

# Drainage Analysis of Cihea Area, Haurwangi Subdistrict, Cianjur Regency, West Java

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**Abstract**— The research area is located on Cihea Area, Cianjur Regency, West Java at 107° 17'00" E - 107° 20' 00" E and 6° 51' 00" S - 6° 53' 30" S. The purpose of this research was to determine the drainage pattern characteristics of the research area and its relationship to the physical characteristics of the research area. The research method is studio analysis using Map Info software which produces several thematic maps such as drainage pattern, slope, and geological maps. In addition, satellite images are acquired through Google Earth software. Based on the results, the research has rectangular drainage pattern. It indicates that there is an influence of geological structure control on sedimentary rocks. This is also supported by the presence of elongated hills that may have been formed due to the fault structure. It is also in accordance with the results of previous geological research. Because the research area is influenced by geological structure control, it is suggested that the research area needs clear and integrated spatial and regional planning. Therefore, it can be concluded that the analysis of drainage pattern is important and related to the physical characteristics of the research area.

**Keywords**— Cihea, drainage pattern, geology, geomorphology, Google Earth.

## I. INTRODUCTION

The research was conducted in the Cihea Area, Cianjur Regency, West Java at 107° 17'00" E - 107° 20' 00" E and 6° 51' 00" S - 6° 53' 30" S. This research is important because the geological conditions of the research area are quite complex. This is in accordance with the geological research that has been done previously. The purpose of this research was to determine the drainage pattern characteristic of the research area and its relationship to the physical characteristics of the research area.

Physical characteristics of the research area can be identified and determined through the geomorphological appearances. Some distinctive morphologies formed due to the influence of structures that can be known such as elongated hills with irregular and irregular shapes, also solitary hills with perfect and imperfect conical shapes [1]. The geomorphological conditions that are influenced by those geological structures can also affect the characteristics of land use [2]. On the other hand, land use changes can occur due to erosion processes [3][4]. Intensive erosion process in a form of geomorphology and land use can lead to degradation of environmental conditions [5][6].

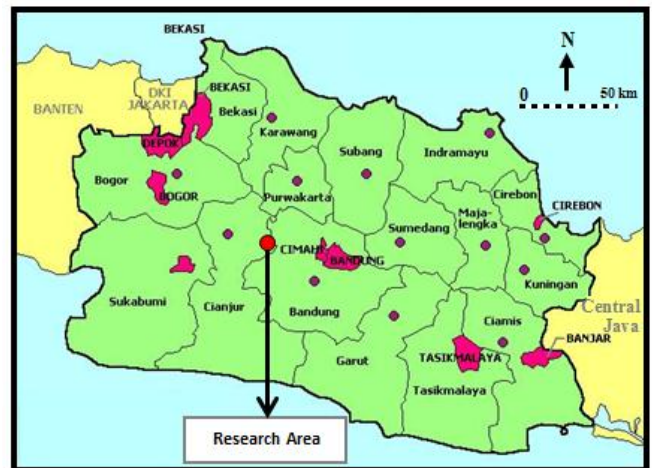


Fig. 1. The research area in the Cianjur Regency

Land use is one of the parameters related to the physical characteristics of a certain area and it is one of the important things in the development of a certain area[7][8]. Land use of a certain area related to geological and geomorphological conditions can be identified through remote sensing [2]. Therefore, satellite images can be used to observe various land use [9][10].

## II. METHOD

The research method is studio analysis using Map Info software which produces several thematic maps such as drainage pattern, slope, and geological maps. In addition, satellite images are acquired through Google Earth software. Drainage pattern map is obtained from digitization process of topographic map, slope map is obtained from analysis process of SRTM DEM with a resolution of 30 meters, and geological map is obtained from the previous geological research [11]. This research was conducted by identifying and analyzing the maps and satellite images. Determination of drainage pattern is carried out based on the classification made by researchers [12][13].

Land use conditions in an area can be determined through remote sensing approaches [14][15]. One of the media used in remote sensing is satellite images [16]. Satellite images can be obtained by downloading images using the Google Earth software [17][18].

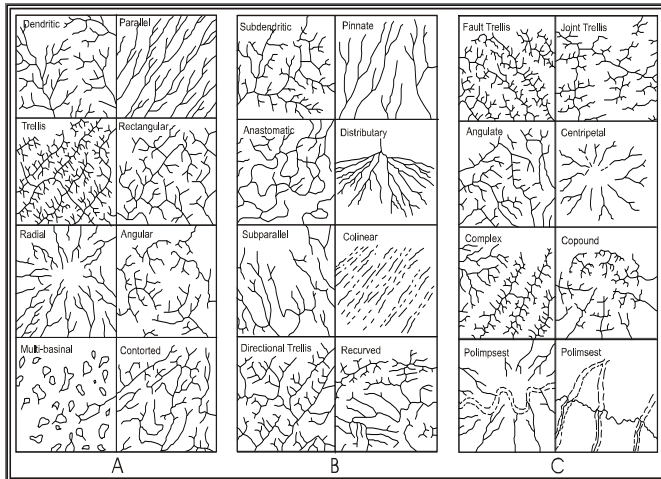


Fig. 2. Drainage pattern classification [13]: (A) Basic drainage pattern; (B and C) Modified basic drainage pattern

