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DETAILED MAPPING FOR THE CONSERVATION OF KARST AREA IN THE LIMESTONE PROSPECT AREA IN BOJONGMANIK, LEBAK REGENCY, WEST JAVA PROVINCE, INDONESIA

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ABSTRACT

Conservation of karst area is necessary amid the rampant exploitation that occurs. The area of Bojongmanik in Lebak Regency, West Java Province has potential limestone content. Detailed mapping of the karst phenomenon is important to reduce the negative impact of exploitation of this area. The results of this study recommend 4 karst areas that are feasible to be conserved and 5 blocks of limestone mining prospect areas. One of the conservation areas is the Cimuli Karst Conservation Area, which is located in the west of the exploration area and occupies an area of around 9.23 hectares. Other areas are Cibiuk Karst Conservation Area in the northwest of the exploration area, which is about 15.38 hectares wide, and Bojongmanik Karst Conservation Area that is located in the middle of the exploration area and also in the north of Cimayang River with an area of about 11.91 hectares. Besides those three areas, there is also Kars Cimayang Conservation Area. Located in the middle of the exploration area and also in the south of Cimayang River flow, it is approximately 6.98. hectares wide. Meanwhile, the five blocks of prospect area have an average area of 77.60 hectares and limestone with an average volume of 31.78 million m^3.

KEY WORDS : Karst conservation, Bojongmanik, Limestone, Prospect area, Resources.

INTRODUCTION

Lebak Regency, specifically Bojongmanik area and its surroundings, has a potential limestone quarrying area. An adequate solution is required to overcome the environmental problems that will arise due to mining activities, especially the problem of karst protected areas and factory activities. During the mining preparation process, the sociocultural, legal, political, infrastructure, technological, environmental, price, and marketing aspects must be taken into account and considered since exploration began. Considering that mining is an economic venture with large capital, using advanced and expensive methods or technologies, the profit and loss must be calculated from the beginning. Furthermore, exploration and mining absolutely must be designed in as much detail as possible, as well as technically and scientifically held accountable.

The detailed mapping activities carried out in the above area consist of mapping and identification of geological, hydrogeological, and carcinological conditions. The purpose is to identify areas indicated as Cave and Water Flow Safeguard Points (CWFSP), or commonly called Karst conservation areas, which need special attention in determining the mining design in order to create good and proper mining technical rules in accordance with the existing regulations.

RESEARCH METHODS

Detailed mapping for Karst conservation in the study was carried out with two primary data collection methods, namely the surface mapping method and subsurface data collection to determine the presence of ground water or ground water level if any, using the geoelectric method. The calculation of the value of prospect area resources was determined with the contour method. The data were presented in a karst conservation map with the overlay method.

RESULTS AND DISCUSSION

Karstification symptoms due to the limestone dissolution process that occurred in the area of investigation consisted of exokarst and endokarst. Exokarst phenomenon occurred on the surface, while endokarst occurred below the surface. Karstification symptoms in the study area were not very significant. That is because the limestone in this area has been covered by younger rocks, namely volcanic rocks. The distribution is shown in Figure 4. Geological Map.

Exokarst phenomenon that occurred in this region is shown by the presence of doline and karren/lapiez structure, which is the structure of dissolution cavities. Doline is generally a rounded, oval, and square shaped curve with a diameter of several meters to hundreds of meters. The base is relatively flat and most of it has been filled with weathering soil, namely terra rosa that is quite thick. The weathered soil is used for agricultural land and plantations. The karren structure from the initial dissolution makes the rock hollow, with the cavity size ranging from a few millimeters to several centimeters. The cavities are sometimes interconnected with intensity tight enough that rain water flows quickly through them.

Symptoms of endokarst that characterize the landscape as a result of further level of dissolution are manifested in the form of caves. At present, there are cave systems that are still active, while and some are dead or dry.

In the study area, caves are only found around permanent watercourses such as Cimayang River, which functions as a tunnel into and out of the main river flow. Subsurface flow or water tunnels of Cimayang River are found in Cimayang Village, particularly in locations BM1 and BM3, and in Bojongmanik Village, particularly in BM45, BM53, BM55, BM56, and BM57. The subsurface flow or water tunnel of Ciparengpeng River - Cibiuk River in the Southwest of the study area, has springs coming out of limestone shown in. The flow of water that comes out is dammed and has been used for various purposes throughout the seasons, including for irrigation purposes. Moreover, several caves that are dead or inactive are also found in this area. On the other hand, in the East, the karstification process does not proceed intensively, so caves are rarely found (see Table 1).

