mining activities	Amount	%
1.	Agree with the reclamation plan	57	81,42
2.	Disagree with the reclamation plan	6	8,57
3.	No answer	7	10
	Total	**70**	**100**
	The reason of their agreement :		
1.	To protect of landslide and to maintain the tourism area surrounding Telaga Remis	25	35,71
2.	To take benefits from land reclamation which is expected will increase social welfare to the local community	31	44,28
3.	To protect water resources	14	20
	Total	**57**	**81,42**
	The reason of disagree :		
1.	Worry about the losing of job opportunity as workers in the sand quarry.	5	7,14
2.	The income of village from mine will terminate	1	1,42
	Total	**6**	**8,57**

Source: Primary Data, 2004

Table 5. People Perception on Reclamation Type

No.	People Perception to the Kinds of Reclamation	Amount	%
1.	Recreation Resort/Camping Ground	21	30
2.	Fishing area	12	17,14
3.	Tourism	14	20
4.	Reforest	20	28,57
5.	Not to answer	3	4,28
	Total	**70**	**100**
	The reason of agreement :		
1.	The income from recreation can replace the losing income as quarry workers	21	30
2.	The new tourism activities can increase people income	12	17,14
3	The development of freshwater fish can increase income	14	20
4.	Reforest area will generate :		
	a. The increases land of breeding land		
	b. The water sources of Telaga Remis as irrigation can be functioned again.		
	c. The scene of environment can be obtained	5132	7,1418,572,85
	Total	**70**	**100**

Source: Primary Data, 2004

has reached the zone of saturated layers. The existence of Telaga Remis on the west side of mine area also need to be considered, because the high wall as a result of mine activity will be easily collapsed. Those will disturb the tourism area around the Telaga Remis.

The rehabilitation concept to the mined out area will be based on the environmental condition, the regency regulation, the spatial planning and the people perception. Based on the people's perception surveys, the rehabilitation plan of abandoned mined area for Cikalahang illegal mining will be used as a tourism area.

CONCLUSION AND SUGGESTION

Conclusion

1. The illegal mining activities that cover at the area of 5,5 hectares in Cikalahang Village have obviously disturbed and given negative impact to the environment such as :
   - Landscape disturbance,
   - The hidrology and water surface flow pattern changes,
   - The top soil nutrient loose,
   - Texture and soil fertility destruction,
   - Land slope instability,
   - The disturbing of flora and wild animal,
   - Beautiful and attractive scene disappearance.

2. About 20 to 28.75% people consider that the illegal mining exixtence will potentially cause landslide and destruction to the environment. However, the mining activities has also generated the job vacancy for the people in the village. So they have an alternative job beside as farmers.

3. The people perception shows that about 81.20% respondent agree with the mining, 8,57 % respondent disagree or reject and the rest (10 %) give no response. The reasons of people who agree with the mining are the fear of losing their job as a miner and decreasing of village budget due ton the primary village income is from the sand production and restribution.

4. The mined out area is potentially to be developed as tourism resort, with the facility of parking area, camping ground, play ground and outbond area.

Suggestion

1. Due to the environmental destruction in the mine area, the illegal mining activities should be closed as soon as possible.

2. The government must create policy to stop completely all illegal mining activities in Cikalahang Village.

3. The government of Cirebon and Kuningan Regencies must create the joint coordination to make a better plan for rehabilitation of Cikalahang abandoned mine area, which is correspond to the spatial planning and people requirements.

4. A hill embankment, which act as a border between Telaga Remis and mined out area must be reconstructed into benches with slightly slope.

5. The erosion must be controlled by revegetating the opened area.

6. All of people components must be involved to participate on land rehabilitation.

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