### III. RESULT AND DISCUSSION

In general, all rivers in the research area flow from the south to the north. It can be seen in Figure 3 that the research area has rectangular drainage pattern. It is characterized by right-angled bends in both the main stream and its tributaries [12]. The rectangular pattern indicates that the research area is influenced by the presence of geological structures. It can be proven from the existence of geological structures that develop based on geological map [11].

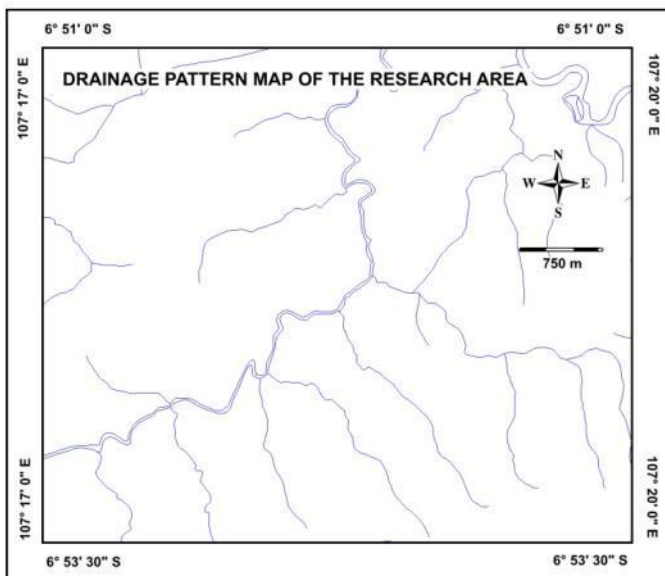


Fig. 3. Drainage pattern map of the research area

Rectangular drainage pattern implies geological structure control as its pattern is influenced by the right-angled faulting or jointing of rocks [12][13]. It can be seen in the slope map (Figure 4) which shows the presence of elongated hill features. It is possible that the elongated hill features were formed due to the control of the fault structure. Moreover, these elongated hill features can be identified from satellite image (Figure 5).

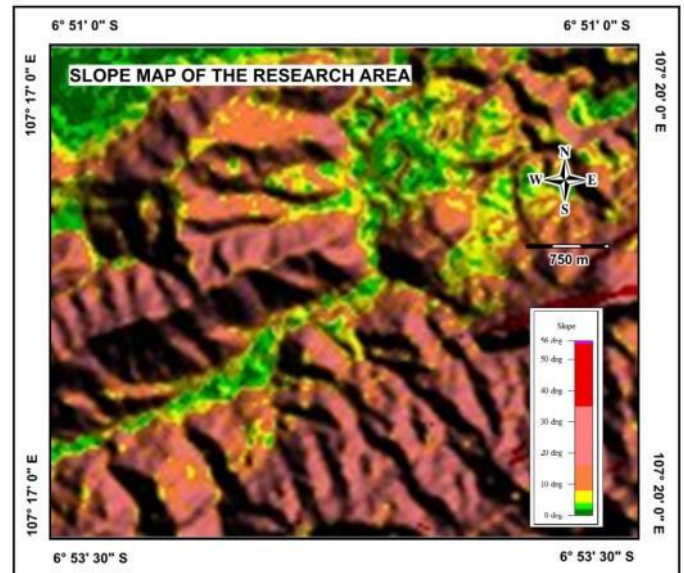


Fig. 4. Slope map of the research area

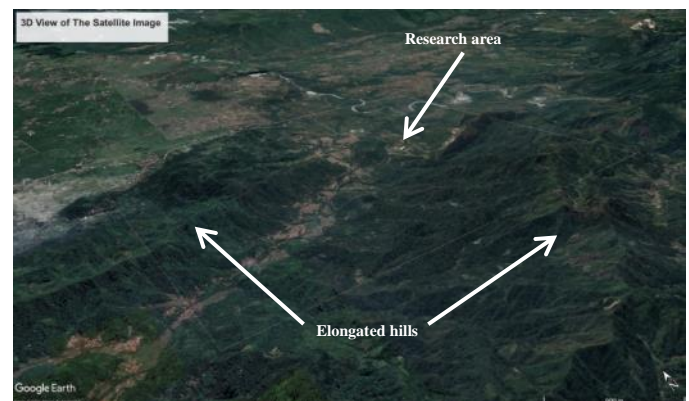


Fig. 5. 3D view of satellite image of the research area (source: Google Earth)

The geological condition of the research area can be identified through geological map (Figure 6). It can be seen that the research area is composed by various rock types, such as volcanic rocks, sedimentary rocks, and alluvium. Volcanic rocks are found in the north and west of the research area, sedimentary rocks found in the center to the south of the research area, and alluvium found in the center to the west of the research area. In addition, indications of fault structure can also be found in the center of the research area. It proves that the rectangular pattern is related to the geological structures in the research area.