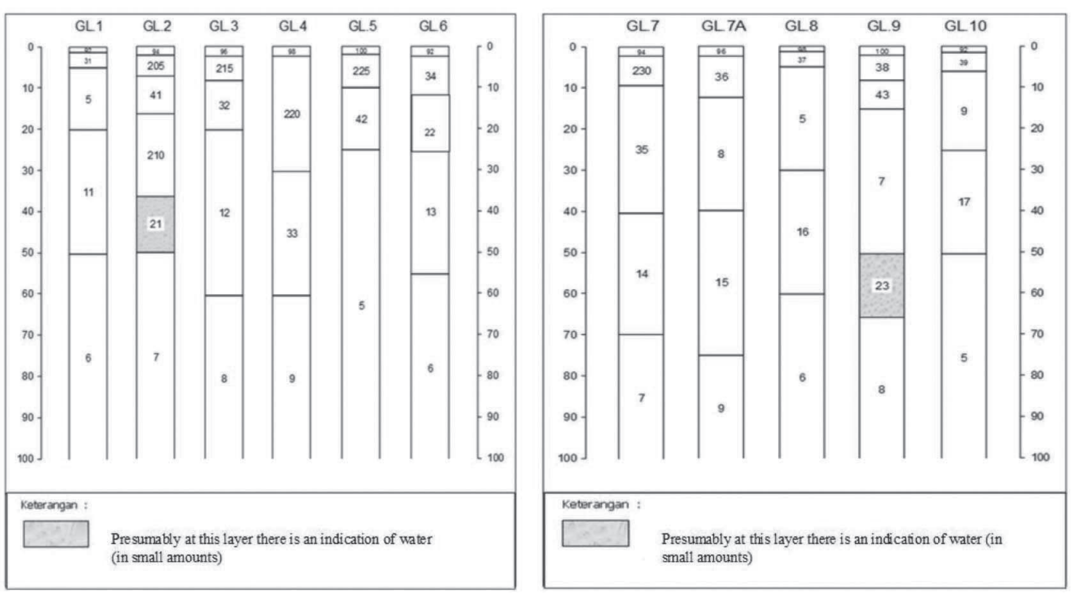

Fig. 1. Profile of geoelectric point cross-section GL 1 to GL10. It is assumed that there is an indication of water in this layer (in a small amount).

Table 1. List of karstification results in the study area.

No.	Location Code	Name and Condition of Cave and Spring	Location Name
1.	BM1	Cimayang Cave, which surrounds Cimayang River. It is an active cave and has speleothems in the form of flowstones. It is a subsurface river tunnel, where the Cimayan River exit is.	Cimayang River in Cimayang Village (see Figure 1)
2	BM3.	Cimayang Cave, the place where Cimayang River flows below the surface	Cimayang River in Cimayang Village.
4	BM3A	Subsurface river with water entering from the roof of the cave.	Cimayang River in Cimayang Village.
5	BM45	Cisurupan Cave, where some of the water flow from Cimayang River enters.	Cimayang River in Bojongmanik Village.
6	BM53	Singkir Cave, which surrounds the downstream of Cimayang River.It is where some water flow from Cimayang River enters. The size is large and it has speleothems in the form of flowstones. 30 meters from the mouth of the cave, there is a waterfall that enters the river channel directed at N160-340E.	Cimayang River in Bojongmanik Village.
7	BM55	Seepage of water that comes out of limestone on the edge of Cimayang River.	Cimayang River in Bojongmanik Village.
8	BM56	Seepage of water that comes out of limestone on the edge of Cimayang River.	Cimayang River in Bojongmanik Village.
9	BM57	The mouth of the Nembol Cave, where the Cimayang River water flows out below the surface from BM45 and BM53. The flow is dammed for irrigating rice fields in the dry season.	Cimayang River in Bojongmanik Village.
10	BM129	The mouth of Ciparangpeng Cave, where Ciparangpeng River flows below the surface	Ciparengpeng River in Cibiuk Sub-village, Cimayang Village.
11	BM196	The mouth of Cibiuk Cave, where Cibiuk River stream flows from below the surface. It comes from Ciparangpeng River.	Cibiuk River in Bojongmanik Village.
12	BM151	A spring by the Cikondang River that comes out of limestone.	Tributary of Cimuli River
13	BM153	A spring by the Cikondang River that comes out of limestone. It is dammed for irrigating rice fields in the dry season.	Cimuli River

Meanwhile, for identifying subsurface rivers that are normally present in the karst area, a geoelectric estimation was performed at 10 ridge positions (see Figure 2), which may have subsurface rivers. The profile results are presented in Figure 1. This profile shows that there is little possibility of subsurface rivers in limestone in this area and there are only small reservoir deposits. The absence of subsurface rivers is probably caused by the geological setting of this area which is based on claystone and coated with volcanic rocks, so the karstification process did not go well. The dominant hydrological condition in the study area is a generally northward directed surface runoff that flows to Ciujung River.

Based on the delineation results of lithology unit in the geological map and karst conservation area that is overlayed, 5 (five) blocks of limestone mining prospects were obtained (see Figure 2) The value of the resources and the final mine design of the five blocks in this study were calculated based on a compilation of available data.

The calculation of resources was conducted using the contour method based on the division of 5 prospect blocks and contour secondary data sourced from the Geospatial Information Agency. The calculation of the contour method was performed at each height interval of 5 meters. The basic assumption of the base level calculation of this

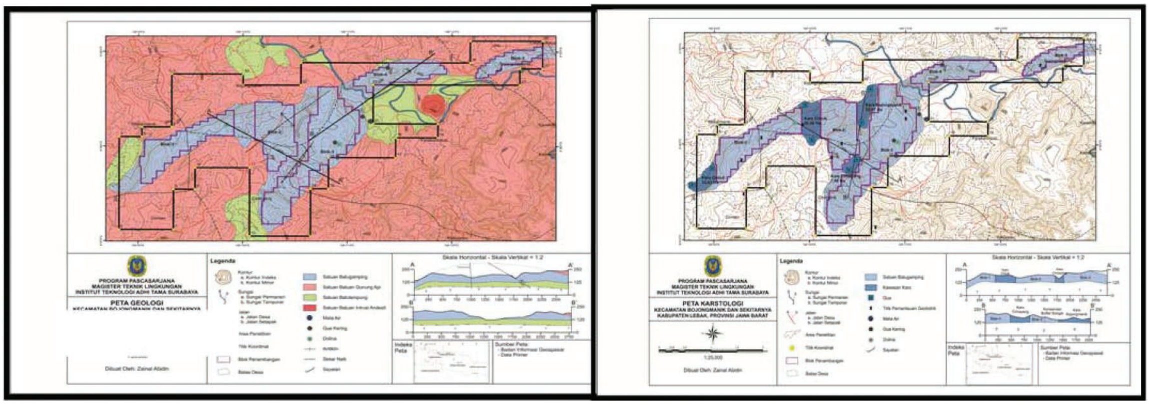

Fig. 2. Geology and karstology map of the study area.

resource is the lowest height of the mining block in the area, so the mine design would not form a mine basin (void). This was carried out to reduce the impact of damage to the environmental support capacity of the area. This base level assumption is also based on the consideration that the geoelectric data above do not indicate the presence of a subsurface river in the limestone area of the study area.

. CONCLUSION

Based on the data analysis and discussion that have been carried out, several conclusions that the karst conservation area in the study area, the researchers recommend 4 conservation sites feasible for conservation, namely: Cimuli karst conservation area, Cibiuk karst conservation area, Cimayang karst conservation area, and Bojongmanik karst conservation area.The results of mapping the limestone prospect area are divided into 5 prospect blocks, namely: Block 1 (80.29 Ha), Block 2 (76.33 Ha), Block 3 (152.78 Ha), Block 4 (48.52 Ha), and Block 5 (30.08 Ha).The final mine design recommended for each prospect block is the design that does not cause voids or mine pits. Although the formation of void is not recommended, the value of the calculated resources is still very large and prospective. This is to minimize the negative impacts of limestone exploitation.

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