Based on satellite image (Figure 7), it can be seen that the research area has quite interesting morphological features. In addition, it can also be seen that there are some changes in land use. Similar to land use in other areas, changes in land use conditions in the research area may occur due to an increase in population and land requirements. In the center-west and south of the research area, there are elongated hills where no significant land use changes were found. On the other hand, in the center and north-northeast of the research area there are valleys and lower areas where land use changes were found such as residential areas, rice fields area, etc.



Because the research area is influenced by geological structure control, the land use change needs to be regulated in a clear and integrated spatial and regional planning.

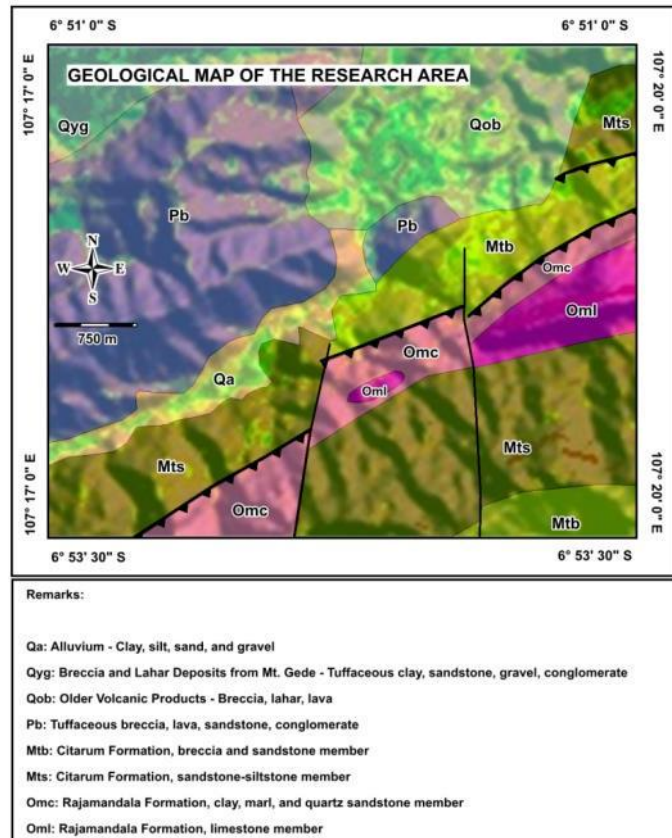


Fig. 6. Geological map of the research area (modified from [11])

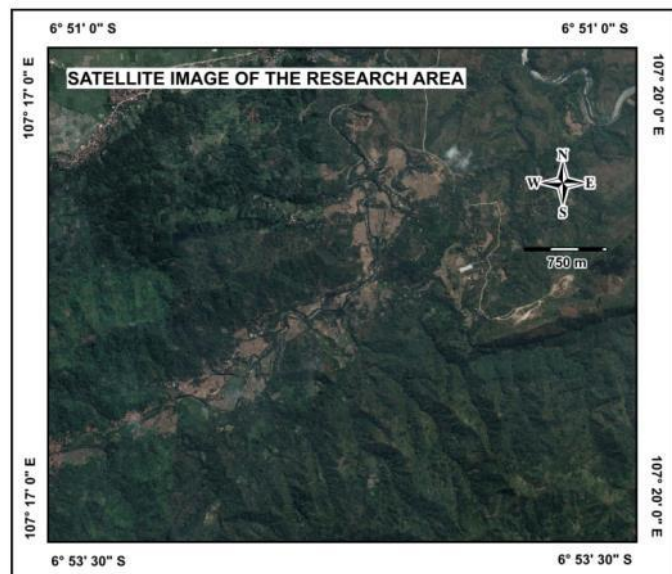


Fig. 7. Satellite image of the research area (source: Google Earth)

#### IV. CONCLUSION

The research was conducted in the Cihea Area, Cianjur Regency, West Java. Rectangular drainage pattern was

identified in the research area which indicates that there is an influence of geological structure control on sedimentary rocks. This is also supported by the presence of elongated hills that may have been formed due to the fault structure. The elongated hills can be identified by slope map and satellite images whereas the fault structure can be identified by geological map. Because the research area is influenced by geological structure control, it is suggested that the research area needs clear and integrated spatial and regional planning. Therefore, it can be concluded that the analysis of drainage pattern is important and related to the physical characteristics of the research area.

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